



# The State of America's Forests

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# Executive Summary

The forestlands of the United States tell a fascinating story about humankind and its relationship with the land. It is a story of trial and error, of consumption and conservation, and of conflict and collaboration. But most of all, it is a story of regrowth, renewal, and abundance.

Through words, statistics, and graphs, *The State of America's Forests* tells this story, and even though it has not yet concluded, there is good reason to believe that the ending of this story will be a happy one.

Indeed, America's forests have their problems. Insects and disease, invasive weeds, unmanaged recreation, fragmentation, and land conversion are each having an effect on forests from coast to coast and providing a formidable challenge to the know-how and talent of the natural resources profession. And yet, as this report suggests, there remain reasons to be optimistic.

- The United States ranks fourth on the list of most forest-rich countries, following the Russian Federation, Brazil, and Canada, with 8 percent of

the world's primary forest.

- The number of acres of forestland in the United States has remained essentially the same during the past century.
- On average, 11 percent of the world's forestland benefits from some type of conservation effort. In the United States, 20 percent is protected by conservation initiatives.
- Assessments of biodiversity on the nation's forests have found that the annual rate at which species are listed as threatened or endangered has declined five-fold.
- Historical trends indicate that the standing inventory (the volume of growing stock) of hardwood and softwood tree species in US forests has grown by 49 percent between 1953 and 2006.
- Forest management also has been recognized as an effective means of sequestering carbon over the long

term. In the United States, the total amount of carbon sequestered by forests and the creation of wood products during the 1990s was estimated at almost 200 megatons per year, an amount equal to approximately 10 percent of US carbon dioxide emissions.

- An estimated 25 percent of US private forestland is managed in accordance with one of the three major forest certification schemes (the Sustainable Forestry Initiative, the Forest Stewardship Council, and the American Tree Farm System), and conservation initiatives on private land, such as easements, are becoming increasingly common.

Most encouraging of all, perhaps, is not what has already been accomplished, but what is likely to be achieved by forestry and natural resources professionals in the future. Scientific discoveries occur almost every day, and these advances are leading to developments in biofuels, forest and biodiversity conservation, tree farming and production, environmentally sound building materials, fire management, and controls for insect and disease outbreaks—successes that will enhance our

efforts to conserve, regrow, and use the forest more effectively than we do today.

To that end, this report is designed to inform stakeholders about the current state of US forestlands, how the conservation, management, and utilization of US forests compare with efforts in other nations, and the problems that threaten to diminish the future health and productivity of the public and private forests on which all Americans depend.

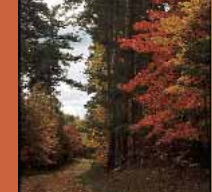


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# Introduction

There is no shortage of news coverage regarding the state of America's forests. And as a quick Google news search will reveal, much of it focuses on the problems, both biotic and human-caused, affecting their health and management. Stories about large wildfires, the continued spread of the emerald ash borer, and timber harvests blocked by court rulings make good headlines, but they don't provide a complete picture of what is happening on the nation's millions of acres of public and private forestland.

As this report suggests, there is much good news to be shared about America's forests, particularly in regard to their abundance, the ecological services and recreational opportunities they offer, the raw materials they provide, and the successful initiatives to sustain them.

For example, few people may realize that for the past 100 years, the amount of forestland in the United States has remained relatively stable, at around 755 million acres, thanks to improvements in markets for forest products and reforestation efforts. Those efforts include several government-sponsored programs that offset the

loss of large tracts of forestland early in the 20th century.

Even better, perhaps, is that the efforts to conserve America's forests have continued. The most recent analyses from federal land management agencies indicate that more than 753 million acres of forested and other lands benefit from some kind of protection. Conservation efforts, such as conservation easements on private lands, are increasing nationwide, and 25 percent of US private forestlands are certified. In fact, when compared with the world average—11 percent protected forestland—the United States has twice as much forestland benefiting from some type of conservation initiative.

The protection is appropriate, as America's growing population continues to demand ever more goods and services from the nation's forests. According to the 2000–2001 US National Recreation Survey, 97 percent of Americans are involved in at least one outdoor recreation activity, and national forests alone host an estimated 137 million visits per year. Further, even though US forests are among the most productive in the world, Americans' consumption of timber products exceeds

Note: Terms that may not be familiar to every reader are defined in the glossary, beginning on page 65.

production by 4.2 billion cubic feet.

The protection of US forestland ensures that America's forested landscapes can continue to provide the ecosystem services—clean air, clean water, wildlife habitat, and carbon sequestration—on which we rely. For instance, in the United States, the total carbon sequestered by forests and the creation of wood products during the 1990s reached almost 200 megatons per year—the equivalent of nearly 10 percent of US carbon dioxide emissions from the burning of fossil fuels.

Because forests are a renewable resource, when managed in a sustainable manner, they can continue to provide such services while simultaneously enabling landowners to meet their economic objectives. This, in turn, gives landowners an incentive to retain their forestland rather than sell it to developers who may convert it to other uses.

However, despite its economic importance to landowners, timber harvesting has remained well under sustainable limits. For the past 50 years, removals have

remained below 2 percent of standing tree inventory, while net tree growth was near 3 percent. Currently, the volume of annual net timber growth is 36 percent higher than the volume of annual timber removals.

In comparison with other nations, the United States ranks fourth among the top forest-rich countries, is home to 8 percent of the world's primary forests, and is one of the five countries with the greatest total growing stock. In fact, when taken together, the United States, China, and the Russian Federation host more than half of the world's productive plantations.

Of course, in sharing this good news, it's important not to downplay the challenges facing the health of the nation's forests. For example:

- In 2006, almost 8 percent of US forests—approximately 58 million acres—were at significant risk from insect and disease mortality.
- According to the US Forest Service, 14 percent of the plant species on noncrop lands in the Midwest





are nonnative invasive plants,

- In the past decade, the number of wildland forest fires in the United States has been unusually high, especially in the West. Between 1999 and 2006, fires affected an average of 5.8 million acres per year.
- A recent study estimated that more than 44 million acres of private forestlands could experience substantial increases in housing density in the next three decades.

Further, trends within the forest products industry, such as forest divestiture by large corporations and increased competition from abroad, have caused widespread uncertainty and led to further declines within the US industry. As a result, a growing number of forest owners are now forced to decide whether they should maintain their forests or convert them to other uses that provide a higher financial return.

Despite those concerns, however, there is a growing consensus within the broad US environmental community

that maintaining forestland is vital not only to maintaining and enhancing forest ecosystems but also to sustaining a healthy and competitive forest products industry.

The purpose of this report is to provide a complete and realistic assessment of the nation's forests that can help stakeholders as they consider the issues and trends affecting forest management and use. Because there is no consistent standard for presenting statistics pertaining to forests in both America and abroad, the reader will find here a variety of data about America's forests from a wide range of sources pertaining to historical trends that have shaped forest appearance, use, ownership and conservation; the economic, environmental, and social benefits they provide; how their health and productivity compare with those in other countries; and the effect of cultural, institutional, and economic changes, such as forest certification, new ownership patterns, increased competition from foreign markets, and shifting demand for wood and paper products.

Dale Bosworth

*Former Chief, USDA Forest Service*

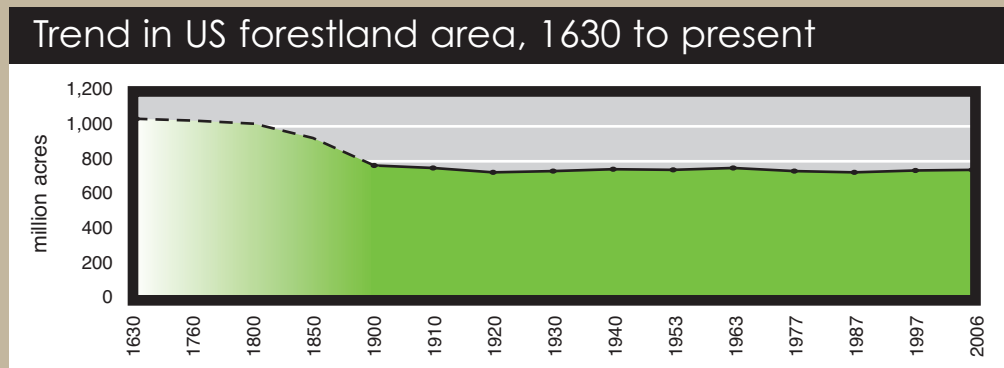




## Historical Trends

The amount of forestland in the United States has been relatively stable for the past century. Prior to European settlement, forests of the future nation occupied about 1 billion acres. The vast forests and the rich soils under the original forests were critically important to building the United States into a prosperous industrial nation. During the 300-year period from 1600 to 1900, 25 to 30 percent of the original forest area was converted to other land uses, primarily agriculture.

However, by the beginning of the 20th century, the amount of forestland in the United States stabilized at an average of 755 million acres, and has remained relatively constant in the past 100 years.<sup>1</sup> Nationwide, through much of the 20th century, loss of forestland acreage due to agricultural land conversion and urban expansion was offset by forestland additions resulting from natural regeneration of marginal or abandoned agricultural land and reforestation efforts accomplished through several government-sponsored programs, especially the Soil Bank, Forestry Incentive, and Conservation Reserve programs.<sup>2</sup> In addition, the



Note: Data prior to 1950 are based on historical evidence, not field sampling.  
Source: USDA Forest Service, *Forest Inventory Analysis Program*. 2006.

industrialization of farming has freed land that was formerly used to provide food for draft animals and has made this land available for human food production, and farming has become more efficient, with genetically improved crops, irrigation, and fertilizers.<sup>3</sup>

Since 1997, forestlands in the United States slightly increased, to some 755 million acres. However, the way *forestland* is defined affects the total forest acreage reported. Recently, the US Forest Service adopted new standards for what qualifies as forestland. For example, ecosystems such as chaparral and sparse piñon and

<sup>1</sup>Smith, W.B., P.D. Miles, J.S. Visage, and S.A. Pugh. 2004. *Forest Resources of the United States, 2002*. Gen. Tech. Report NC-241. St. Paul, MN: USDA Forest Service, North Central Forest Experiment Station.

<sup>2</sup>Wear, D.N., and J.G. Greis. 2002. *The Southern Forest Resource Assessment*. Gen. Tech. Report SRS-53. Asheville, NC: USDA Forest Service, Southern Research Station. [www.srs.fs.usda.gov/sustain/report//index](http://www.srs.fs.usda.gov/sustain/report//index). Accessed November 2006.

<sup>3</sup>MacCleery, D.W. 1996. *American Forests. A History of Resiliency and Recovery*. Forest History Society issues series. Durham, NC: Forest History Society.

## Trends in US forestland area (million acres) by region, 1630–2006

Region	1630	1760	1800	1850	1900	1953	1963	1977	1987	1997	2006
North	298	294	285	227	144	161	166	164	165	170	171
South	354	352	346	329	252	226	228	217	212	214	214
Rocky Mountain	154	154	154	149	149	148	146	144	145	149	150
Pacific Coast	104	104	99	104	97	93	92	91	87	87	88
Alaska	128	128	128	128	128	128	128	128	128	127	127
<b>Total</b>	<b>1,038</b>	<b>1,032</b>	<b>1,013</b>	<b>936</b>	<b>769</b>	<b>755</b>	<b>761</b>	<b>745</b>	<b>738</b>	<b>748</b>	<b>750</b>

*Note: Historic data are reconciled and corrected to reflect new forestland definition; accordingly, previously published figures may differ. Figures may not add to totals because of rounding. Source: Forest Service statistics based on data from Forest Inventory Analysis data and reports (1950–); Forest Service report estimates prior to field inventories (1900–1949); Bureau of the Census land clearing statistics (1850–1899); clearing estimates proportional to population growth (1760–1849).*

juniper “forests” (with 5 to 10 percent tree cover) in the Rocky Mountain and West Coast have been reclassified as woodlands rather than forestlands. The Forest Service estimates that the new definition removes about 6 million to 8 million acres previously considered forestlands. Some of the statistics in this document reflect these changes in definition. Generally, these changes do not affect historic estimates of productive, unreserved forestland or timberland.



# What and Where Are America's Forests?

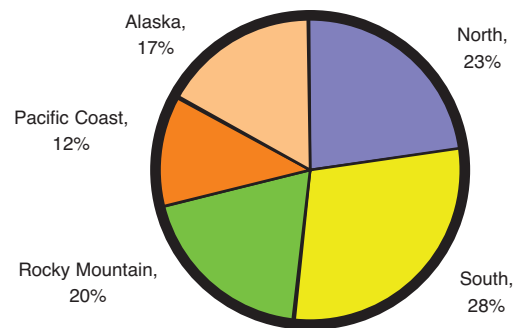
## Forestland

A forested area is classified as forestland if it is at least 1 acre in size and contains at least 10 percent tree cover. "Forest cover," however, is distinguished from "forest use." In the United States, some 25 million to 30 million acres meeting the criterion for forest cover do not have a primary forest use.<sup>4</sup> These lands are typically in urban areas and are not considered in this publication.

## Timberland

A forested area is classified as timberland if the forest is capable of growing 20 cubic feet of commercial wood per year. Commercial timberlands can be used for the repeated growing and harvesting of trees. Traditionally, commercial timber production has been among the primary uses of these lands.

Forestland distribution in the United States, 2005



Source: USDA Forest Service, Forest Inventory Analysis Program. 2006.

US forestland regions



Source: USDA Forest Service.

<sup>4</sup> US Forest Service FIA, personal communication, Brad Smith. October 2006.

## US forestland (million acres) by region, 2005

	Total land area	Forestland			Other land	
		Total	Timberland	Reserved <sup>a</sup>		Other <sup>b</sup>
Northeast	127	85	80	4	1	42
North Central	287	86	83	2	1	201
<b>North</b>	<b>414</b>	<b>171</b>	<b>163</b>	<b>6</b>	<b>2</b>	<b>243</b>
Southeast	148	88	86	2	0	60
South Central	387	126	117	1	7	261
<b>South</b>	<b>535</b>	<b>214</b>	<b>203</b>	<b>3</b>	<b>7</b>	<b>321</b>
Great Plains	194	6	5	0	0	188
Intermountain	548	145	65	20	60	403
<b>Rocky Mountain</b>	<b>742</b>	<b>151</b>	<b>70</b>	<b>20</b>	<b>60</b>	<b>591</b>
Alaska	365	127	12	33	82	238
Pacific Northwest	109	53	44	5	4	56
Pacific Southwest	109	35	20	6	9	74
<b>Pacific Coast</b>	<b>583</b>	<b>214</b>	<b>76</b>	<b>44</b>	<b>94</b>	<b>369</b>
<b>US total</b>	<b>2,274</b>	<b>750</b>	<b>512</b>	<b>74</b>	<b>164</b>	<b>1,524</b>

<sup>a</sup> “Reserved” forestlands are withdrawn from harvest by statute or administrative regulation. They include wilderness areas and national parks. Reserved forestland is assumed to fit in Categories I and II of IUCN (the World Conservation Union). This estimate does not include any allowance for reserved private lands.

<sup>b</sup> “Other” forestlands do not fit the timberland or reserved categories. They include, for example, scrub oak forests and black spruce forest in poor sites of the Rocky Mountains and interior Alaska.

Note: Figures may not add to totals because of rounding.

Source: USDA Forest Service, Forest Inventory Analysis Program. 2006.

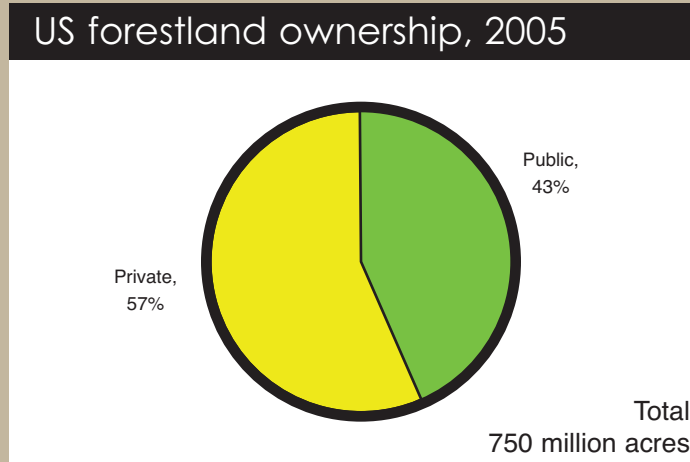


# Who Owns America's Forests?

**F**ifty-seven percent of US forestland is owned by private interests, whether individuals or companies; 43 percent is “public” land under the control of federal and state agencies. Almost two-thirds of private forestlands are located in the North and South, and over 60 percent of public forestlands are in the Rocky Mountain region and Alaska.

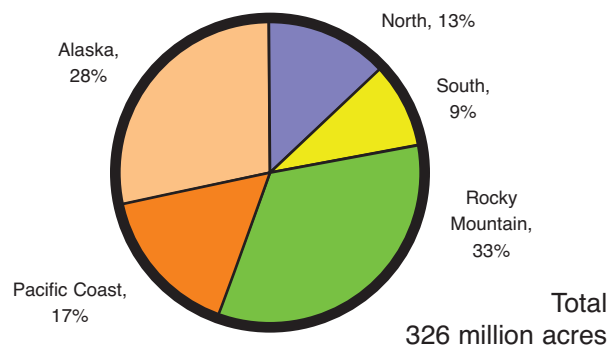
Private ownership is land owned by individuals, families, private cooperatives, industries, investment funds and any private institution, organization or society.

Public ownership is land owned by national, state and regional governments, or government-owned institutions, corporations or other public entities.



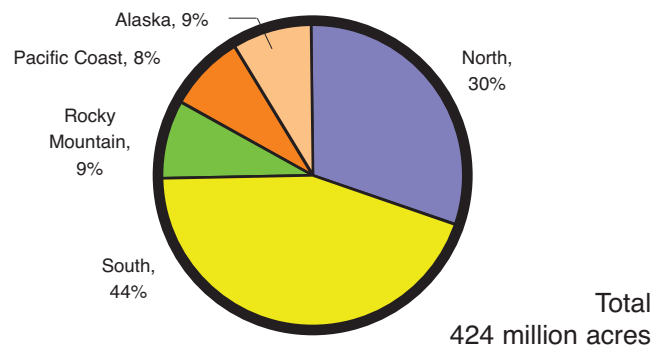
*Note: Native American lands have been counted as private ownership.  
Source: USDA Forest Service.*

## Public forestland ownership distribution in the United States, 2005



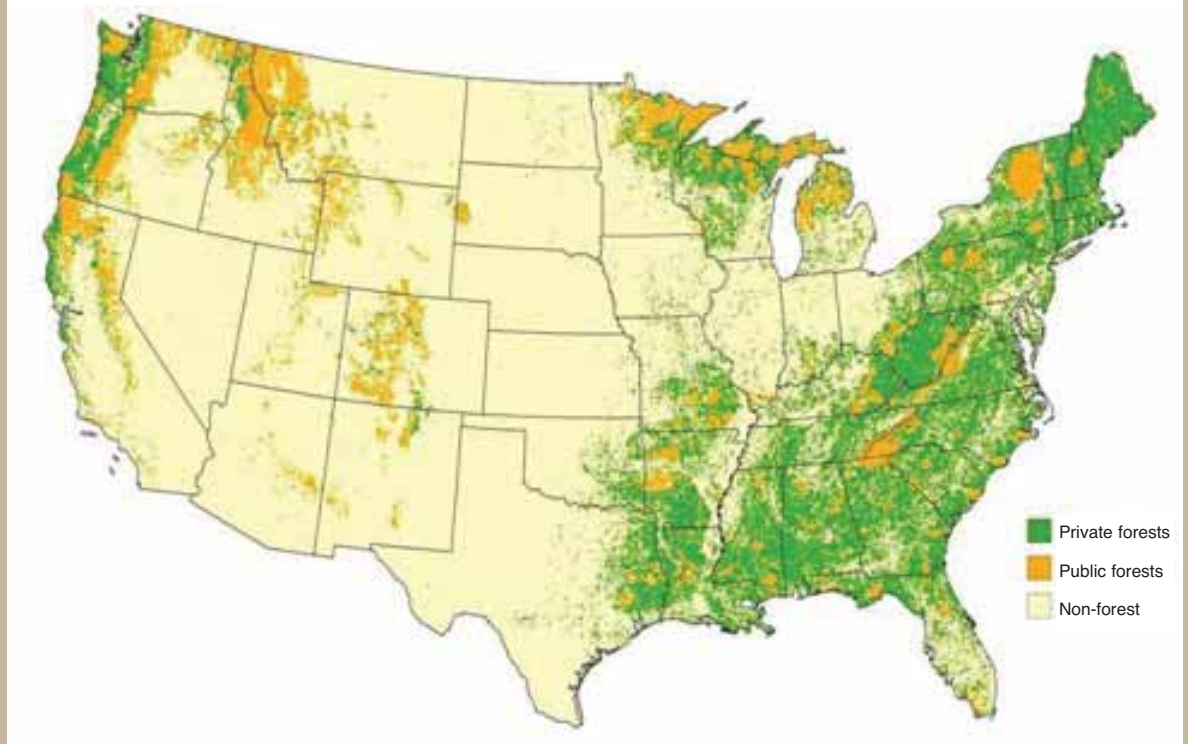
Source: USDA Forest Service, Forest Inventory Analysis Program. 2006.

## Private forestland ownership distribution in the United States, 2005



Source: USDA Forest Service, Forest Inventory Analysis Program. 2006.

## Forest ownership in the United States, 2003



Source: USDA Forest Service Forest Inventory and Analysis National Woodland Owner Survey. Forests: University of Maryland, MODIS Vegetation Continuous Fields; Public Ownership: University of California Santa Barbara Managed Area Database; States: ESRI Data and Maps.





# Conservation of America's Forests

The area of US forestland under conservation efforts almost doubles the world average.<sup>5</sup> In US private forests, conservation efforts are escalating nationwide through conservation easements, and 25 percent of private forests have been already certified as being sustainably managed.

Regional, state, tribal, and federal agencies, academic institutions, private companies, and conservation groups—a total of some 500 organizations—participate in the Gap Analysis Program (GAP), a nationwide effort to assess to what extent native animal and plant species are being protected. The national guidelines define three designations for protected areas:<sup>6</sup>

## GAP Class 1

An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management. This class includes federal designations such as national

parks, national monuments, wilderness areas, nature reserves, preserves, and research natural areas.

## GAP Class 2

An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance. This class includes state parks, state recreation areas, national wildlife refuges, national recreation areas, areas of critical environmental concern, wilderness study areas, conservation easements, private conservation lands, and national seashores.

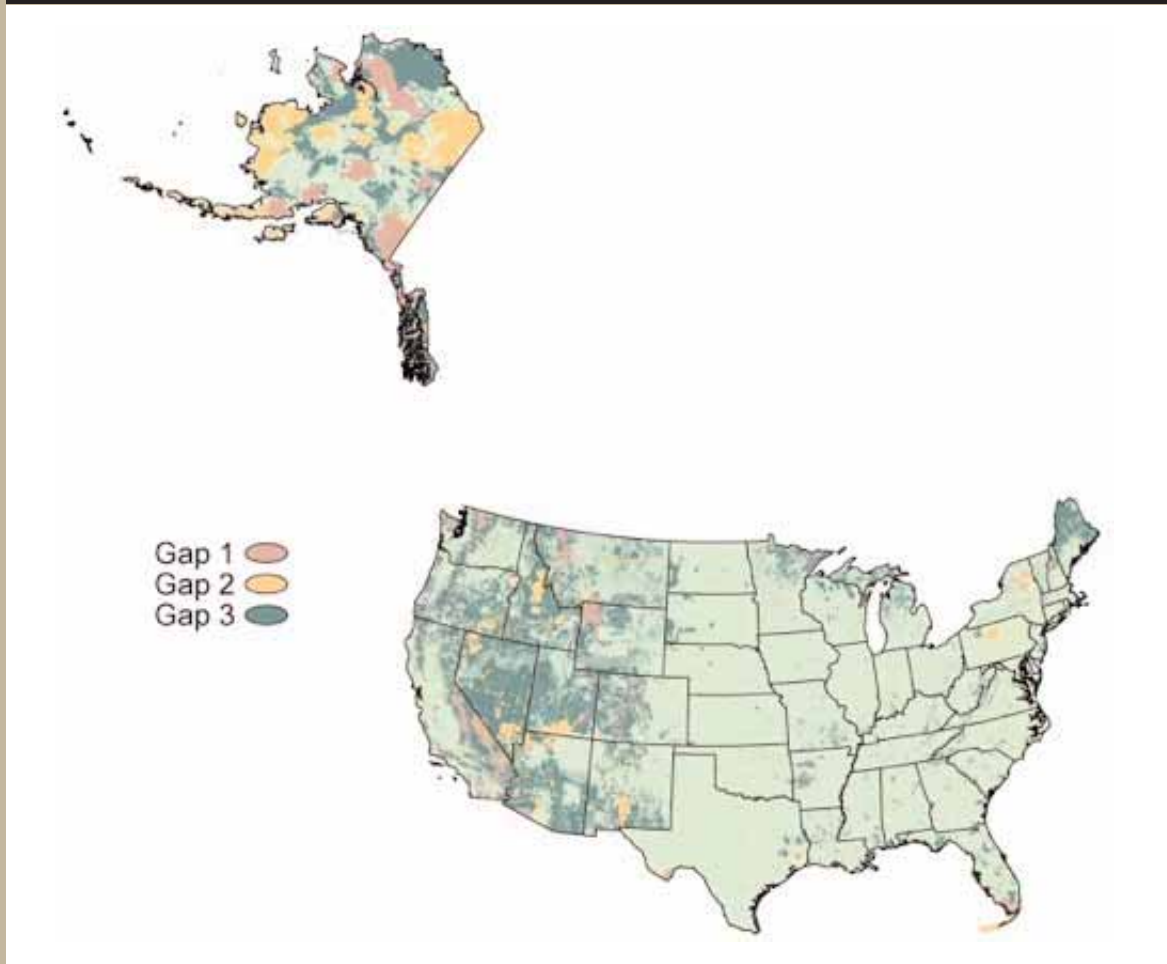
## GAP Class 3

An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or a localized intense type (e.g., mining). The designation also confers protection to federally listed endangered and threatened species

<sup>5</sup> Food and Agriculture Organization. 2005. Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management. Rome.

<sup>6</sup> Gap Analysis Program Handbook. Mapping and Categorizing Land Stewardship Chapter. [http://gapanalysis.nbii.gov/portal/server.pt/gateway/PTARGS\\_0\\_2\\_1105\\_209\\_242\\_43/http%3B/gapcontent1%3B7087/publishedcontent/publish/public\\_sections/gap\\_home\\_sections/handbook/handbook\\_stewardship/handbook\\_stewardship.html](http://gapanalysis.nbii.gov/portal/server.pt/gateway/PTARGS_0_2_1105_209_242_43/http%3B/gapcontent1%3B7087/publishedcontent/publish/public_sections/gap_home_sections/handbook/handbook_stewardship/handbook_stewardship.html). Accessed November 2006.

## Areas of the United States under some degree of protection



throughout the area. This class includes national forests, most Bureau of Land Management land, wildlife management areas, military reservations, state forests, game and fish preserves, fish hatcheries, and state commemorative areas, access areas, national grasslands, and Army Corps of Engineers holdings.

The most recent analysis shows that more than 753 million acres of land is classified under one of the three protection categories. This figure includes both forested and other land.

Source: Conservation Biology Institute. 2006. Protected Areas Database, version 4.  
<http://www.consbio.org/cbi/projects/PAD/>. Accessed November 2006.



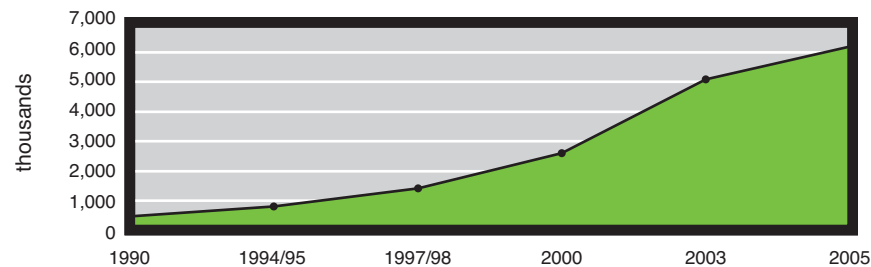
## Conservation Easements

Historically, most forest conservation has been done through government ownership. Today, private conservation efforts are emerging worldwide.

Nongovernmental organizations and private entities are buying forestland, acquiring land through concessions, and buying property rights through conservation easements. During the past decade in the United States, conservation easements have escalated in part because of the large tracts of forestland put up for sale in the market and increased government incentives.

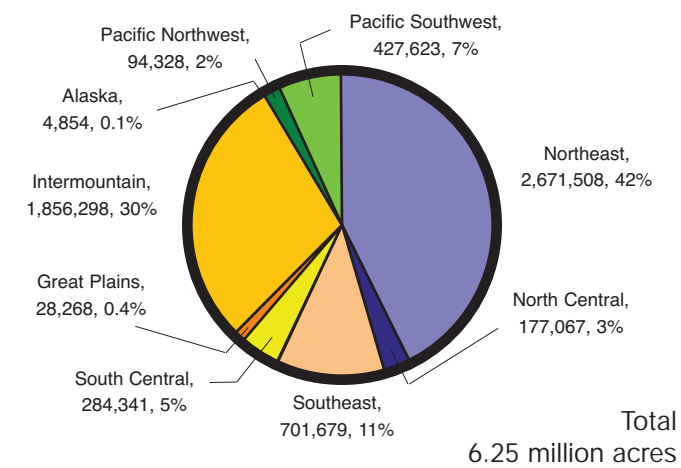
The area protected by conservation easements is expected to keep growing nationwide. In August 2006 a new law was approved providing enhanced tax benefits to forest landowners and farmers. Through the end of 2007, the new tax law will allow donors of completed conservation easements to deduct the value of the easement from their personal income (up to 50 percent of personal income for up to 16 years). Previous tax law allowed deducting only up to 30 percent each year for a total of six years.

## Trend in acreage under conservation easements



Source: Land Trust Alliance, 2005 National Land Trust Census. November 2006

## Acreage and distribution of conservation easements by region, 2005



Source: Land Trust Alliance, 2005 National Land Trust Census. November 2006

## Federal Laws Related to Forest Ecosystem Protection

The legal framework for ensuring forest sustainability and conservation of forests is both comprehensive and complicated. Despite the many laws and regulations that govern forestry in the United States, there is no overarching policy that guides lawmakers at all levels of government in ensuring sustainability. The majority of land-use regulations are often not specifically forestry related but pertaining to more general environmental concerns, such as water or air quality. That said; there are many statutes that govern forestry and promote sustainability.

Major federal conservation statutes that help conserve and protect forest resources include the following:<sup>7</sup>

**National Environmental Policy Act of 1969.** The act requires all federal agencies proposing major actions that may substantially affect the environment to follow a process. Agencies must produce an environmental analysis through either environmental assessments or environmental impact statements.

**Clean Air Act of 1970.** This comprehensive federal law regulates air emissions from area, stationary, and mobile sources. Its purpose is to protect and enhance the quality of the nation's air resources. It authorizes the Environmental Protection Agency to establish National Ambient Air Quality Standards to protect public health and the environment. The original Clean Air Act was passed in 1963, but the current US national air pollution control program is based on the 1970 version of the law. The 1990 Clean Air Act Amendments are the most far-reaching revisions of the 1970 act.

**Clean Water Act of 1972.** The act established a regulatory system for navigable waters in the United States, whether on public or private land. It is intended to eliminate discharge of water pollutants into navigable waters, to regulate discharge of toxic pollutants, and to prohibit discharge of pollutants from "point" sources (e.g., pipeline effluent) without permits. The law was amended in 1977, 1981, and 1987.

**Endangered Species Act of 1973.** The law instructs federal agencies to carry out programs to conserve

<sup>7</sup>Environmental Protection Agency.  
<http://www.epa.gov/epahome/laws.htm>.  
Accessed November 2006.



endangered and threatened species and to conserve the ecosystems on which these species depend. Species declared to be threatened or endangered receive extra legal protection, and special management procedures are designed to restore their populations to healthy and sustaining levels.

**The National Forest Management Act of 1976.**<sup>8</sup> The law requires the US Forest Service to create a land and resources management plan for every national forest. The agency must consider each unit under the principles of multiple use and sustained yield, taking into account timber, watershed management, recreation, and other forest uses. Public participation is required for the creation of such management plans.

**Forest Land Policy and Management Act of 1976.** The act requires the Bureau of Land Management to manage forest and rangeland in a multiple-use, sustained-yield fashion. Multiple-use, sustained-yield practices are not a formula for land managers but rather an executive order to consider all possible uses of an area of land, and to choose the combination of uses to promote the

greatest value.

**Federal Insecticide, Fungicide, and Rodenticide Act of 1948 (amended 1996).** The act was designed to allow for federal control over the sale and use of pesticides. The Environmental Protection Agency (EPA) was given authority to research the consequences of using pesticides and to require users to register with EPA when purchasing pesticides. Later amendments to the act require users of pesticides to be certified, and any pesticide used within the United States has to be registered by EPA.

## State Laws Related to Forest Ecosystem Protection

State regulations widely vary. All states with a forest industry presence, under the Clean Water Act of 1987, developed best management practices (BMPs). These were designed to control water quality within the state. Some states have developed state forest practice laws. These laws go beyond water quality protection and can regulate such activities as reforestation, fire control, chemical use, and forest land conservation.<sup>9</sup>

<sup>8</sup>National Forest Management Act of 1976. <http://www.fs.fed.us/emc/nfma/includes/NFMA1976.pdf>. Accessed November 2006.

<sup>9</sup>American Forest and Paper Association. *State Forest Best Management Practices*. [http://www.afandpa.org/Content/NavigationMenu/Forestry/State\\_Forestry\\_Best\\_Management\\_Practices/State\\_Forestry\\_Best\\_Management\\_Practices.htm](http://www.afandpa.org/Content/NavigationMenu/Forestry/State_Forestry_Best_Management_Practices/State_Forestry_Best_Management_Practices.htm). Accessed November 2006.

## Private conservation efforts (easements) by state, 2000, 2003, and 2005

State	2000		2003		2005		State	2000		2003		2005	
	Acres	(n)	Acres	(n)	Acres	(n)		Acres	(n)	Acres	(n)	Acres	(n)
Alabama	855	7	19,094	6	48,428	199	Montana	449,445	508	598,938	796	714,993	918
Alaska	1,250	11	4,373	29	4,854	42	Nebraska	2,150	0	3,914	7	12,916	8
Arizona	1,606	18	1,447	40	35,645	46	Nevada	0	0	0	0	0	0
Arkansas	173	0	700	0	2,320	0	New Hampshire	96,468	945	119,792	1,200	133,836	1,497
California	160,671	572	298,472	776	427,411	1,105	New Jersey	6,383	116	9,524	179	11,832	217
Colorado	293,864	456	658,674	1,005	849,825	1,606	New Mexico	41,039	69	76,167	89	142,072	101
Connecticut	19,821	368	21,765	601	24,164	769	New York	280,499	806	167,974	1,386	191,095	1,628
Delaware	1,274	15	2,544	22	2,394	22	North Carolina	40,573	200	85,852	412	112,874	641
D.C.	3	5	3	9	3	2	North Dakota	0	0	0	0	0	0
Florida	19,550	46	35,667	56	37,458	99	Ohio	9,390	163	24,619	316	35,262	484
Georgia	27,996	23	35,887	51	87,643	102	Oklahoma	0	0	1,407	6	3,507	23
Hawaii	4	2	46	4	212	9	Oregon	13,597	25	27,430	76	50,627	82
Idaho	16,277	39	25,798	341	29,987	133	Pennsylvania	88,316	1,066	115,861	1,432	139,309	1,905
Illinois	5,013	103	6,413	153	7,532	180	Rhode Island	9,292	130	5,608	156	7,863	278
Indiana	1,376	14	5,327	54	5,648	155	South Carolina	71,209	136	98,114	210	98,349	268
Iowa	6,541	30	6,689	48	6,000	68	South Dakota	7,760	0	7,785	2	10,769	6
Kansas	2,296	11	4,201	17	4,583	17	Tennessee	4,198	29	13,177	63	21,075	105
Kentucky	1,545	8	4,388	30	5,026	49	Texas	40,621	47	119,574	82	131,520	116
Louisiana	13,385	0	14,100	3	24,042	3	Utah	28,404	18	42,526	38	34,418	53
Maine	61,452	708	1,125,859	779	1,492,279	887	Vermont	319,580	1,284	368,986	1,147	399,681	1,516
Maryland	125,334	278	174,337	1,558	191,330	1,796	Virginia	180,255	881	461,284	1,747	365,355	2,146
Massachusetts	50,061	869	60,427	1,169	61,569	1,600	Washington	21,285	268	34,077	503	43,701	608
Michigan	20,877	360	44,243	455	54,762	669	West Virginia	4,004	20	12,885	51	16,156	71
Minnesota	16,703	175	22,545	245	24,500	290	Wisconsin	10,883	169	25,970	246	33,903	415
Mississippi	4,225	34	33,660	90	48,423	126	Wyoming	10,664	53	35,425	145	49,358	189
Missouri	1,452	11	4,272	16	9,460	56	<b>Total</b>	<b>2,589,619</b>	<b>11,096</b>	<b>5,067,820</b>	<b>17,846</b>	<b>6,245,969</b>	<b>23,305</b>

Note: Data availability is limited and therefore conservation area may be underreported. Source: Land Trust Alliance, 2005 National Land Trust Census. November 2006.



# Biodiversity, Wildlife, Water, and Nontimber Forest Products

## Biodiversity

There are two common measures of forest biodiversity<sup>10</sup>: the number of forest-dependent species, also called species richness, and the status (rare, vulnerable, threatened, endangered, or extinct) of forest-dependent species at risk.

### Species Richness

Hundreds of taxa (trees, mammals, birds, amphibians, reptiles, and butterflies) are associated with US forest habitats. A generally accepted count is 689 tree species and 1,486 terrestrial animal species (227 mammals, 176 birds, 176 amphibians, 191 reptiles, and 475 butterflies.)

Species richness varies geographically:

- Overall biodiversity is highest in the South—in particular the Southeast and the arid ecoregions of the Southwest.
- Mammals have a higher species richness in the southern Appalachians, the southern Rocky Mountains, and the Sierra Nevada and Pacific coast mountains.

- Forest bird species are most numerous in the arid Southwest and extending northeast into New England forests.
- The number of forest amphibian species is highest in the Southeast.
- Reptile species are most numerous in the Southeast and southwestern arid regions.
- The most forest butterfly species are found in the central hardwood forests, the central forest-grassland transition zone, and a broad band of western ecoregions that include grassland, shrubland, and montane forest habitats.

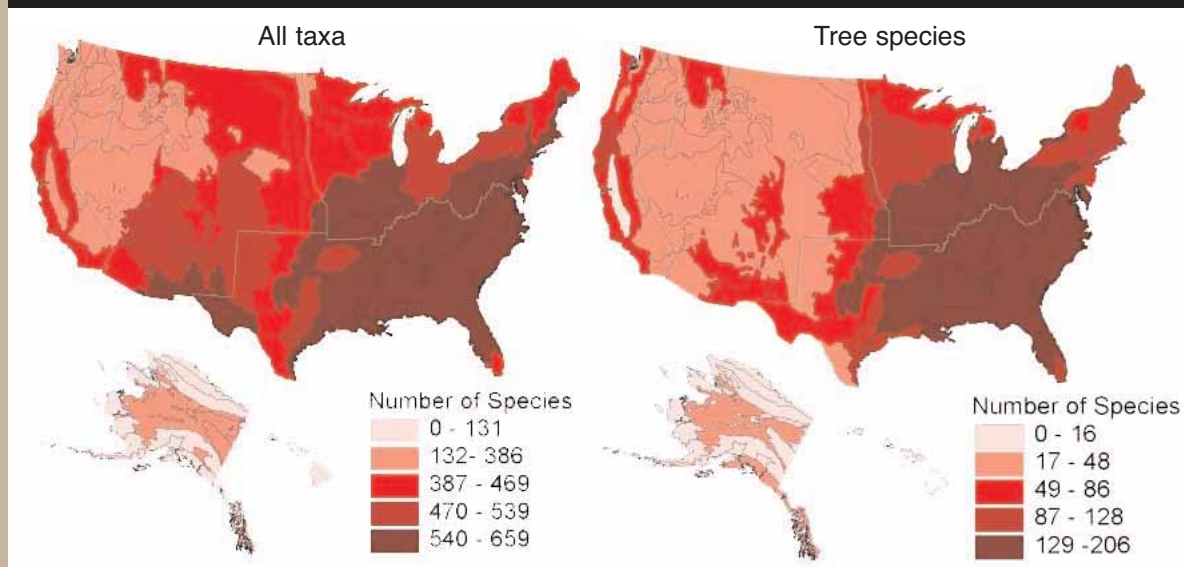
Since the mid-1970s, forest bird richness has increased the most in the West, and the decline is highest in certain eastern areas.

### Species-at-Risk Status

In the past 100 years, few species of crustaceans, amphibians, mammals, or reptiles are known to have become extinct. The number of bird species listed as extinct has remained constant since the early 1900s. However, the number of insects, mollusks, fish, and

<sup>10</sup>Flather, C.H., T.H. Ricketts, C.H. Sieg, M.S. Knowles, J.P. Fay, and J. McNees. 2003. Criterion 1: Conservation of biological diversity. In: Darr, D. (comp.), Technical Document Supporting the 2003 National Report on Sustainable Forests. Washington, DC: US Department of Agriculture, Forest Service. <http://www.fs.fed.us/research/sustain/>. Accessed November 2006.

## Geographic variation in the number of forest-associated species



Source: C.H. Flather, T.H. Ricketts, C.H. Sieg, M.S. Knowles, J.P. Fay, and J. McNees. 2003. *Criterion 1: Conservation of Biological Diversity. Indicator 6: The Number of Forest-Dependent Species*. In Darr, D. (comp.), *Technical Document Supporting the 2003 National Report on Sustainable Forests*. Washington, DC: USDA Forest Service. <http://www.fs.fed.us/research/sustain/>. Accessed November 2006.

<sup>11</sup> Flather, C.H., J.S. Brady, and M.S. Knowles. 1999. *Wildlife Resource Trends in the United States: A Technical Document Supporting the 2000 USDA Forest Service RPA Assessment*. Gen. Tech. Rep. RMRS-GTR-33. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

<sup>12</sup> Flather, C.H., M.S. Knowles, and J. McNees. 2006. *Geographic Patterns of At-Risk Species: An Update to Support the 2005 RPA Assessment*. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

vascular plants known to become extinct has increased over time. The southern Appalachians, peninsular Florida, the Atlantic and Gulf coasts, and the arid Southwest account for 10 percent of counties with the highest count of at-risk species.

Forest habitats deviate, to a certain extent, from this trend. Although the vast majority of trees and species of terrestrial animals are not at risk, 15 percent (mostly amphibians, butterflies, and grasshoppers) of those at risk of extinction are associated with forest habitats. These at-risk species are concentrated geographically in Hawaii, in the Southeast, and on the West Coast.

Since the last Wildlife Assessment,<sup>11</sup> the annual rate at which species are listed as threatened or endangered declined fivefold, to 12 species per year. The areas where these species are concentrated remained basically the same. By the end of 2004, the total number of species listed as threatened or endangered was 1,264. Of those, 59 percent were plants, and 41 percent, animals.<sup>12</sup>

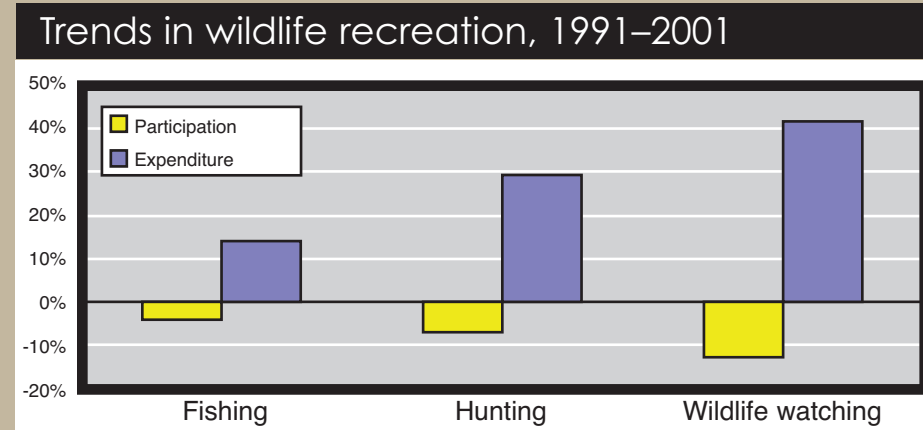




## Wildlife

US wildlife resources<sup>13</sup> provide a wide range of consumptive and nonconsumptive recreational opportunities in both private and public lands. In 2001, 34 million people fished, 13 million hunted, and 66 million participated in wildlife-watching activities (observing, feeding, or photographing wildlife). Associated spending totaled \$108 billion, representing 1.1 percent of the gross domestic product. People who participated in such outdoor activities spent approximately \$36 billion on fishing, \$21 billion on hunting, \$14 billion on fishing and hunting items, and \$38 billion on wildlife-watching trips, equipment, and other items.<sup>14</sup> Although overall participation in these activities declined in the 1990s, spending increased significantly.

Current wildlife recreational opportunities can be attributed, in part, to the results of the private and public efforts to reestablish depleted populations at the beginning of the 20th century. Current trends show increases in populations and harvests of big-game species (e.g., elk, wild turkey, deer, and black bear) and in populations of breeding birds. However, the evidence



*Note: During this decade, there were fluctuations in these trends. For example, wildlife watching decreased from 1991 to 2001 by 13 percent but increased from 1996 to 2001 by 5 percent. Activities included in this category, such as bird watching, animal feeding, and others, presented a wide variation among themselves. In fact, although bird watching was one of the 10 fastest-growing recreational activities between 1983 and 2001, participation in other activities in the wildlife watching category declined by a greater percentage.*  
Source: USDI Fish and Wildlife Service and USDC Census Bureau. 2002. National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Washington, DC: US Government Printing Office.

indicates a decline in small-game populations and harvests for species associated with grasslands and early successional and farmland habitats. It is unknown whether these trends are associated with the rapid changes occurring in forestland ownership today.

<sup>13</sup>Flather, C.H., M.S. Knowles, J. McNees, and S.J. Brady. 2006. Population and Harvest Trends of Big Game and Small Game Species: An Update to Support the 2005 RPA Assessment. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

<sup>14</sup>USDI Fish and Wildlife Service and USDC Census Bureau. 2002. National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. Washington, DC: US Government Printing Office.





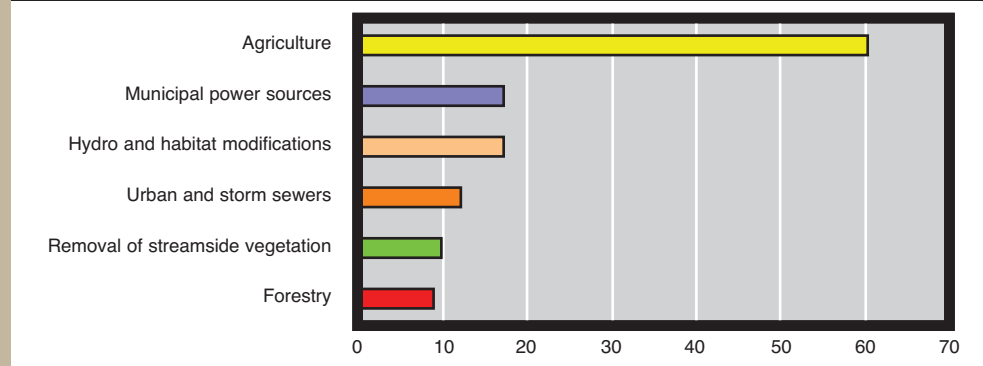
## Water

Since the 1980s, water consumption levels have remained constant despite the increase in US population. More than half of the freshwater supply, 53 percent, originates on forestlands, which occupy 29 percent of total US territory. Twenty-four percent of freshwater supply originates on federal forestlands. In the West, federal lands' contribution is highest, at 66 percent. In other regions, state and private lands supply 89 percent or higher.

According to EPA, forestry is a minor contributor to water pollution, ranking last among the top nonpoint sources of pollution in the latest report on National Water Quality. Forestry contributes to less than 10 percent of total impaired river and stream miles, or about 1 percent of the nation's river and stream miles.

States have developed best management practice programs to prevent and diminish adverse impacts of forestry as a nonpoint source of pollution.<sup>15</sup> BMPs are ...a practice or combination of practices, that are determined by a state, or designate area-wide plan-

### Percent of stream miles impaired by nonpoint sources of pollution



Source: Environmental Protection Agency (EPA). 1995. *National Water Quality Inventory: 1994 Report to Congress*. EPA 841-R-95-005. Washington, DC.

ning agency, after problem assessment, examination of alternative practices, and appropriate public participation, to be the most effective, practicable (including technological, economic and institutional considerations) means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.<sup>16</sup>

Ninety-five percent of US wetlands are classified as

<sup>15</sup> National Association of State Foresters and Society of American Foresters. 2000. *A Review of Waterbodies Listed as Impaired by Silvicultural Operations*. Publication SAF-00-03. Bethesda, MD: Society of American Foresters.

<sup>16</sup> Rey, M.E. 1980. *The Effects of the Clean Water Act on Forest Practices*. In *Proceedings of Symposium on Forestry and Water Quality in the 80's*. Washington, DC: Water Pollution Control Federation, 11-30.

## Available data on nontimber forest products

NTFP	Date	Value (million \$)	Region
Moss and lichen <sup>a</sup>	1995	14 (exports)	Mostly Appalachian and Pacific Northwest
Saw palmetto <sup>b</sup>	1999	45 (retail sale)	Mostly Florida
Wild-harvested bloodroot <sup>c</sup>	2001	1.9 (exports)	
Wild-harvested ginseng <sup>d</sup>	2003	29–58 (exports)	
	2001	18.5 (wholesale)	Kentucky, North Carolina, Tennessee, Virginia
Black cohosh <sup>e</sup>	2001	2.25 (market value)	Eastern United States
Black walnuts <sup>f</sup>	2002	0.32 (value to pickers)	Kentucky

Sources: <sup>a</sup> Goldberg, C. 1996. *From necessity, new forest industry rises*. *New York Times, National Report Section*. Sunday, 24 March, 1.

<sup>b</sup> Blumenthal, M. 2000. *Saw palmetto gets strong public boost: USP publishes monograph and Consumer Reports gives thumbs up, recognizing benefits for BPH*. *HerbalGram* 50:32–37.

<sup>c</sup> Predny, M.L., and J.L. Chamberlain. 2005. *Bloodroot (Sanguinaria canadensis): An annotated bibliography*. *General Technical Report SRS-86*. Asheville, NC: USDA Forest Service, Southern Research Station.

<sup>d</sup> Chamberlain, J.L., and M. Predny. 2004. *Non-timber forest products enterprises in the South: Perceived distribution and implications for sustainable forest management*. In *Proceedings, First National Symposium on Sustainable Natural Resource-Based Alternative Enterprises*. Mississippi State, MS, 28–31 May 2003.

<sup>e</sup> Predny, M.L., and J.L. Chamberlain. 2006. *Black cohosh (Actaea racemosa): An annotated bibliography*. *General Technical Report SRS-97*. Asheville, NC: USDA Forest Service, Southern Research Station.

<sup>f</sup> USDA Forest Service, *Forest Inventory Analysis Program*. Southern Research Station. 2006.

freshwater wetlands, which include forested wetlands, shrub wetlands, freshwater emergents, and freshwater ponds less than 20 acres. These areas are commonly known as swamps, bogs, fens, marshes, swales, oxbows, or wet meadows. In 2004, forested wetlands represented 51 percent of the 102.5 million acres of freshwater wetlands. Between 1998 and 2004 there was a net gain of 548,000 acres of forested wetlands, mostly due to the succession of shrub wetlands to forests. During that period, more than 299,000 acres of forested wetlands were converted to other land uses, 63,000 acres were converted to open water ponds, and 27,000 acres became deepwater lakes.<sup>17</sup>

## Nontimber Forest Products

Information about nontimber forest products (NTFPs) that come solely from forestlands is incomplete, but interest in this area is increasing in the United States. Some of the most common NTFPs are wild mushrooms, berries, ferns, tree boughs, cones, moss, maple syrup, honey, and medicinal products like cascara bark and ginseng.

<sup>17</sup> Dahl, T.E. 2005. *Status and Trends of Wetlands in the Conterminous United States, 1998 to 2004*. Washington, DC: US Fish and Wildlife Service, Fisheries and Habitat Conservation.



# Recreational Use of America's Forests

Almost 86 percent of US forestland is available for outdoor recreation—a rapidly growing forest use since the middle of the 20th century. According to the US National Recreation Survey 2000–2001, 97 percent of Americans participate in at least one outdoor recreation activity. National forestlands alone host 137 million visits per year, most of them in the West. Forest areas available for recreation vary by region and ownership. Federal forestlands in the Rocky Mountains and Pacific Coast regions offer the most acreage available for recreation (100 million and 121 million acres, respectively); nonindustrial forestlands in the North and South offer 91 million and 105 million acres, respectively. The Rocky Mountains region has the most forest area available for recreational use per person.<sup>18</sup>

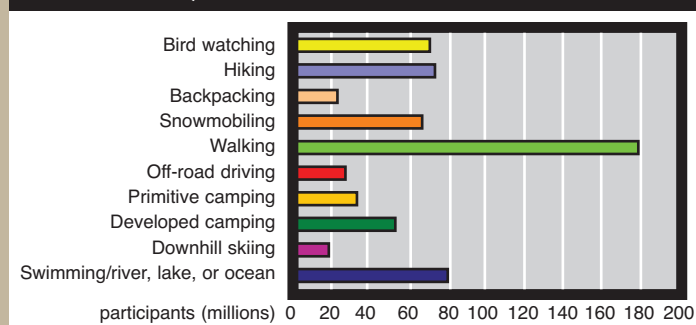
Walking is the most popular recreational activity (with 84 percent participation), followed by attending outdoor gatherings with family and friends (73 percent); visiting nature centers, nature trails, visitor centers, and zoos (57 percent); picnicking (55 percent); and viewing or photographing natural scenery (54 percent).<sup>19</sup>

## Most popular outdoor activities

Category	Participants		Individual activities	Percentage of US population
	Millions	Percentage of participants		
Trail, street, or road	192.4	90.3	Walking	86.0
Traditional social activities	177.7	83.4	Family gathering	76.3
Viewing and photography*	171.5	80.5	Viewing natural scenery	64.4
Viewing and learning	154.7	72.6	Visiting a nature center, nature trail, or zoo	61.9
Driving for pleasure	142.6	66.9	Picnicking	59.8
Swimming	141.3	66.3		

Source: 1999–2002 National Survey on Recreation and the Environment, USDA Forest Service and the University of Tennessee. Knoxville, TN.

## The 10 fastest-growing recreational activities, 1983–2001

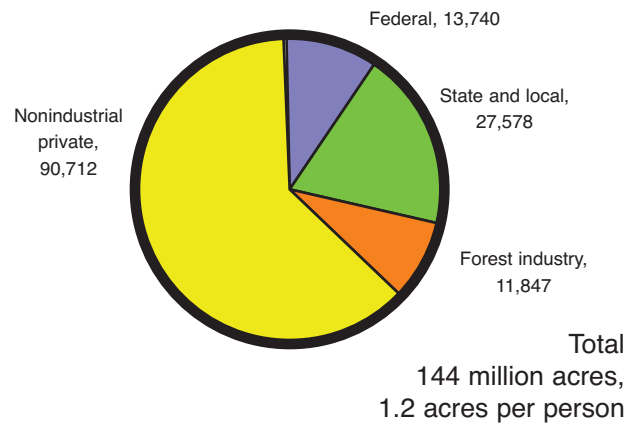


Note: Recreational activities are presented according to their growth demand from 1983 to 2001, from top (highest, 234 percent increase in bird watching) to bottom (lowest, 64 percent increase in swimming). Source: USDA Forest Service. 2003. Nation's Report on Sustainable Forest Management: United States.

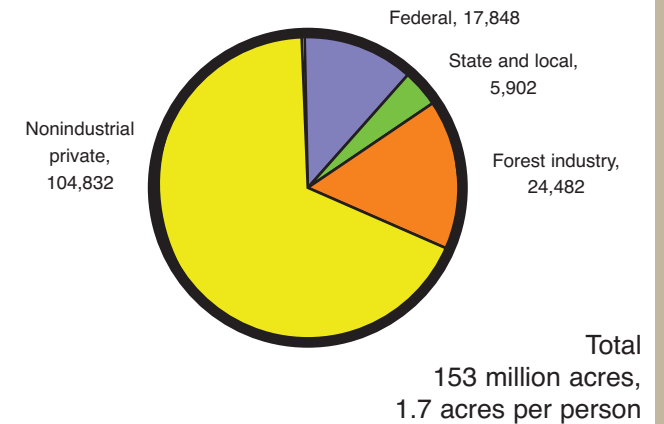
<sup>18</sup> Cordell, H.K., et al. 2004. Outdoor Recreation for 21st Century America, A Report to the Nation: The National Survey on Recreation and the Environment. Chapter 8. State College, PA: Venture Publishing.  
<sup>19</sup> USDA Forest Service. 2003. Nation's Report on Sustainable Forest Management: United States.

## Ownership of forestland for recreation by region, 2002

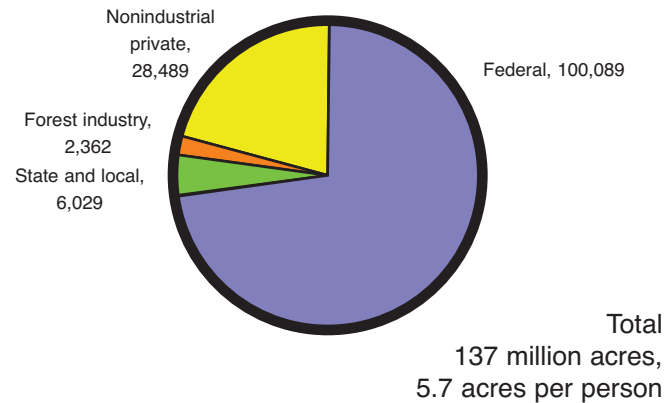
**Forestland available for recreation in the North  
(thousand acres)**



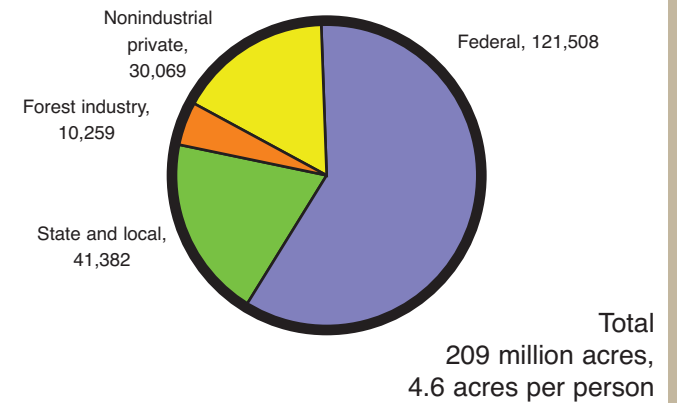
**Forestland available for recreation in the South  
(thousand acres)**



**Forestland available for recreation in the Rocky Mountains  
(thousand acres)**



**Forestland available for recreation in the Pacific Coast  
(thousand acres)**



Source: USDA Forest Service. 2003. *Nation's Report on Sustainable Forest Management: United States.*



# Growth, Harvesting, and Reforestation of America's Forests

**F**orests represent one of the greatest renewable resources and provide vital ecosystem values, products, services, and conditions. When forests are managed in a sustainable manner, forest production can commonly meet the landowner's economic objectives while also protecting the environment.

Historical trends show that the standing inventory (the volume of growing stock) of hardwood and softwood tree species in US forests has increased continually over the past five decades—by 49 percent between 1953 and 2006. In the same time period, the total annual net growth of growing stock (annual growth minus annual mortality) increased 75 percent.

One indicator of forests' ability to provide wood products over the long term is the ratio between timber growth and timber harvest. When this ratio, the net annual gain, is positive, it means that the increase in the growing stock exceeds timber removals. Sometimes only a portion of commercial timber is available for harvesting because the landowner has goals other than timber production. Thus net annual gain, when aver-

US timberland growing stock<sup>a</sup> (million cubic feet) by region, 2006

Region	Annual growth	Annual mortality	Net annual growth <sup>b</sup>	Annual harvest	Net annual gain <sup>c</sup>
Northeast	4,002	845	3,157	1,272	1,885
North Central	3,692	944	2,748	1,439	1,309
North	7,694	1,789	5,905	2,711	3,194
Southeast	6,593	1,010	5,583	4,306	1,278
South Central	7,577	1,128	6,450	5,391	1,059
South	14,171	2,138	12,033	9,696	2,337
Great Plains	126	54	72	39	32
Intermountain	2,871	1,073	1,798	502	1,296
Rocky Mountain	2,997	1,127	1,869	541	1,328
Alaska	504	256	248	66	182
Pacific Northwest	4,363	961	3,402	1,939	1,463
Pacific Southwest	1,919	368	1,550	469	1,081
Pacific Coast	6,786	1,586	5,200	2,474	2,726
<b>US total</b>	<b>31,647</b>	<b>6,640</b>	<b>25,007</b>	<b>15,423</b>	<b>9,585</b>

<sup>a</sup> Growing stock = standing tree inventory.

<sup>b</sup> Net annual growth = total annual growth less annual mortality.

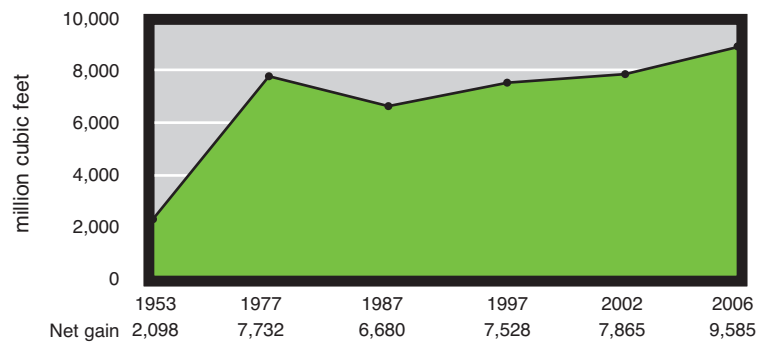
<sup>c</sup> Net annual gain = net annual growth less annual harvest.

Note: Figures may not add to totals because of rounding.

Source: USDA Forest Service, Forest Inventory Analysis Program. 2006.

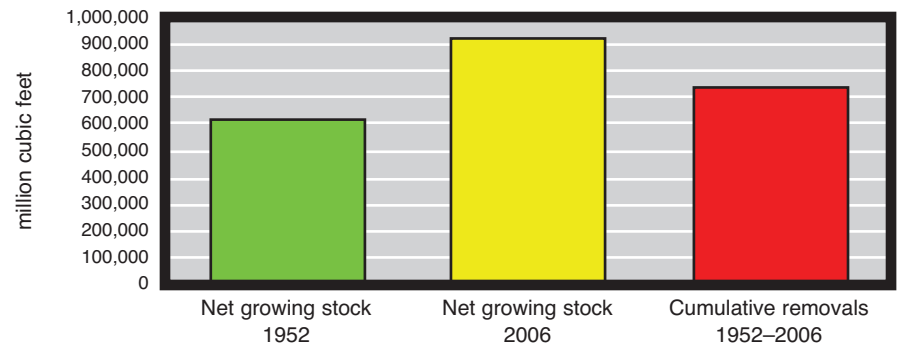
aged at the national level, is not representative of the condition of a specific forest area, but an overall estimate of the status of our forests at a large scale. In 2006, the total net annual gain was 9.6 billion cubic feet, almost 22 percent higher than the net annual gain

## Trend in net annual gain of growing stock in US timberland, 1953–2006



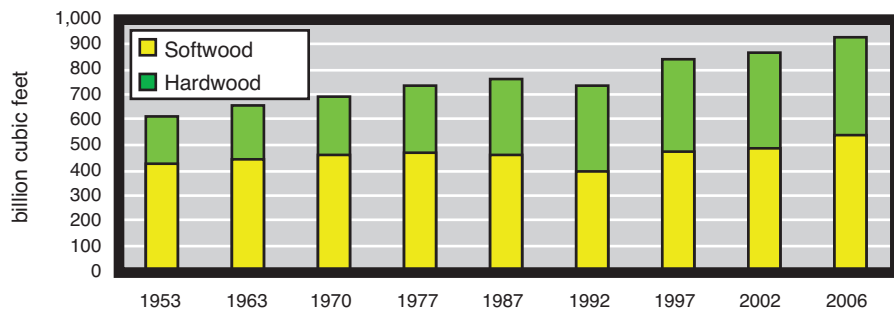
Source: USDA Forest Service, Forest Inventory Analysis Program. 2006.

## Growing stock and cumulative removals, 1952–2006



Source: USDA Forest Service, Forest Inventory Analysis Program. 2006.

## Trends in softwood and hardwood growing stock in US timberland, 1953–2006



Source: USDA Forest Service, Forest Inventory Analysis Program. 2006.

in 1996, and more than four times higher than in 1953. Currently, the volume of annual net growth is 38 percent higher than the volume of annual removals.

For the past 50 years, removals have remained below 2 percent of standing inventory (the figure for 2006 was 1.68 percent), while the net growth was 3 percent (in 2006, 2.64 percent). Mortality remained below 1 percent of standing inventory for this period (in 2006, 0.63 percent).





# Carbon Sequestration

**F**orest management is contributing to carbon sequestration in many areas over the long term, especially if the additions to wood products and landfill pools are counted.<sup>20</sup> In many private forestlands, timber harvesting provides an economic incentive for landowners to retain forest cover rather than convert the land to other uses that do not sequester and store carbon at similar rates. In addition, wood products and materials can have a favorable carbon balance over their life cycle, depending on how much energy is consumed in their production, the products' lifetime, and their ultimate fate (e.g., whether they are landfilled or burned). Standardized accounting mechanisms to estimate the amount of carbon stored in wood products are being developed, and product life-cycle analysis is ongoing. Wood and other tree biomass also represent a low-impact and renewable source of energy that is used widely by the wood products and paper industry. In fact, technology advances are likely to make wood-based ethanol a growing source of transportation fuels. Whereas fossil fuels, such as petroleum, introduce new carbon to the atmosphere, when biomass fuels are replaced by new tree growth, they become carbon neutral.<sup>21</sup>

In the United States, the total carbon sequestered by forests and wood products during the 1990s reached almost 200 megatonnes per year (Mt/yr),<sup>22</sup> an amount equivalent to around 10 percent of US emissions of carbon dioxide from burning fuels. About 60 Mt/yr was stored in landfills and wood products, and about 140 Mt/yr was sequestered in forest ecosystems. These estimates do not include the carbon stored in forest soils. An analysis of US historical trends for carbon sequestration revealed that the relatively high rates of carbon sequestered during the 20th century, with highest sequestration around the 1980s, were a consequence of the intense cutting of forests during the 19th century and their relatively fast recovery in the 20th century. Predictions suggest that regrowth, and consequently the rates of carbon sequestered per year, might slow in the near future.<sup>23</sup>

Trees are living organisms that do not grow forever. Therefore their capacity to sequester carbon is limited by their life cycle, and the rate of sequestration is determined by their growth rate.

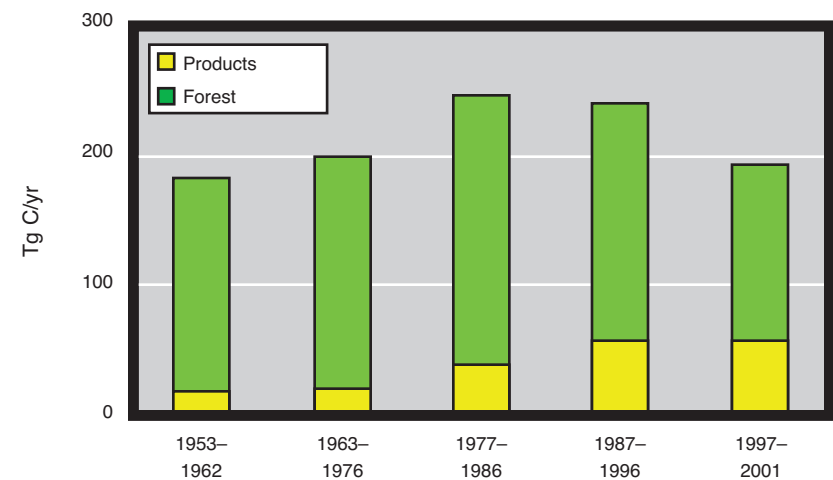
<sup>20</sup> Eav, B., R.A. Birdsey, and L.S. Heath. 2000. The Kyoto Protocol and Forestry Practices in the United States. In *Forests and Society: The Role of Research*, Subplenary sessions, vol. 1, Proceedings of the XXI IUFRO World Congress, 7–12 August, Kuala Lumpur, Malaysia, 566–76.

<sup>21</sup> World Business Council for Sustainable Development (WBCSD) and National Council for Air and Stream Improvement (NCASI). 2005. *The Sustainable Forest Products Industry, Carbon and Climate Change. Key Messages for Policy-Makers*.

<sup>22</sup> Heath, L.S., and K. Skog. 2004. Criterion 5, Indicator 28: Contribution of Forest Products to the Global Carbon Budget. In D.R. Darr (ed.), *A Supplement to the National Report on Sustainable Forests 2003*. FS-766A. Washington, DC: USDA.

<sup>23</sup> Birdsey, R., K. Pregitzer, and A. Lucier. 2006. Forest Carbon Management in the United States: 1600–2100. *Journal of Environmental Quality* 35: 1461–69.

## Carbon (teragrams per year) sequestered in US timberlands, 1953–2001



*Note: Figures exclude soil carbon, carbon on reserved forestland, and carbon on low-productivity forestland.*

*Source: compiled in Birdsey, R., K. Pregitzer, and A. Lucier. 2006. Forest Carbon Management in the United States: 1600–2100. Journal of Environmental Quality 35: 1461–69. Original data from*

- Heath, L.S., and J.E. Smith. 2004. Criterion 5, Indicator 27: Contribution of Forest Ecosystems to the Total Global Carbon Budget, Including Absorption and Release of Carbon (Standing Biomass, Coarse Woody Debris, Peat and Soil Carbon). In D.R. Darr (ed.), *A Supplement to the National Report on Sustainable Forests 2003. FS-766A*. Washington, DC: USDA.
- Heath, L.S., and K. Skog. 2004. Criterion 5, Indicator 28: Contribution of Forest Products to the Global Carbon Budget. In D.R. Darr (ed.), *A Supplement to the National Report on Sustainable Forests 2003. FS-766A*. Washington, DC: USDA.
- USDA. 2004. *U.S. Agriculture and Forestry Greenhouse Gas Inventory: 1990–2001. Tech. Bull. 1907. Global Change Program Office, Office of the Chief Economist*. Washington, DC: USDA.



# America's Forests in a Global Context

According to the United Nations Food and Agriculture Organization,<sup>24</sup> the world's total forest area is almost 9.8 billion acres. Two-thirds of that, however, is found in just 10 countries; seven countries have no forest at all, and forests cover less than 10 percent of the total land in 57. The United States is fourth most forest-rich country (with 8 percent of the world's primary forests), after the Russian Federation, Brazil, and Canada.

Global loss of forest area continues at a high but slowing rate. Most of this decrease comes from the conversion of forestland to agricultural use: 18 million acres was converted each year between 2000 and 2005, and 22 million acres each year between 1990 and 2000. The largest net reduction of forest cover was in Africa, with 10.8 million acres converted each year between 1990 and 2000, and 10 million converted each year between 2000 and 2005. South America followed Africa, with 9.4 million acres converted each year between 1990 and 2000, and 10.5 million converted between 2000 and 2005.

The amount of conversion is only partially offset by increases in other regions. European forests expanded at a rate of 2.2 million acres per year between 1990 and 2000, and 1.6 million between 2000 and 2005. US net forestland also increased at a rate of 0.9 million acres per year between 1990 and 2000, and 0.4 million between 2000 and 2005.

The United States is one of five countries with the greatest total growing stock, with 1,240 billion cubic feet. Together, Brazil, the Russian Federation, the United States, Canada, and the Democratic Republic of Congo account for over 60 percent of the global total (around 9,217 billion cubic feet). Forty percent of the world's total growing stock is of commercial value. Global commercial growing stock amounts to about 7,134 billion cubic feet. Europe and North and Central America account for 64 percent of global commercial growing stock (about 4,591 billion feet), of which the United States has 2,779 million cubic feet.

Tropical regions represent a lower percentage of total growing stock than temperate regions because of differ-

<sup>24</sup> Food and Agriculture Organization. 2005. Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management. Rome.

ences in forest species diversity and harvesting regimes. Tropical forests have more tree species, but only a few are considered commercially valuable, and selective logging (cutting only trees above a certain diameter, leaving smaller, less valuable trees behind) is the most common harvesting practice. Temperate forests have less diversity but more tree species with commercial value. Since harvesting regimes are not always based on minimum diameters, most of the growing stock in temperate forests is considered to be commercial.

Even though 20 percent of US forest area is associated with conservation efforts (compared with the world average of 11 percent), US conservation acres are underreported because the figures do not include all conservation practices on private forests.

A recent study<sup>25</sup> showed a direct correlation between a nation's annual per capita gross domestic product and its forest growing stock. In those countries whose per capita income was \$4,600 or higher, the growing stock change was positive from 1990 to 2005. In addition, this increase in growing stock consequently translated

into an increase in accumulated biomass or carbon. This finding indicates that in nations with good economies, forest inventories are increasing, because of either an increase in timber volume per acre or an increase in the amount of forestland, or perhaps some combination. In Europe and the United States, volume per area increased and forest area expanded slowly.

In 2005, 10 countries accounted for 73 percent of the total global area of productive forest plantations, representing 196.4 million acres. China, the United States, and the Russian Federation together host more than half of the world's productive plantations, with 77.5 million, 42.2 million, and 41.9 million acres, respectively.

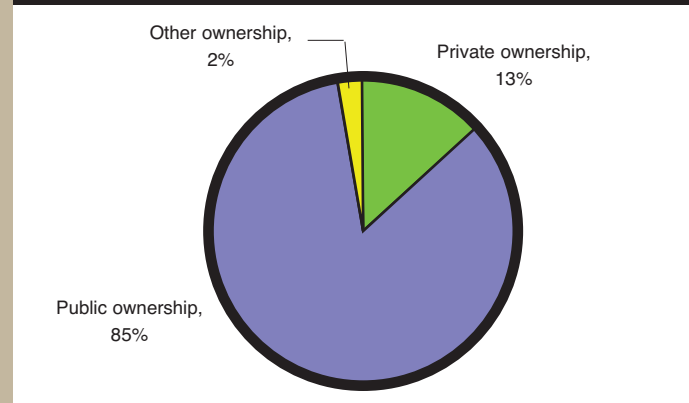
Since the end of the 1970s, governments in many parts of the world have used privatization measures to improve economic performance. Although forests have not been among the first assets to be privatized, land privatization continues to grow. There are few countries with high percentages of private forests. However, the proportion of US forestland owned privately (57 per-

<sup>25</sup> Kauppi, P.E., J.H. Ausubel, J. Fang, A.S. Mather, R.A. Sedjo, and P.E. Waggoner. 2006. Returning Forests Analyzed with the Forest Identity. *Proceedings of the National Academy of Sciences of the United States of America* 2006(103): 17574–79.



cent) is highest among the top 10 forest-rich countries. In general, forests in developing nations are still under government jurisdiction, and decisions about forest management are made by the government.<sup>26</sup>

### Ownership of the world's forest area, 2000



*Source: Food and Agriculture Organization. 2005. Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management. Rome.*

<sup>26</sup> Food and Agriculture Organization. 2005. Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management. Rome.

## Countries with more than 0.1 percent of the world's total forests

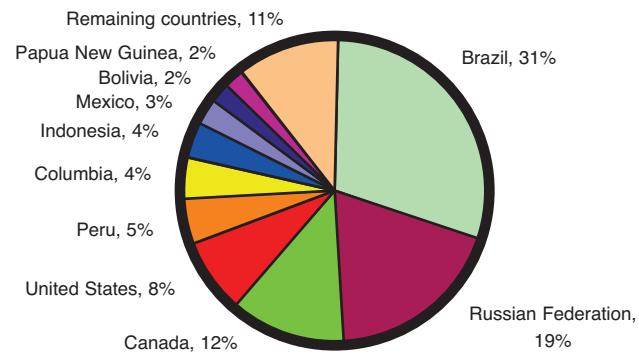
Country	Acres <sup>a</sup>	Percentage of world total	Country	Acres <sup>a</sup>	Percentage of world total	Country	Acres <sup>a</sup>	Percentage of world total	Country	Acres <sup>a</sup>	Percentage of world total
Russian Federation	1,998,564	20.47	Papua New Guinea	72,740	0.74	Viet Nam	31,953	0.33	French Guiana	19,924	0.20
Brazil	1,180,417	12.09	Sweden	68,023	0.70	Madagascar	31,723	0.32	Belarus	19,506	0.20
Canada	766,358	7.85	Japan	61,450	0.63	Mali	31,066	0.32	Namibia	18,931	0.19
United States	748,949	7.67	Central African Rep	56,229	0.58	Botswana	29,512	0.30	Philippines	17,698	0.18
China	487,514	4.99	Finland	55,599	0.57	Chad	29,457	0.30	Somalia	17,621	0.18
Australia	404,457	4.14	Congo	55,527	0.57	Nigeria	27,402	0.28	Burkina Faso	16,788	0.17
Congo	330,158	3.38	Gabon	53,807	0.55	Germany	27,369	0.28	Guinea	16,615	0.17
Indonesia	218,676	2.24	Cameroon	52,498	0.54	Iran	27,367	0.28	Romania	15,741	0.16
Peru	169,865	1.74	Malaysia	51,620	0.53	Ecuador	26,818	0.27	Korea, Rep	15,481	0.16
India	167,293	1.71	Mozambique	47,597	0.49	Cambodia	25,815	0.26	Korea People's Rep	15,288	0.16
Sudan	166,910	1.71	Paraguay	45,653	0.47	C. d'Ivoire	25,711	0.26	Ghana	13,633	0.14
Mexico	158,736	1.63	Spain	44,269	0.45	Mongolia	25,333	0.26	Nicaragua	12,822	0.13
Colombia	150,062	1.54	Zimbabwe	43,342	0.44	Turkey	25,143	0.26	Honduras	11,485	0.12
Angola	146,049	1.50	Lao	39,888	0.41	Italy	24,659	0.25	Morocco	10,784	0.11
Bolivia	145,150	1.49	Chile	39,836	0.41	Ukraine	23,660	0.24	Panama	10,611	0.11
Venezuela	117,901	1.21	France	38,435	0.39	Norway	23,196	0.24	Turkmenistan	10,198	0.10
Zambia	104,901	1.07	Guyana	37,323	0.38	S. Africa	22,741	0.23	Guatemala	9,731	0.10
Tanzania	87,122	0.89	Suriname	36,512	0.37	Poland	22,714	0.23	Austria	9,543	0.10
Argentina	81,597	0.84	Thailand	35,880	0.37	Senegal	21,431	0.22	Portugal	9,348	0.10
Myanmar	79,622	0.82	Ethiopia	32,124	0.33	N. Zealand	20,532	0.21	<b>World</b>	<b>9,765,666</b>	<b>100</b>

<sup>a</sup> Acres are reported in thousands.

Source: Food and Agriculture Organization. 2005. *Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management*. Rome.

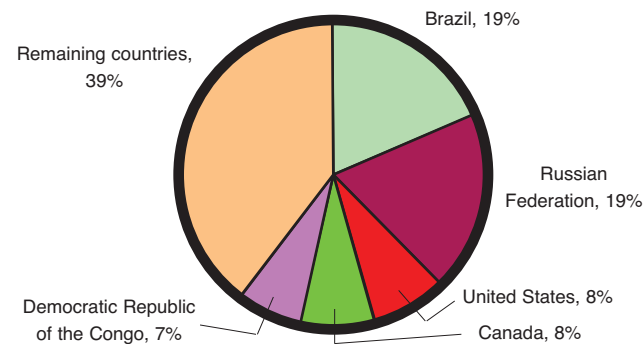


## Countries with highest percentage of total world's primary forest, 2005



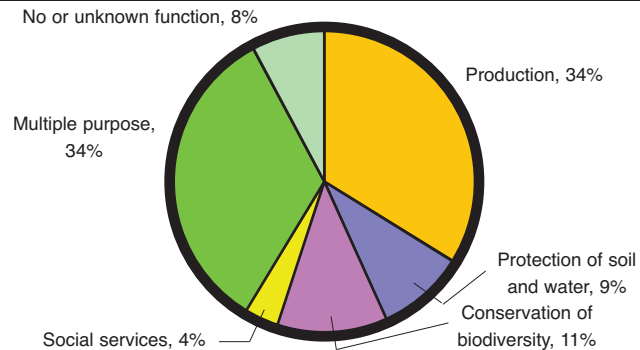
Source: Food and Agriculture Organization. 2005. *Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management*. Rome.

## Countries with highest total growing stock, 2005



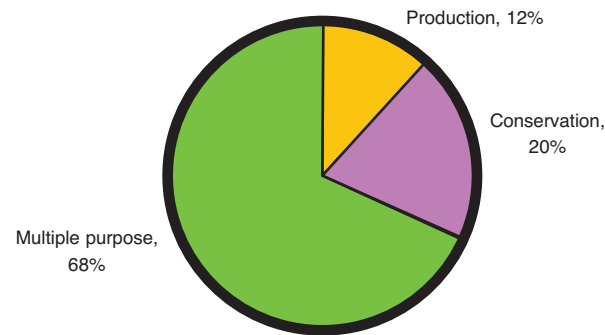
Source: Food and Agriculture Organization. 2005. *Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management*. Rome.

## Designated functions of the world's forests, 2005



Source: Food and Agriculture Organization. 2005. *Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management*. Rome.

## Designated functions of US forests, 2005



Source: Food and Agriculture Organization. 2005. *Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management*. Rome.

## Designated functions<sup>a</sup> of forests (primary function) for top 10 forest-rich countries, 2005

Country or area	Total forest area (1,000 acres)	Percentage of total forest whose primary function is					
		Production	Protection	Conservation	Social services	Multiple purpose	None or unknown
Russian Federation	1,998,564	76.9	8.7	2	1.5	10.8	-
Brazil	1,180,417	5.5	17.8	8.1	23.8	44.8	-
Canada	766,358	1.3	-	4.9	-	86.7	7.1
United States	748,949	12	-	19.8	-	68.1	-
China	197,290	58	31.3	2.7	1.2	6.8	-
Australia	163,678	8	-	13.1	-	77.6	1.3
Congo	22,471	88.2	-	4.4	-	7.4	-
Indonesia	218,676	53.9	27.5	18.6	-	-	-
Peru	169,865	36.7	0.5	26.9	n.s.	26	9.9
India	67,701	21.2	14.8	21.7	-	42.4	-
<b>Total North America</b>	<b>1,674,050</b>	<b>6</b>	<b>0.1</b>	<b>11.8</b>	<b>-</b>	<b>78.9</b>	<b>3.3</b>
<b>World</b>	<b>9,765,666</b>	<b>34.1</b>	<b>9.3</b>	<b>11.2</b>	<b>3.7</b>	<b>33.8</b>	<b>7.8</b>

<sup>a</sup> Designated function = the function or purpose assigned to a piece of land either by law or by the landowner. Definitions of designated functions are based on the nine ongoing regional and international processes on criteria and indicators for sustainable forest management:

- **Production.** Forests and trees outside forests provide a wide range of wood and nonwood forest products. The theme expresses the ambition to maintain a high and valuable supply of primary forest products, while at the same time ensuring that production and harvesting are sustainable and do not compromise management options of future generations.
- **Protection.** The theme addresses the role of forests and trees outside forests in moderating soil, hydrological, and aquatic systems; maintaining clean water (including healthy fish populations); and reducing the risks and impacts of floods, avalanches, erosion, and drought. Protective functions of forest resources also contribute to ecosystem conservation efforts and have strong cross-sector aspects because the benefits to agriculture and rural livelihoods are high.
- **Conservation of biological diversity.** The theme concerns the conservation and management of biological diversity at ecosystem (landscape), species, and genetic levels. Such conservation, including the protection of areas with fragile ecosystems, ensures that diversity of life is maintained and provides opportunities to develop new products in the future, including medicines. Genetic improvement is also a means of increasing forest productivity—for example, to ensure high wood production levels in intensively managed forests.
- **Social services.** Social functions of forests vary among countries and are difficult to measure, depending on the nation's traditions and needs. The theme includes two measures: area of forest for which the provision of social services was designated as the primary function, and total area of forest for which recreation, education, and other social services were designated as one of the functions.

Note: Figures may not add to totals because of rounding.

Source: Food and Agriculture Organization. 2005. *Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management.*





## Disturbances affecting forests annually in top 10 primary forest-rich countries, 2000

Country	Fire		Insects		Disease		Other	
	Area (thousand acres)	% of country's total forestland	Area (thousand acres)	% of country's total forestland	Area (thousand acres)	% of country's total forestland	Area (thousand acres)	% of country's total forestland
Russian Federation	3,133	0.39	12,239	1.51	2,365	0.12	1,255	0.06
Brazil	168	0.03	74	0.02	49	n.s	-	-
Canada	5,076	1.64	35,183	11.34	-	-	-	-
United States	5,152	1.70	12,568	4.16	42,947	5.75	-	-
China	126	0.07	15,298	8.64	2,182	0.50	2,026	0.46
Australia	-	-	-	-	-	-	-	-
Congo	42	0.19	-	-	-	-	-	-
Indonesia	301	0.31	0	0.00	0	0.00	0	0.00
Peru	86	0.12	-	-	-	-	-	-
India	9,143	13.53	2,471	3.66	20,757	12.43	-	-

Source: Food and Agriculture Organization. 2005. *Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management*. Rome.

## Illegal Logging and “Suspicious” Wood Products

Illegal logging represents a serious problem in some parts of the world, depressing the value of legally produced timber products in international trade, causing environmental degradation, and denying governments revenue.

Although the scale of these impacts is uncertain, some estimates (UNECE/FAO 2006<sup>27</sup>) suggest that illegal logging accounts for approximately 10 percent of harvests, and other studies conclude that this number could be as high as 20 percent (Wood Resources International LLC and Seneca Creek Associates 2004). In 2006, the World Bank estimated that the annual global loss was approximately \$15 billion, taking into account losses to governments and legal competitors. In 2004, other estimates suggested that worldwide, illegally logged roundwood plus lumber and plywood produced from illegally harvested wood had a market value of \$22.5 billion. About 22 percent, roughly \$5 billion, entered world trade and represented 7 percent of the \$69 billion in world trade of primary wood products

(Wood Resources International LLC and Seneca Creek Associates 2004<sup>28</sup>).

The impact of illegal logging on the US wood products market is significant. Illegal logging represents an opportunity cost of \$460 million per year for US exporters. Elimination of illegally harvested roundwood, also called “suspicious” roundwood, in the global market would raise US prices by 2 to 4 percent, thus increasing the value of domestic wood products shipments by perhaps as much as \$500 million to \$700 million annually; it would also affect the pulp and paper sector (Wood Resources International LLC and Seneca Creek Associates 2004).

Governments and industry have joined forces to combat illegal logging and stop imports of suspicious wood products. In November 2005, 43 countries accepted by acclamation the St. Petersburg Declaration at the Ministerial Conference on Forest Law Enforcement and Governance, which represents one of the major efforts. Other efforts addressing law enforcement and associated trade in the forest sector include these measures:<sup>29</sup>

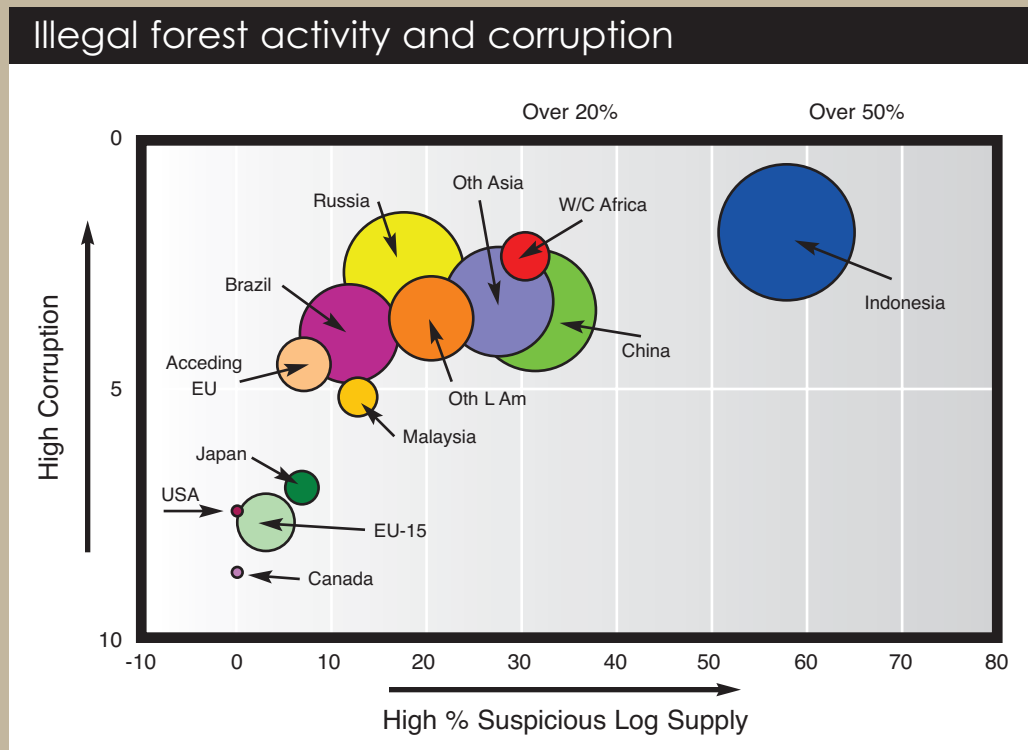
<sup>27</sup>United Nations Economic Commission for Europe (UNECE) and FAO. 2006. Forest Products Annual Market Review 2005–2006. New York and Geneva.

<sup>28</sup>Wood Resources International LLC and Seneca Creek Associates. 2004. “Illegal” Logging and Global Wood Markets: The Competitive Impacts on the US Wood Products Industry. Bothell, WA: Wood Resources International.

<sup>29</sup>Food and Agriculture Organization. 2005. Best Practices for Improving Law Compliance in the Forestry Sector. FAO Forestry Paper 145. Rome.

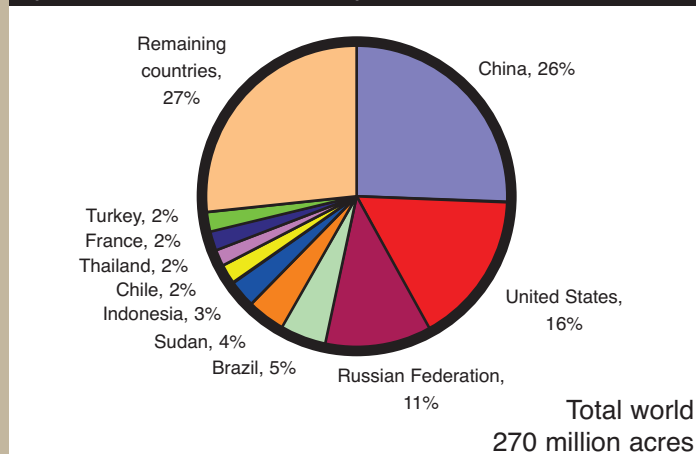


- **Global environmental conventions:** Convention on International Trade in Endangered Species of Wild Fauna and Flora ([www.cities.org](http://www.cities.org)), and Convention on Biological Diversity ([www.biodiv.org](http://www.biodiv.org)).
- **Regional processes:** World Bank–supported Forest Laws Enforcement and Governance (FLEG) initiatives, European Union FLEG Initiative ([www.europa.int/comm/development](http://www.europa.int/comm/development)), G8 Action Programme on Forests, Ministerial Conference on the Protection of Forests in Europe ([www.mcpfe.org](http://www.mcpfe.org)), Asia Forest Partnership ([www.asiaforests.org](http://www.asiaforests.org)), and Congo Basin Forest Partnership ([www.cbfp.org](http://www.cbfp.org)).
- **National initiatives:** United States President’s Initiative Against Illegal Logging ([www.usaid.gov](http://www.usaid.gov)) and United Kingdom’s Forest Law Enforcement and Governance Programme ([www.illegal-logging.info/dfid](http://www.illegal-logging.info/dfid)).
- **Bilateral timber trade agreements.**
- **International organizations and partnerships:** Collaborative Partnership on Forests ([www.fao.org/forestry/cpf](http://www.fao.org/forestry/cpf)), Food and Agriculture Organization of the United Nations ([www.fao.org](http://www.fao.org)),



*Note: Bubble size relates to volume of suspicious roundwood, including imports.*  
 Source: Wood Resources International LLC and Seneca Creek Associates. 2004. "Illegal" Logging and Global Wood Markets: The Competitive Impacts on the US Wood Products Industry. Original data from Transparency International and WRI/SCA estimates.

## Countries with the largest area of productive forest plantations, 2005



Source: Food and Agriculture Organization. 2005. *Global Forest Resources Assessment 2005. Progress Towards Sustainable Forest Management*. Rome.

International Tropical Timber Organization ([www.itto.or.jp](http://www.itto.or.jp)), Programme on Forests ([www.profor.info](http://www.profor.info)), United Nations Forum on Forests ([www.un.org/esa/forests](http://www.un.org/esa/forests)), World Bank ([www.worldbank.org](http://www.worldbank.org)), and World Bank/WWF Alliance ([www.forest-alliance.org](http://www.forest-alliance.org)).

The harmonization of national procurement policies and regulations that affect timber trade worldwide could create the necessary rules for ensuring legal and sustainable timber production. This will also discourage artificial trade barriers. The European Union's plan for Forest Law Enforcement, Governance and Trade seeks to link good governance in developing countries with the legal instruments and leverage offered by the internal EU market. The European Union is encouraging governments to remain neutral regarding competing schemes when developing their public procurement policies and to focus on the promotion of sustainable forest management, using certification as the tool for achieving this objective (UNECE/FAO 2006).



# Certification of America's Forests

Certification of sustainable forest management continues to increase every year worldwide. From 2005 to 2006, the area of certified forests increased by 12 percent, exceeding 667 million acres, or 7 percent of the global forest area.

Certification programs were originally developed to address the issue of tropical deforestation. Most of today's certified forests (87 percent), however, are in temperate and boreal regions in developed countries, with 58 percent in North America and more than 30 percent in western Europe. Potential supply of certified timber is currently 22 percent of timber consumption.<sup>30</sup>

Final consumers are not demanding certified products and do not appear willing to pay a premium for them. Instead, certification is being driven by business-to-business markets in the wood supply chain. Through procurement policies, governments and the business community worldwide are requiring that wood products come from sustainably managed forests. Chain-of-custody certification to trace certified content to its source is increasing as well. Although some progress has been made toward coordination among certification

schemes, certifiers' reluctance to harmonize standards and recognize competing programs creates confusion for consumers and promoters of sustainably managed forestry.<sup>31</sup>

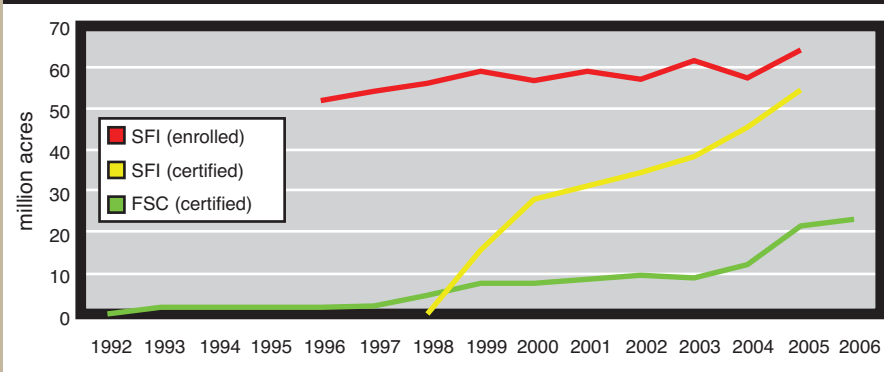
Forest certification programs continue to develop and evolve. In 1999, the Programme for the Endorsement of Forest Certification schemes (PEFC) was founded as the global umbrella organization for the assessment of and mutual recognition of national and international certification schemes.

In the United States, three major forest certification schemes are in place: the Sustainable Forestry Initiative®, (SFI) program, the Forest Stewardship Council© (FSC), and the American Tree Farm System. With 65 years of history, Tree Farm is the oldest voluntary, third-party forest management verification process in the country. It certifies the forestry practices of family-owned and other nonindustrial private landowners. FSC, founded in 1993, is an international nonprofit organization whose members, from more than 70 countries, represent social, economic, and environmen-

<sup>30</sup> United Nations Economic Commission for Europe (UNECE). 2006. Government Procurement and Corporate Social Responsibility Policies Influencing UNECE Region Forest Products Markets in 2005 and 2006. Press release. Geneva, 8 August. [http://www.unece.org/press/pr2006/06tim\\_p03e.htm](http://www.unece.org/press/pr2006/06tim_p03e.htm). Accessed November 2006.

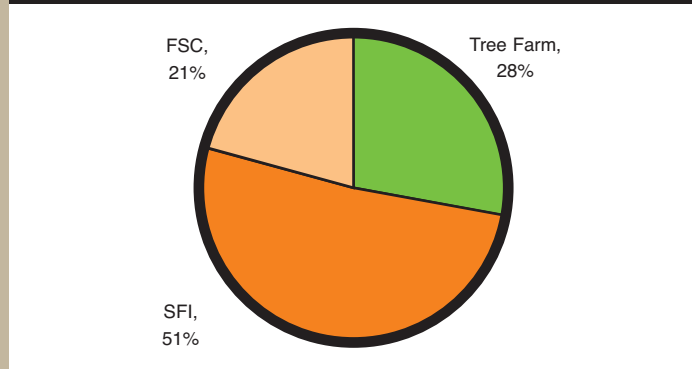
<sup>31</sup> United Nations Economic Commission for Europe (UNECE) Timber Committee and Food and Agriculture (FAO) European Forestry Commission. 2004. Statement on Forest Products Markets in 2004 and Prospects for 2005. Geneva, 12 October. [http://www.unece.org/press/pr2004/04tim\\_n01e.htm](http://www.unece.org/press/pr2004/04tim_n01e.htm). Accessed November 2006.

### Area of certified US forests, 1992–2006



Source: Sustainable Forestry Board and Forest Stewardship Council.

### Certified US forestland by certification program, 2005



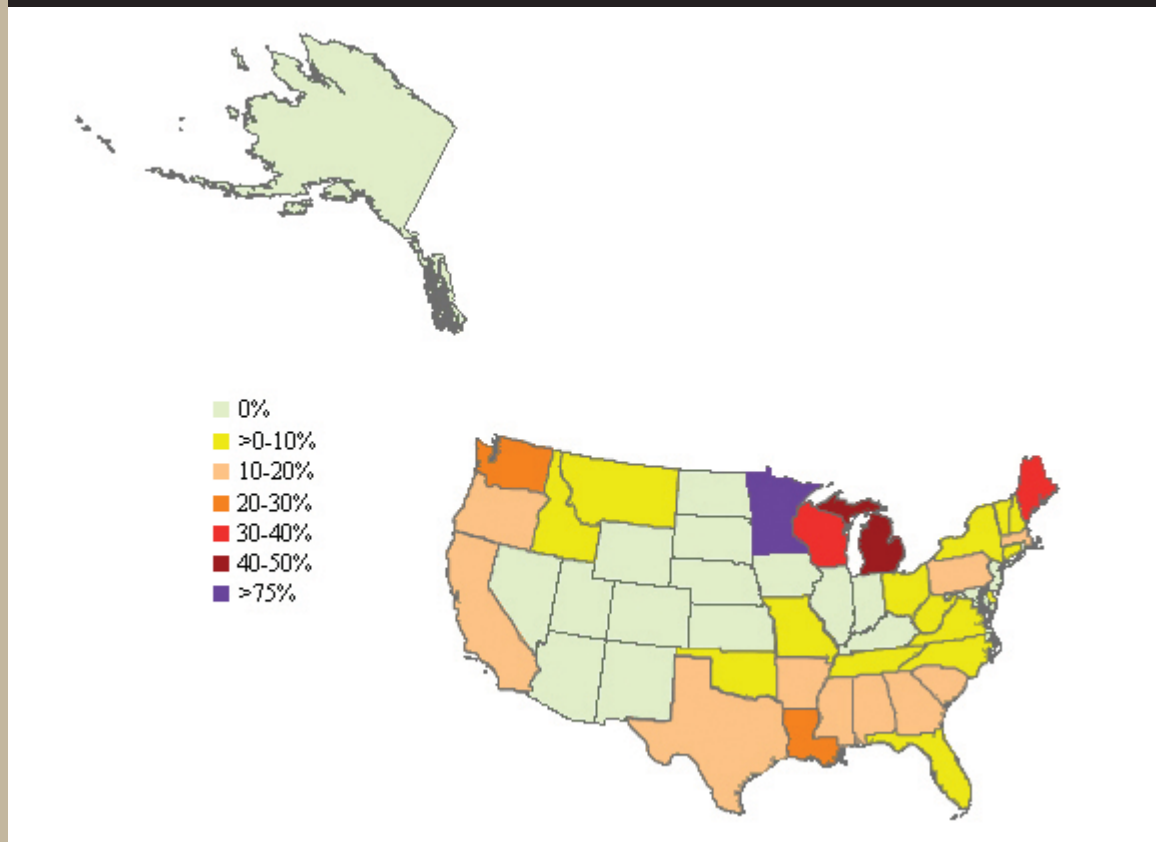
Source: Sustainable Forestry Board, Forest Stewardship Council, and Tree Farm.

tal interests centered on forests. The SFI program was developed by the American Forest and Paper Association in 1994 to document the commitment of member companies to sustainable forestry. In 2000, an independent 501(c)(3) multistakeholder organization, the Sustainable Forestry Board, was established to oversee SFI standards development and the certification process. SFI certifies companies in the United States and Canada.

Thus far, SFI is the only US scheme officially recognized by PEFC. In recent years, both SFI and FSC have been certifying increasing numbers of forest acres in the United States; Tree Farm acreage has remained stable. Today, these three systems together certify more than 107 million acres, representing 14 percent of total US forests. Some 25 percent of private US forestland is now certified.



## Percentage of forests certified by SFI and/or FSC, 2005



Source: Elaborated from Sustainable Forestry Board and Metafore statistics.

## SFI- and FSC-certified forests in acres and percentage of total forest area by state, 2005

State	SFI			FSC		State	SFI			FSC	
	Enrolled (acres)	Certified (acres)	% of total forest	Certified (acres)	% of total forest		Enrolled (acres)	Certified (acres)	% of total forest	Certified (acres)	% of total forest
Alabama	3,362,969	3,154,884	13.7	-	-	Missouri	534,000	0	0.0	326,579	2.2
Arkansas	3,373,966	2,755,381	14.6	495,105	2.6	Montana	1,391,767	1,391,767	6.0	159,583	0.7
California	2,513,951	2,480,654	7.5	1,227,478	3.7	New Hampshire	163,298	140,158	2.9	267,555	5.6
Connecticut	9,292	7,840	0.4	9,750	0.5	New York	495,172	305,504	1.7	205,321	1.1
Delaware	11,876	11,876	3.1	0	0.0	North Carolina	1,324,601	1,247,328	6.8	50,262	0.3
Eastern US*				1,848,362		Oklahoma	753,194	704,906	9.2	0	0.0
Florida	1,706,811	1,284,464	7.9	1,585	0.0	Oregon	3,207,888	2,478,571	8.1	578,187	1.9
Georgia	2,930,789	2,863,613	11.6	7,907	0.0	Pennsylvania	2,247,471	146,971	0.9	2,281,567	13.8
Hawaii	0	0	0.0	34,600	2.0	South Carolina	1,376,593	1,342,402	10.5	6,420	0.1
Idaho	1,132,573	827,696	3.8	667,187	3.1	Tennessee	795,297	577,082	4.1	162,688	1.2
Louisiana	3,318,677	3,223,220	22.8	582,518	4.1	Texas	2,504,820	2,436,839	14.1	0	0.0
Maine	4,753,092	4,759,359	26.9	1,599,976	9.0	Vermont	30,290	290	0.0	112,607	2.4
Maryland	60,590	60,090	2.3	28,999	1.1	Virginia	538,017	537,500	3.3	228,718	1.4
Massachusetts	294,100	0	0.0	597,832	19.1	Washington	4,848,711	4,556,871	20.6	46,683	0.2
Michigan	5,004,495	4,995,029	25.9	4,056,740	21.0	West Virginia	668,844	668,344	5.6	29,380	0.2
Minnesota	7,208,127	6,620,453	40.9	5,798,917	35.8	Wisconsin	3,293,461	3,262,420	20.3	1,584,098	9.9
Mississippi	2,173,296	2,106,796	11.3	0	0.0	<b>US total</b>	<b>62,028,028</b>	<b>54,948,308</b>	<b>7.4</b>	<b>22,996,604</b>	<b>3.1</b>

\* Holdings of The Forestland Group.

Source: Sustainable Forestry Board and Metafore.





# Threats to America's Forests

United States forests face challenges that threaten their health and even their existence. The major threats are insects and diseases, invasive species, fire risk, urban growth, and climate change.

## Insects and Diseases

By 2006, approximately 58 million acres (8 percent of US forests), were at significant risk from insect and disease mortality. Several major forest insects currently affect US forests:<sup>32</sup>

- **Gypsy moth.** A hardwood defoliator. Despite a significant reduction in gypsy moth populations in recent years, defoliation has averaged 2.7 million acres per year for the past 20 years, reaching record levels of activity as this insect spread into better habitat.
- **Southern pine beetle.** A bark beetle whose preferred hosts are loblolly pine and shortleaf pine. For the past 20 years, its activity was historically high. Activity has declined after peaking at 13.5 million acres in 2001. In 2004, about 2.7 million acres were affected. From 1960 to 1990, damage in the

South totaled \$901.8 million,<sup>33</sup> \$350 million in 1995 alone.<sup>34</sup>

- **Mountain pine beetle.** A bark beetle of lodgepole, ponderosa, sugar, and western white pines. Activity levels have been low prior to 2001, but have been steadily increasing in recent years. Mortality caused by this beetle was mapped on over 3 million acres in 2005.<sup>35</sup>
- **Western spruce budworm.** The most widely distributed and destructive defoliator of coniferous forests in western North America. Activity levels were high from 1883 to 1992 and have declined since then. The northern Rocky Mountains suffered an epidemic that began in 1949 and persisted into the 1990s despite repeated insecticidal treatments between 1952 and 1966 of more than 6 million acres.<sup>36</sup>
- **Spruce budworm.** A defoliator of needles and buds of spruce and fir. Its cyclical activity levels have declined for the past 20 years and now affect the Lakes States.

Several new problems are emerging in US forests:<sup>37</sup>

<sup>32</sup> USDA Forest Service. 2005. US Forest Resource Facts and Historical Trends. FS-801-M. Washington, DC.

<sup>33</sup> Price, T.S., C. Doggett, J.M. Pye, and T.P. Holmes. 1992. A History of Southern Pine Beetle Outbreaks in the Southeastern United States. Macon, GA: Georgia Forestry Commission.

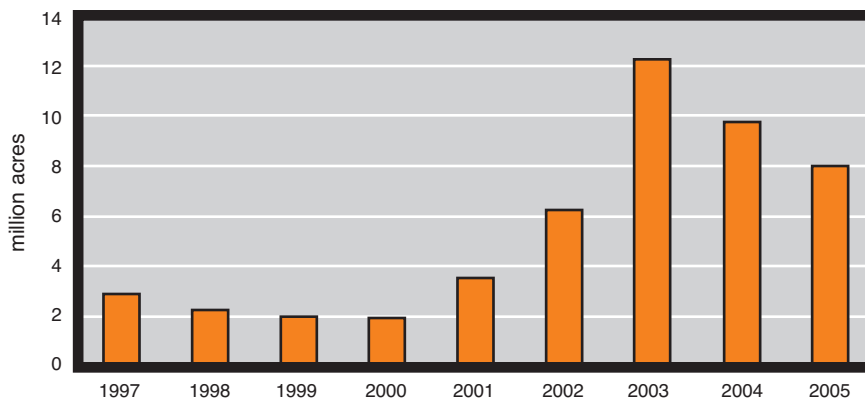
<sup>34</sup> USDA Forest Service. 1995. Forest Insect and Disease Conditions in the United States, 1995. Forest Pest Management. Washington, DC.

<sup>35</sup> USDA Forest Service. 2006. Forest Insect and Disease Conditions in the United States, 2005. Forest Health Protection. Washington, DC.

<sup>36</sup> Fellin, D.G., and J.E. Dewey. 1982. Western Spruce Budworm. Forest Insect and Disease. Leaflet 53. Washington, DC: USDA Forest Service. <http://www.na.fs.fed.us/spfo/pubs/fidls/westbw/fidl-wbw.htm>. Accessed November 2006.

<sup>37</sup> USDA Forest Service, Forest Health Protection. 2005. Forest Insect and Disease Conditions in the United States 2004. [http://www.fs.fed.us/foresthealth/publications/annual\\_i\\_d\\_conditions/ConditionsReport\\_04\\_Final\\_web.pdf](http://www.fs.fed.us/foresthealth/publications/annual_i_d_conditions/ConditionsReport_04_Final_web.pdf). Accessed November 2006.

## Forest acres with insect- and disease-caused tree mortality, 2005



Source: USDA Forest Service, Forest Health Protection. 2006. *Forest Insect and Disease Conditions in the United States, 2005*.

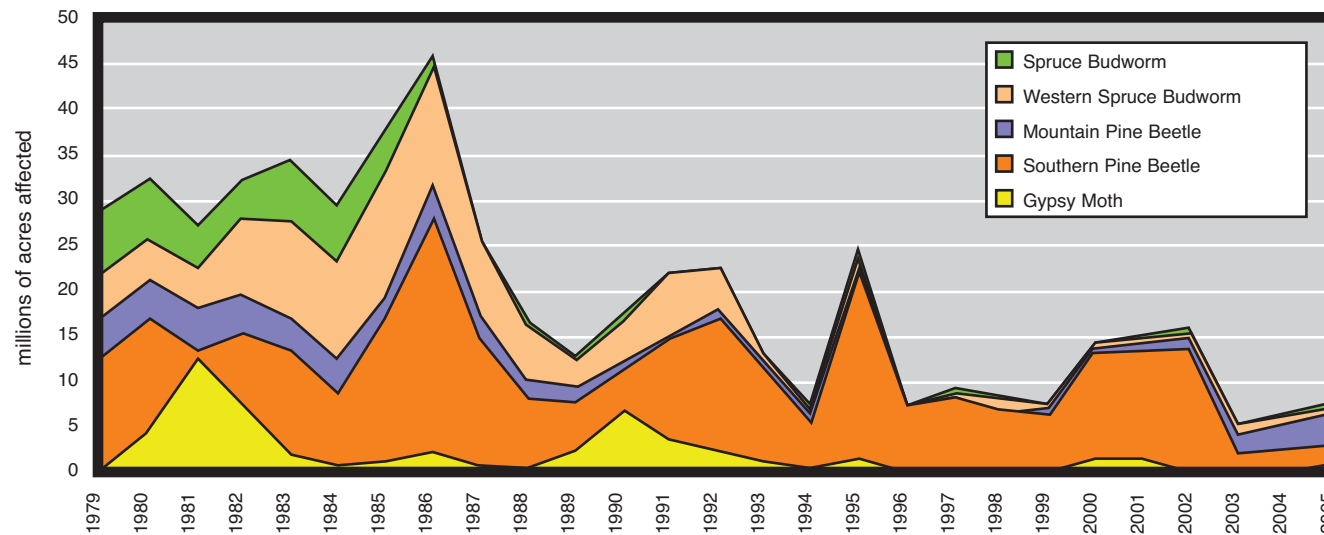
- **Emerald ash borer.** First discovered in Detroit in 2002, today it affects several areas of Michigan, Ohio, Indiana, and Illinois.
- **Mortality of piñon pine.** Record levels of mortality of piñon pine were observed in 2003, with more than 3.7 million acres affected in Arizona, California, Colorado, Nevada, New Mexico, and Utah.

- **Western bark beetle.** High levels of activity have been seen in forests stressed by widespread and prolonged drought and overstocking.
- **Asian longhorned beetle.** This exotic pest threatens a wide variety of hardwood trees in North America. First discovered in New York City in 1996, today it affects several areas of New York and New Jersey. An infestation in Chicago, Illinois has been deregulated, with eradication expected in early 2008.
- **Hemlock woolly adelgid.** Native to Asia, this serious pest of eastern hemlock and Carolina hemlock is present from the northeastern Georgia to southeastern Maine and west to eastern Tennessee.
- **Sudden oak death.** First reported in central coastal California in 1995, it is estimated that this disease has killed a million overstory oaks and tanoaks, with at least another million currently infected. The pathogen, *Phytophthora ramorum*, also causes a foliar disease called ramorum blight, which affects 100 known plant species including *Rhododendron* spp., huckleberry, bay laurel, madrone, bigleaf maple, manzanita, and California buckeye.<sup>38</sup>

<sup>38</sup> California Forest Pest Council. 2007. California Forest Pest Conditions Report, 2006. <http://www.fs.fed.us/r5/spf/publications/pestconditions/index.shtml>. Accessed November 2006.



## Trends in damage by major insect pests, 1979–2005



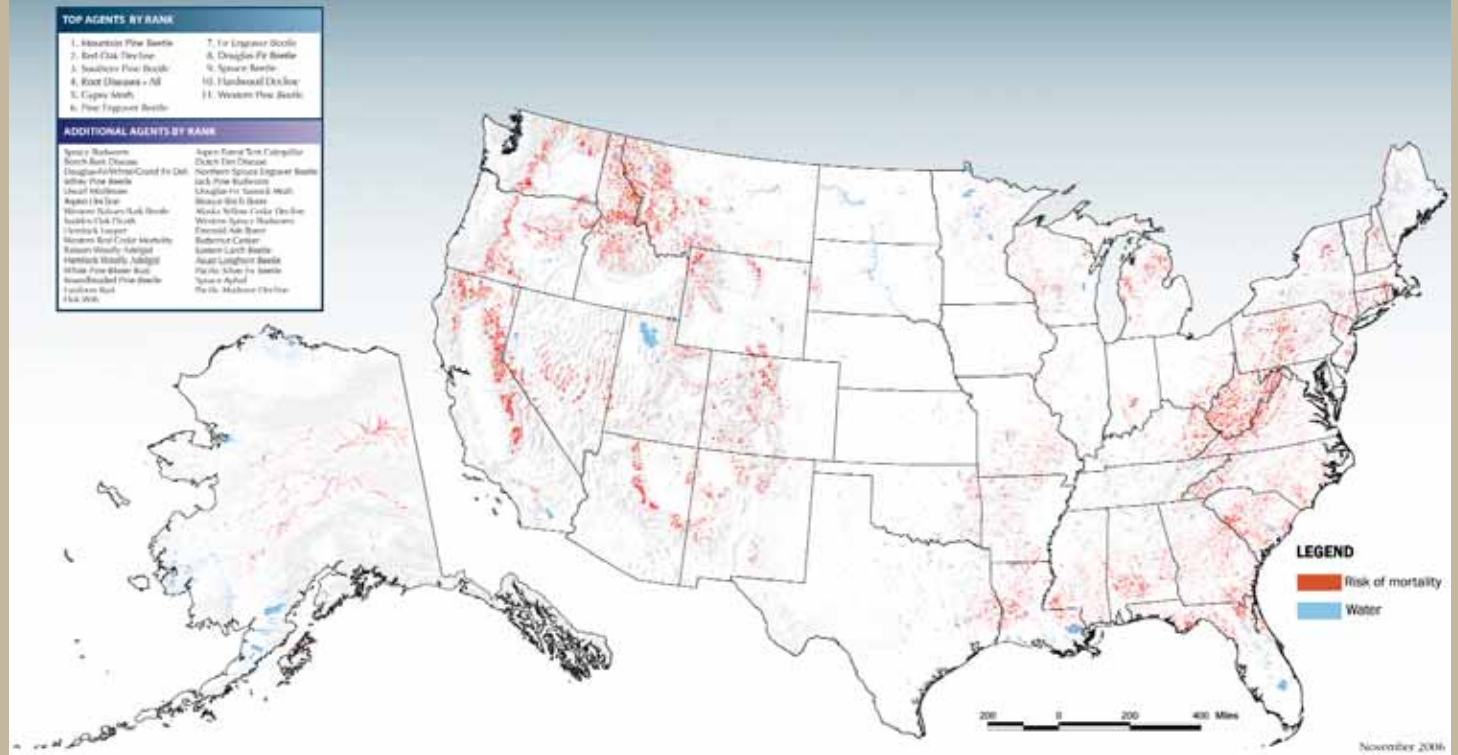
Source: USDA Forest Service, Forest Heath Protection.

Several other insects, such as the sirex wood wasp and the pine shoot beetle, are gaining a foothold. And although not a recent disease, the beech bark disease represents another threat. First localized in Maine in

1932, this scale and its associated fungus affect American beech. The disease has spread to the west and south throughout New England, New York, New Jersey, and northern and eastern Pennsylvania.<sup>39</sup>

<sup>39</sup>Houston D.R., and J. O'Brien. 1983. Beech Bark Disease. USDA Forest Service, Forest Insect & Disease Leaflet 75. <http://www.na.fs.fed.us/spfo/pubs/fidls/beebark/fidl-beech.htm>. Accessed November 2006.

## Risk of insect and disease, 2006



Note: Risk is defined as the expectation that 25% or more of the standard live volume of trees greater than 1 inch in diameter will die over the next 15 years.

Source: USDA Forest Service, Forest Health Protection.



## Invasive Species

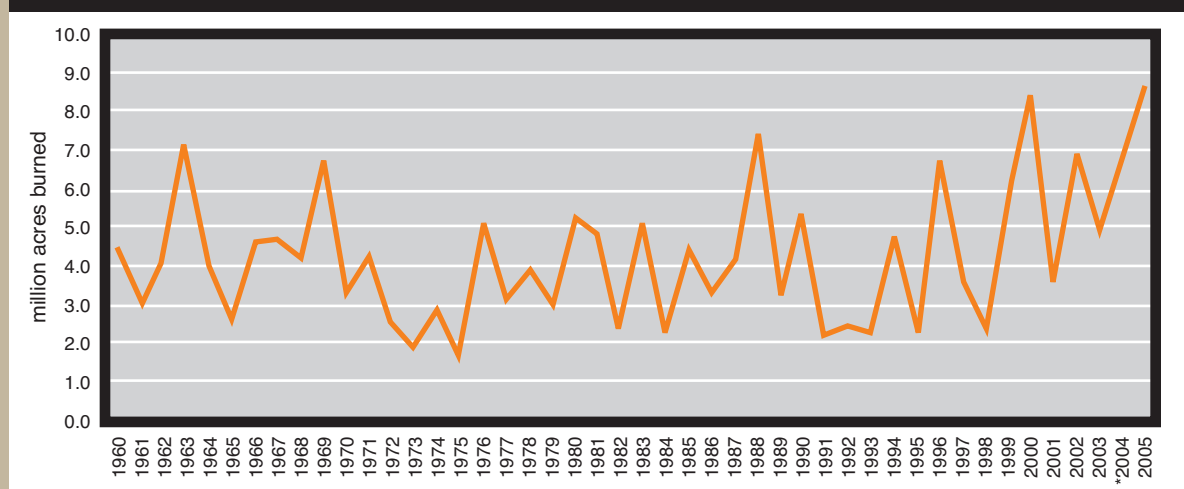
Invasive alien species have a major impact on many native species and ecosystems and are one of the most important threats to biological diversity. According to the US Forest Service, 14 percent of the plant species on noncrop lands in the Midwest are now nonnative invasive plants. Estimates show that some 3.5 million acres of US forestland is infested with invasive weeds, with about 2,000 nonnative invasive plant species concentrated mostly in California, Florida, and Hawaii.

The species of particular concern are leafy spurge, knapweeds and starthistles, saltcedar, nonindigenous thistles, purple loosestrife, and cheatgrass in the West, and garlic mustard, kudzu, Japanese knotweed, tree-of-heaven, purple loosestrife, cogon grass, and hydrilla in the East.<sup>40</sup>

## Fire Risk

In the past decade, the number of wildland forest fires in the United States has increased, especially in the West. Between 1999 and 2006, fires affected an average of 5.8 million acres per year. Catastrophic forest fires continue to be one of the major forest health challenges

Trends in wildland fires, 1960–2005



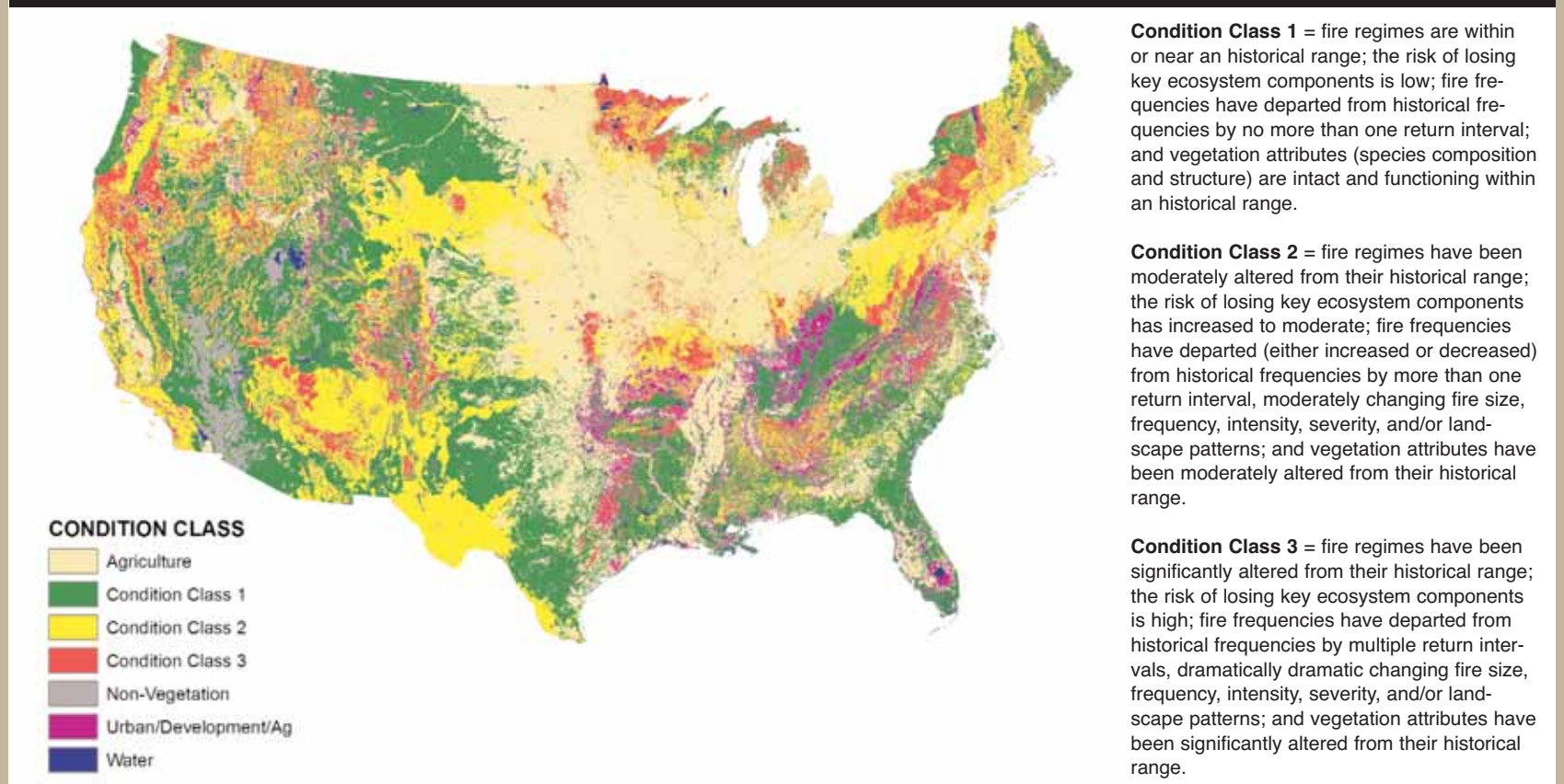
\* 2004 does not include state lands for North Carolina.

Source: National Interagency Coordination Center, *Wildland Fire Statistics*. [http://www.nifc.gov/stats/fires\\_acres.html](http://www.nifc.gov/stats/fires_acres.html). Accessed November 2006.

today because of the increased undergrowth and tree density in some areas. In response, the US Forest Service in 2000 created the National Fire Plan to respond to severe wildland fires and their effects on communities, and Congress adopted new legislation, the Healthy Forest Restoration Act of 2003, to prevent future large, catastrophic fires by reducing hazardous fuels through fuel treatment programs, such as thinning and prescribed burning.

<sup>40</sup>Mitchell, J.E. 2000. Rangeland Resource Trends in the United States: A Technical Document Supporting the 2000 USDA Forest Service RPA Assessment. RMRS-GTR-68. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

## Fire regime current condition classes, 2000



Source: USDA Forest Service, 1999. *Course-scale Spatial Data for Wildland Fire and Fuel Management*. Prescribed Fire and Fire Effects Research Work Unit, Rocky Mountain Research Station. <http://www.fs.fed.us/fire/fuelman/curcond2000/arc.html>. Accessed November 2006.



## Urban Growth

Today, housing development is the cause of land-use conversion from both forests and agricultural lands.

Although in recent years the number of forest acres has remained relatively constant and even increased in some years, a recent study estimated that more than 44 million acres of private forestland might be converted to housing development in the next three decades. The East, the Pacific Northwest, and parts of California will likely be the regions most affected, but the Southeast has the highest rate of urban growth.<sup>41</sup>

Several states have recently experienced a decline in the acreage of forestland near many urban centers as the land is permanently converted to residential, commercial, and other nonforest uses. This trend is the result of a growing population that needs land for residential and commercial development as well as highways and other infrastructure. The impact of urban growth on forests can be minimized through thoughtful urban growth planning and incentives to own, manage, and maintain forestland.

For the past century, national forest inventory data

show a relatively flat trend, with small oscillations, in aggregate forestland area. From a 20th century peak of 762 million acres in 1963, total US forestland decreased around 2 percent by 2005. Although the area of forestland in most states remained stable during that period, or in some cases increased, several southern states, as well as the Pacific Coast states, experienced a reduction in forestland area.<sup>42</sup>

Florida, Georgia, and North Carolina, which experienced rapid population growth and urban growth, together incurred a net loss of almost 7 million acres of forestland between 1963 and 2005. Arkansas, Louisiana, Oklahoma, and Texas experienced an aggregate net loss of forestland of approximately 11.5 million acres since 1963, a result of both urban growth and the conversion of forests to agricultural land. The reduction in forestland acreage in California, Oregon, and Washington since the 1960s represents 10.5 million acres.<sup>43</sup> An estimated 44.2 million acres of private forest is at risk from housing development by 2030, especially in the Southeast and parts of California and the Pacific Northwest.<sup>44</sup>

<sup>41</sup> Stein, S.M., R.E. McRoberts, R.J. Alig, M.D. Nelson, D.M. Theobald, M. Eley, M. Dechter, and M. Carr. 2005. *Forests on the Edge: Housing Development on America's Private Forests*. Gen. Tech. Report PNW-GTR-636. Portland, OR: USDA Forest Service, Pacific Northwest Research Station.

<sup>42</sup> Smith, W.B., P.D. Miles, J.S. Visage, and S.A. Pugh. 2004. *Forest Resources of the United States, 2002*. Gen. Tech. Report NC-241. St. Paul, MN: USDA Forest Service, North Central Forest Experiment Station.

<sup>43</sup> USDA Forest Service, Forest Inventory Analysis Program. Washington, DC.

<sup>44</sup> See note 41 above.

## Climate Change

Native tree species, and vegetation in general, are adapted to the local climate, atmosphere, soils, and disturbances (both human and natural) in a particular region. Any changes in any of these characteristics will have, to a certain degree, an effect on forest species composition.

During the past century, the average US temperature has increased almost 1° F, and precipitation has increased by 5 to 10 percent, mostly coming in heavy downpours. Predictions for the 21st century suggest that changes will be significantly larger. Temperatures could rise 5° to 9° F, and droughts and flash floods are likely to become more frequent and intense if worldwide growth in greenhouse emissions continues its current trend.<sup>45</sup>

Scientific models that use inventory data are predicting forest vegetation response to different climate change scenarios. According to the US National Assessment Synthesis Team on climate change, timber inventories are likely to increase because of increases in atmospheric

carbon dioxide and a longer growing season. Hardwood productivity is likely to increase more than softwood productivity. The southeastern forests could potentially break up into a mosaic of forests, savannas, and grasslands. Species composition in the Northeast is likely to change, with a loss of sugar maples. And those ecosystems already constrained by climate, such as alpine meadows in the Rocky Mountains, are likely to face extreme stress and even disappear in some places. Highly managed ecosystems and plantations seemed more resistant to climate change and could even benefit from it.

<sup>45</sup>National Assessment Synthesis Team. 2000. Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change. US Global Change Research Program. Washington, DC. <http://www.usgcrp.gov/usgcrp/Library/nationalassessment/1IntroA.pdf>. Accessed November 2006.





# Forest Divestiture

**B**eginning in the 1980s and escalating through the 1990s, large tracts of industrial forestlands were sold. Recent divestitures by the forest industry total 46 million acres of forestland—land that could be converted to nonforest uses. In response, private land and timber investment institutions and private conservation efforts (such as conservation easements) have emerged.

Large publicly traded forest products companies, also called C corporations (C-corps), have sold or transferred almost 79 percent of their land holdings. Of the almost 46 million acres no longer owned by C-corps,

- 33 percent moved into publicly traded real estate investment trusts (REITs) or master limited partnerships (MLPs);
- 50 percent was purchased by institutional or other investors through timber investment management organizations (TIMOs); and
- the remainder is now owned by privately held forest industry companies, Subchapter S corporations (S-corps), individuals, family trusts, partnerships, conservation groups, and public agencies.

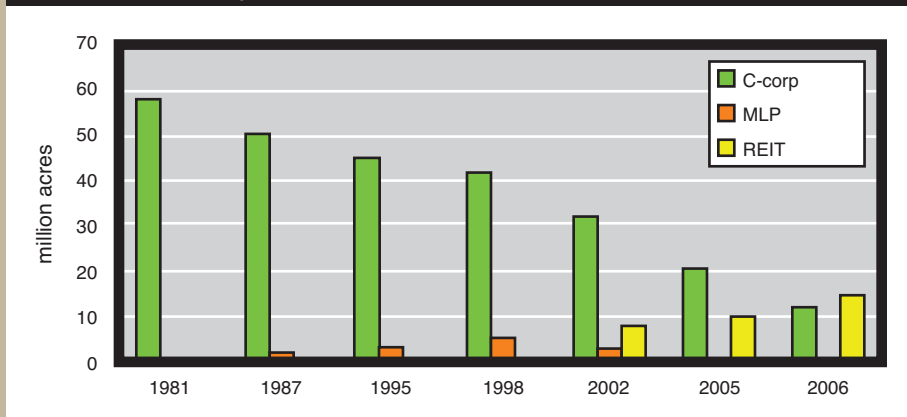
Pressured to increase profitability, the forest products sector's business model has changed over the past two decades, and companies have had to adapt to new trends and market drivers. Land divestiture is one of these adaptations. Institutional investors have invested more than \$15 billion in US timber and timberland (Clutter et al. 2005<sup>46</sup>). TIMOs, on behalf of their institutional clients, are responsible for purchasing and managing many of these timberland investments. Today, TIMOs manage some 23 million acres in the United States and are expected to continue growing because timberlands are recognized as a viable asset class, with reasonably stable cash returns and capital appreciation. In 1995, the top eight to 10 TIMOs managed roughly \$1.5 billion to \$3 billion in assets. Most TIMOs invested in US timberlands, but a growing number are investing overseas, in Australia, New Zealand, and Latin America.<sup>47</sup>

According to Clutter et al. (2005), timberland ownership trends are expected to continue. Institutional investment in timberlands will continue to grow nationally and internationally at a rate of \$2 billion to

<sup>46</sup> Clutter, M., et al. 2005. Strategic Factors Driving Timberland Ownership Changes in the US South. <http://www.srs.fs.usda.gov/econ/pubs/southernmarkets/strategic-factors-and-ownership-v1.pdf>. Accessed October 27, 2006.

<sup>47</sup> Deutsche Bank. 2005. Industry Bulletin. July 5.

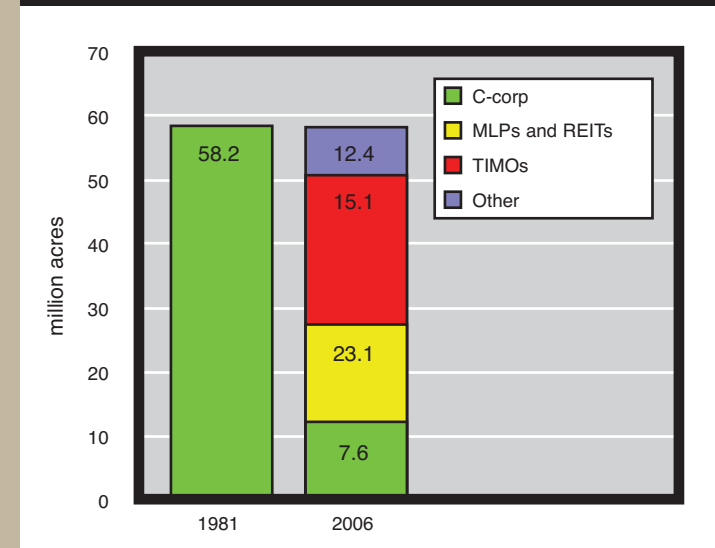
## Trends in timberland ownership of publicly traded companies, 1981–2006



Source: Compiled by Seneca Creek Associates, LLC from US Securities and Exchange Commission filings and other public sources.

\$3 billion per year during the second half of the decade. Real estate markets will continue to grow at the urban-rural interface. And finally, higher-and-better use opportunities will drive the future use of forestlands.

## Forest industry timberland divestiture, 1981–2006



Note: C-corp = C corporation; MLP = master limited partnership; REIT = real estate investment trust; TIMO = timber investment management organization; Other = other public and private entities.  
Source: Compiled by Seneca Creek Associates, LLC from US Securities and Exchange Commission filings and other public sources.

# Wood and Paper Products

The United States continues to be one of the world's top producers and consumers of forest products. Although housing markets cooled in 2006, US and European home construction reached record levels in 2005, using nearly 50 billion cubic feet of wood building materials. In the United States, the housing market reached a 30-year high, with more than 2 million new home starts. Some 1.7 million starts were single-family homes, accounting for roughly 2.2 billion cubic feet of sawnwood and 671.2 million cubic feet of structural panels.<sup>48</sup>

Population growth and attractive mortgage rates are two major reasons for the robust housing market. The total US consumption of timber products has increased since the mid-1960s, by 43 percent in lumber, 32 percent in plywood, 45 percent in pulpwood, and 33 percent in fuelwood, among other products. US per capita consumption of timber products has remained relatively steady, oscillating between 60 to 83 cubic feet per person per year from 1965 through 2005. Production grew 44 percent during this period.

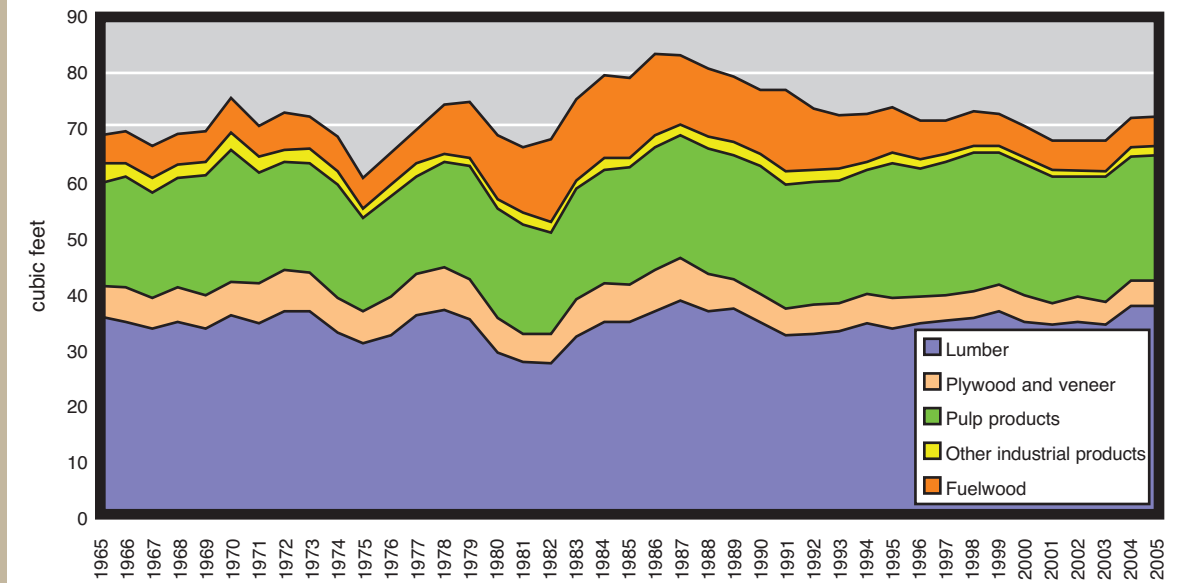
For the softwood lumber industry alone, combined capacity at the 1,067 sawmills in the United States and Canada was 6.7 billion cubic feet in 2005. This represented a 10 percent increase over the previous 10 years. In 2004, the industry produced little over 6 billion cubic feet and employed almost 100,000 people. Capacity grew unevenly among producing areas, however. British Columbia's sawmill capacity had the highest growth because of the large volumes of beetle-killed lodgepole pine available for salvage, followed by the western United States. The Northeast saw a loss in capacity; several large mills in Maine closed because of timber shortages and competition with Canada. In Maine, demand for new housing construction was insufficient to offset the factors for mill closure. However, the Northeast was the only producing US region with a loss.<sup>49</sup>

Overall, US consumption of timber products exceeds US production by 4.2 billion cubic feet.

<sup>48</sup>United Nations Economic Commission for Europe (UNECE) and FAO. 2006. Forest Products Annual Market Review 2005–2006. New York and Geneva.

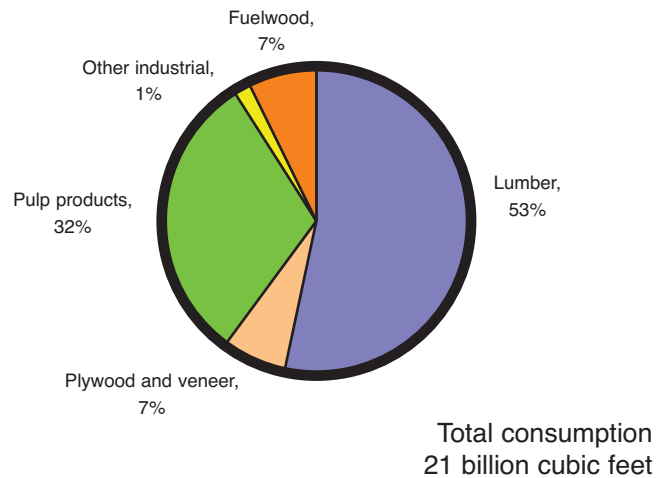
<sup>49</sup>Henry, S.H., and M.P. Alderman. 2005: Softwood Sawmills in the United States and Canada. Research paper FPL-RP-630. Madison, WI: USDA Forest Service, Forest Products Laboratory.

## US per capita consumption of timber products, 1965–2005



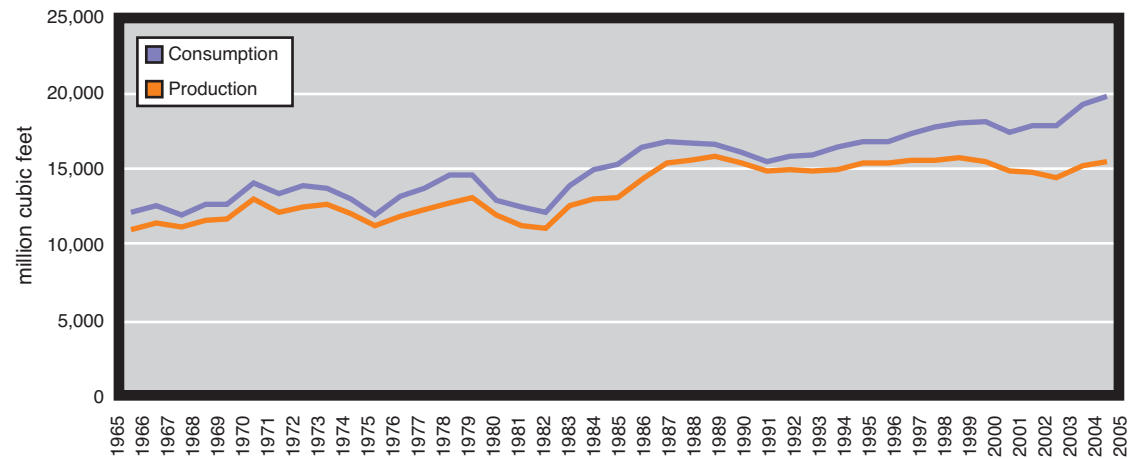
Source: Preliminary data from USDA Forest Service, Forest Products Laboratory. Howard L. James. *U.S. Timber Production, Trade, Consumption and Price Statistics 1965–2005*.

## US timber consumption, 2005



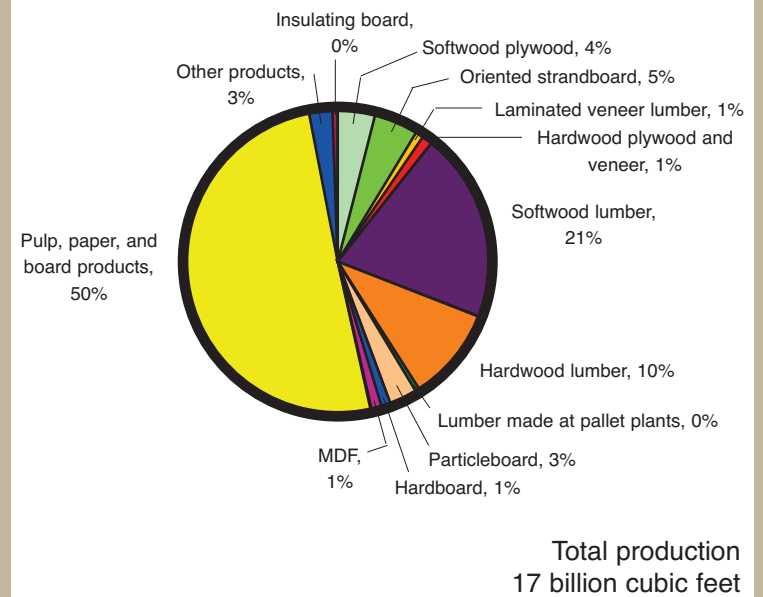
Source: Preliminary data from USDA Forest Service, Forest Products Laboratory. Howard L. James. *U.S. Timber Production, Trade, Consumption and Price Statistics 1965–2005*.

## Total US production and consumption of timber products, 1965–2005



Source: Preliminary data from USDA Forest Service, Forest Products Laboratory. Howard L. James. *US Timber Production, Trade, Consumption and Price Statistics 1965–2005*.

## Production of industrial wood products, 2005



Source: Preliminary data from USDA Forest Service, Forest Products Laboratory. Howard L. James. *U.S. Timber Production, Trade, Consumption and Price Statistics 1965–2005*.



# Forest Products Markets

**G**lobalization and international competition are changing forestry and the way forest products companies operate. Globalization is creating new opportunities and challenges by allowing investments, capital, and technologies to move easily into those world regions where production and manufacturing make the most sense for a company's operations. Industry changes driven by globalization seem to be more apparent in the pulp industry than in the structural wood sector.<sup>50</sup> Today, a forest company might have its headquarters in the United States, build a pulp mill in Central America (where trees grow to commercial maturity in less than a decade), manufacture in China (where the cost of converting pulp into paper is low), and sell to markets all over the world.

Relevant shifts in forest products trade for 2005 include the following:<sup>51</sup>

- The US forest products trade deficit increased for the sixth consecutive year in 2005, although the increase was small compared with the increase in 2004.
- Modest gains in exports of US forest products

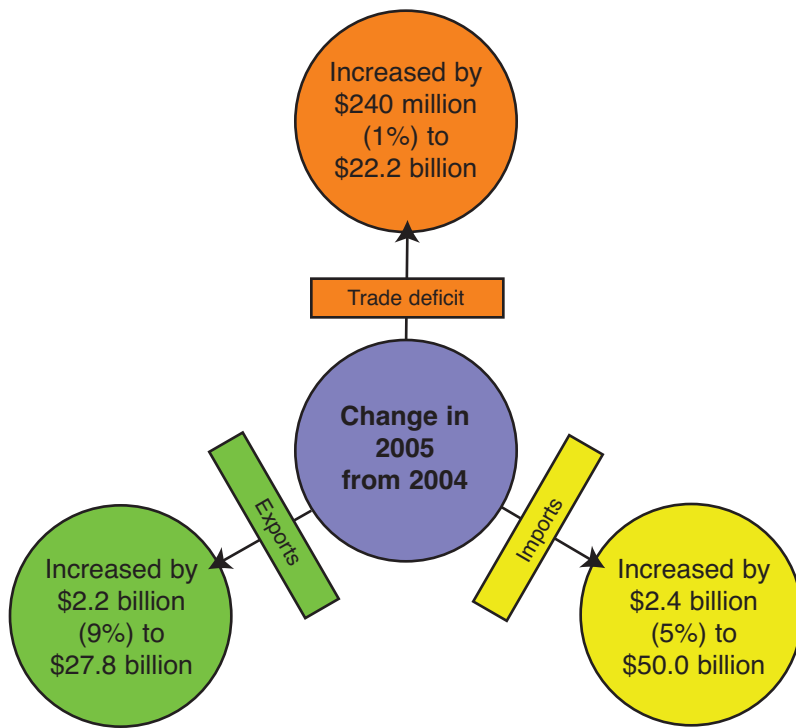
resulted from favorable exchange rates and strong foreign demand for raw materials, such as wood pulp and waste paper.

- Canada remained the United States' largest trading partner in the sector, reflecting Canada's large industry and proximity to US markets.
- Rapid expansion of China's manufacturing has caused large shifts in US forest products trade in recent years. Bilateral trade between China and the United States posted a large gain in 2005, increasing by \$1.4 billion.
- The US trade surplus in forest products with Latin America reversed the declining trend in 2005 as higher exports to Mexico and other countries offset growing imports from Brazil.

<sup>50</sup> Bael D., and R. Sedjo. 2006. Toward Globalization of the Forest Products Industry. Some Trends. Discussion Paper. Washington, DC: Resources for the Future. <http://www.rff.org/documents/RFF-DP-06-35.pdf>. Accessed November 2006.

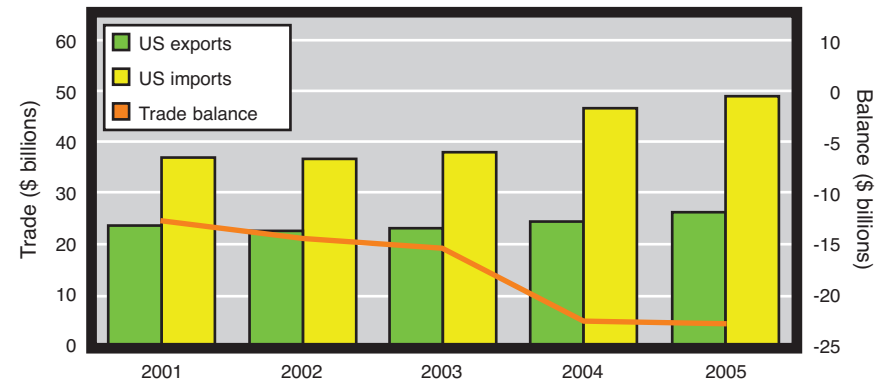
<sup>51</sup> US International Trade Commission. [http://www.usitc.gov/tradeshifts/2006/tradeshifts\\_forest.htm](http://www.usitc.gov/tradeshifts/2006/tradeshifts_forest.htm). Accessed November 2006.

## Forest products trade summary, 2004–2005



Source: US International Trade Commission. *Shifts in US Merchandise Trade 2005*, USITC Publication 3874. Washington, DC: USITC, 2006. <http://www.usitc.gov/tradeshifts/2006/documents/FP.pdf>. Accessed November 2006.

## Forest products imports, exports, and trade balance, 2001–2005



Source: US International Trade Commission. [http://www.usitc.gov/tradeshifts/2006/tradeshifts\\_forest.htm](http://www.usitc.gov/tradeshifts/2006/tradeshifts_forest.htm). Accessed November 2006.

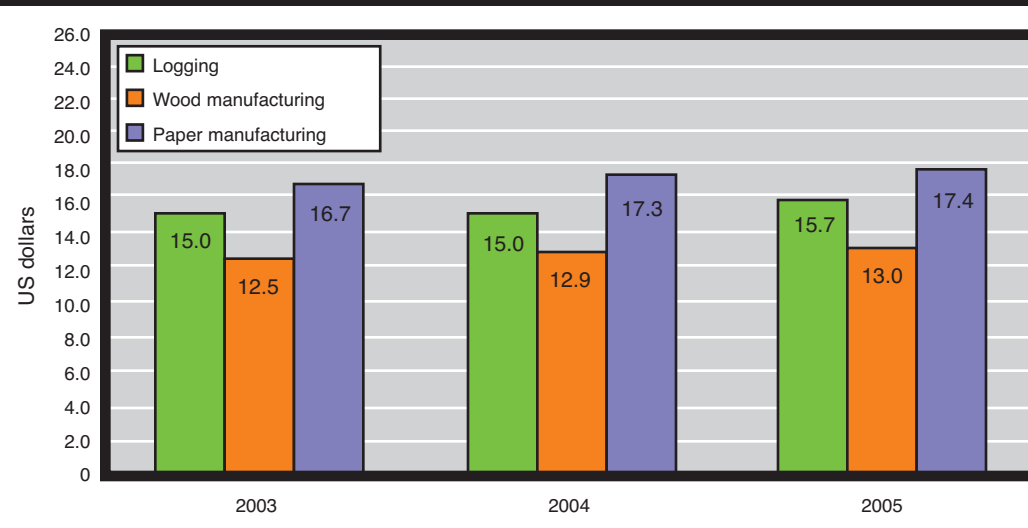




# Economic Importance of a Healthy Forest Industry

The forest products industry has traditionally been viewed as one of the major providers of jobs in rural America. Today, a strong forest products industry is also viewed as providing incentive to own and manage forestland. There is a growing consensus among stakeholders that maintaining current forestland as forest is a key to maintaining and enhancing US biodiversity.<sup>52</sup> Unfortunately, more and more forest owners are facing the decision of whether to maintain their forests or convert them to other uses that provide a higher financial return. A healthy and competitive forest products industry, with a strong demand for raw material, can give landowners incentive to retain forestlands and in the process preserve existing biodiversity and other forest ecosystem services.

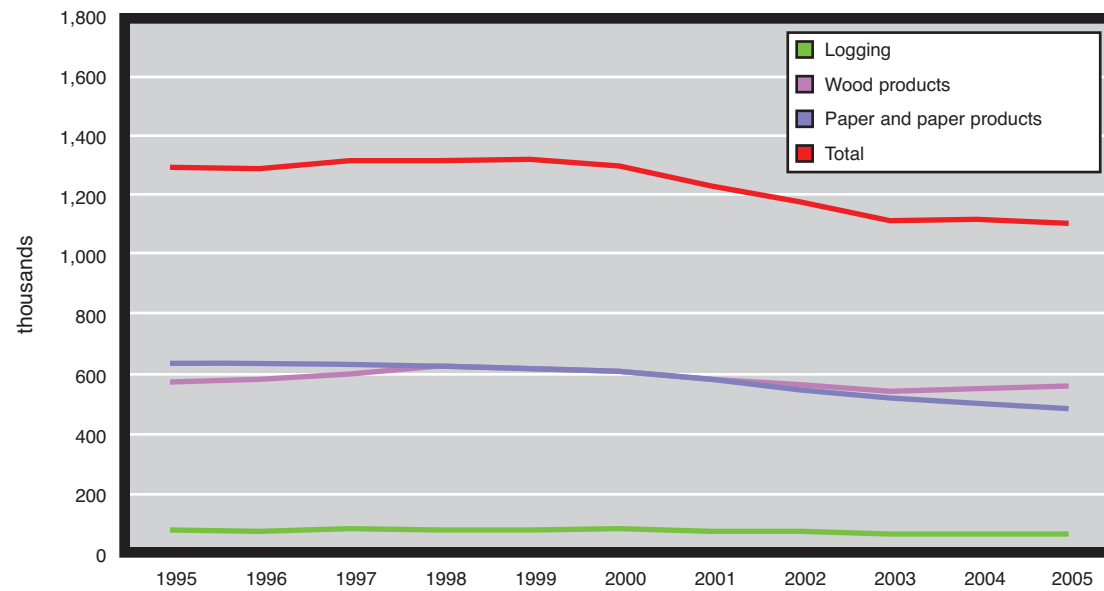
Average hourly earnings of forest industry production workers, 2003–2005



Source: US Bureau of Labor Statistics.

<sup>52</sup> National Commission on Science for Sustainable Forestry (NCSF). 2005. Global Markets Forum Summary Report of the National Commission on Science for Sustainable Forestry. Washington, DC.

## Trends in number of employees



**Employment change 2005-2006**  
Logging, 2.9%  
Wood products, 1.8%  
Paper and paper products, 3.5%

Source: US Bureau of Labor Statistics.



## Conclusion

The US Forest Service defines forestland as land at least 10 percent stocked by forest trees of any size. By that definition, the United States has 750 million acres of forestland, an amount that has remained essentially constant since the beginning of the 20th century. Clearly, America possesses abundant forest resources, and forestland is well distributed throughout the country.

Whereas the forestland in most countries is owned by the government, more than half of US forestland is owned by private interests, both individuals and companies. About a quarter of US private forestland is managed in accordance with forest certification schemes. And conservation initiatives on private land, such as easements, are becoming increasingly common.

America's wildlife resources attract millions of people to both private and public forestland each year for fishing, hunting, and wildlife viewing. Those activities and other forms of recreation—the Forest Service reports that the national forests host 137 million visits per year—are among many reasons to keep forestlands healthy.

Conservation of forestland is critical to the nation's water supply, since more than half of Americans' drinking water originates in forests. Sustainable forestry helps meet the nation's water quality objectives: good management maintains forest health and profitability, and thus forestland remains a desirable land use.

Of course, America's forests not only provide clean water, opportunities for recreation, and habitat for wildlife, they also provide Americans with wood and other products and associated employment. The United States is one of the world's largest consumers of forest products. Timber harvests on US forests, however, are relatively low, below 2 percent of standing inventory. Because US wood consumption exceeds production by 4.2 billion cubic feet, the country imports much of the timber products used by its citizens.

The forest products industry is nevertheless a significant part of the US economy. A healthy and competitive forest industry can provide jobs in rural America and give landowners the necessary incentive to keep their land forested, which in turn allows for continued

ecosystems services that benefit everyone.

Forestland is important for maintaining biodiversity, and it may become an effective means of sequestering carbon over the long term. Given the biological, economic, and social challenges facing America's forests, however, there is some uncertainty as to whether they will continue to deliver these services at current levels.

Insects and disease, invasive plants, catastrophic fire, and the pressures of a growing population are all threatening US forestlands. In addition, recent divestitures of large tracts of forestland by forest products companies threaten to open once-productive forestland to nonforest uses. The divestiture trend is expected to continue and, coupled with the growing demand for forest products within the US and increased competition from abroad, raises questions about the sustainability of both US forests and the US forest products industry.

- Will the current forest health problems on the national forests be adequately addressed?
- How will urban growth change the nature of forest-

land surrounding urban centers?

- Will demand for US wood and paper products provide sufficient incentive for private landowners to maintain their forests as forests?
- Will forestland ownership changes alter forest management practices or land uses?
- Will the increasing costs of owning and managing US forestland (including property taxes, labor, and compliance with regulations) give offshore sources a competitive advantage and encourage US landowners to convert forests to other uses?

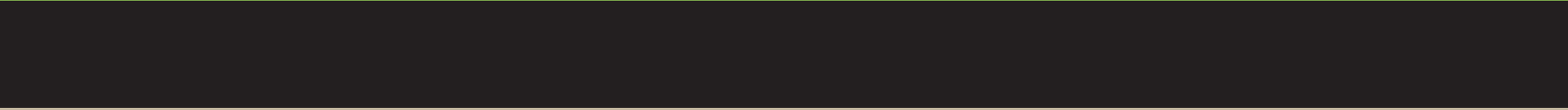
Challenges are often accompanied by opportunities, and that may be the case here as well. For example, only 3 percent of nonindustrial private forest owners have management plans, and only 22 percent have sought professional advice before harvesting timber. Those estimated figures suggest that there is a large population of landowners who could benefit from the guidance of forestry professionals.

Similarly, technological developments in biofuels may create opportunities for using small-diameter wood,



thereby generating revenues that could pay for fuels reduction work on overgrown forests. A biofuels industry could also revitalize rural communities hurt by declines in timber harvesting.

This report is intended to encourage action by those willing to confront the challenges that threaten America's forests and seize the opportunities that will help us address them.





# Glossary

**acre**—a unit of land area measurement equal to 43,560 square feet.

**annual growth**—the increase in volume per year of a tree or group of trees, often expressed in cubic feet or board feet.

**annual harvest**—the volume of timber removed from the forest in a year, often expressed in cubic feet or board feet.

**annual mortality**—the volume, number, or percentage of trees that die per year.

**biomass**—1. the living or dead weight of organic matter in a tree, stand, or forest in units such as a living or dead weight, wet or dry weight, ash-free weight, etc.  
2. *harvesting* the wood product obtained from in-woods chipping of all or some portion of trees, including limbs, tops, and unmerchantable stems, usually for energy production.

**board foot**—the amount of wood in an unfinished

board 1 inch thick, 12 inches long, and 12 inches wide (2.45 x 30.5 x 30.5 cm), abbreviated bd ft or bf —*note* in trees or logs, board-foot is a measure of merchantability, and therefore the number of board feet in a cubic foot depends on tree diameter, amount of slab, and saw kerf.

**conservation easement**—a deed restriction landowners voluntarily place on their property to protect resources, such as productive agricultural land, ground and surface water, wildlife habitat, historic sites, or scenic views. Conservation easements are used by landowners (grantors) to authorize a qualified conservation organization or public agency (grantee) to monitor and enforce the restrictions set forth in the agreement. The legal documents are flexible and tailored to each property. *Source:* [www.farmland.org/farmingontheedge/about\\_glossary.htm](http://www.farmland.org/farmingontheedge/about_glossary.htm)

**C corporation (C-corp)**—a corporation that elects to be taxed as a corporation. The C-corp pays federal and state income taxes on earnings at a corporate tax rate. When the earnings are distributed to the shareholders

as dividends, this income is subject to another round of taxation (as shareholder's income). Essentially, the C-corp's earnings are taxed twice (in contrast, the S corporation's earnings are taxed only once; see below). The name comes from Subchapter C of the Internal Revenue Code.

**endangered species**—any species of plant or animal defined through the Endangered Species Act of 1976 as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register.

**forest industry**—a diverse group of manufacturers that harvest, process, and use timber in their products. Activities include the harvesting of timber, conversion of logs to primary timber products (lumber, plywood, wood pulp), and the conversion of primary timber products to secondary or final products (pallets, furniture, paper goods).

**forestland**—land at least 10 percent stocked by forest trees of any size, including land that formerly had such

tree cover and that will be naturally or artificially regenerated.

**growing stock**—all the trees growing in a forest or in a specified part of it, usually commercial species, meeting specified standards of size, quality, and vigor, and generally expressed in terms of number or volume.

**invasive species**—animals, plants, and pathogens non-native to a country or region that threaten native forms of life in that region.

**master limited partnership (MLP)**—a limited partnership that is publicly traded. MLPs combine the tax benefits of a limited partnership with the liquidity of a publicly traded company.

**net annual growth**—the average annual net increase in the volume of trees during the period between inventories —*note* components of net annual growth include the increment in the net volume of trees at the beginning of the period surviving to the end of the period, plus the net volume of trees reaching the minimum size





class during the year, minus the volume of trees that died and the net volume of trees that became cull during the period.

**nontimber forest product (NTFP)**—any forest product except timber, including resins, oils, leaves, bark, plants other than trees, fungi, and animals or animal products.

**prescribed fire or burn**—the deliberate burning of wildland fuels in either their natural or their modified state and under specified environmental conditions, which allows the fire to be confined to a predetermined area and produces the fireline intensity and rate of spread required to attain planned resource management objectives.

**primary forest**—an original forest, usually containing large trees, that has not been significantly disturbed or influenced by human activity —*synonym* virgin forest.

**pulpwood**—roundwood, whole-tree chips, or wood residues that are used for the production of wood pulp

**real estate investment trust (REIT)**—a real estate company that offers common shares to the public. An REIT stock is similar to any other stock that represents ownership in an operating business but has two unique features: its primary business is managing groups of income-producing properties, and it must distribute most of its profits (90 percent) as dividends. By having REIT status, a company avoids corporate income tax. A regular corporation makes a profit and pays taxes on the entire profits, and then decides how to allocate its after-tax profits between dividends and reinvestment; a REIT simply distributes all or almost all of its profits and skips the taxation.

**roundwood**—a length of cut tree generally having a round cross section, such as a log or bolt.

**sawlog**—a log that meets minimum regional standards of diameter, length, and defect, intended for sawing.

**S corporation (S-corp)**—a corporation that elects not to be taxed as a corporation. Rather than directly paying federal income tax on its earnings, the S-corp (like

a partnership) passes along all its income or losses and other tax items to its shareholders. Contrary to C-corps, income is taxed only once, and timber capital gains income is taxed at a more favorable rate than it would be at the corporate level. S-corps have fewer shareholders than C-corps and provide a means for a family or small group of investors to maintain more direct control over the activities of a company.

**timber investment management organization**

**(TIMO)**—asset management companies that invest in timberland properties on behalf of pension funds, endowments, and foundations. TIMOs may also manage timber investments for wealthy families and individuals. They manage timberland as much for its potential real estate value as for its forestry returns.

**timberland**—land declared suitable for producing timber crops and not withdrawn from timber production by statute or administrative regulation —*note* the minimum level of productivity is often set at 20 cubic feet per acre per year (1.4 cubic meters per hectare per year).

**threatened species**—**1.** a plant or animal species likely to become endangered throughout all or a significant portion of its range within the foreseeable future. **2.** a plant or animal identified and defined in the Federal Register in accordance with the Endangered Species Act of 1976.

**wildland**—land other than that dedicated for other uses, such as agricultural, urban, mining, or parks.

**wildland fire use**—the management of naturally ignited wildland fires to accomplish specific prestated resource management objectives in predefined geographic areas outlined in fire management plans.

Note: Most of the definitions in this glossary are derived from Helms, J.A. 1998. *The Dictionary of Forestry*. Bethesda, MD: Society of American Foresters.

## Photo Credits

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