

Criterion 6

National Report on Sustainable Forests—2010

Maintenance and Enhancement of Long-Term Multiple Socioeconomic Benefits To Meet the Needs of Societies

What is this criterion and why is it important?

Although the first five criteria are centered in the environmental sphere of sustainability (with the exception of Criterion 2, which clearly overlaps the economic sphere), Criterion 6 is centered firmly in the economic sphere. As the sole criterion with an economic focus, it has more (20) indicators than any of the environmental criteria. Its first two subcategories reflect the basic economic breakdown of goods (e.g., wood products) and services (e.g., tourism). The investment subcategory provides indicators of society's attention to forest maintenance. The cultural subcategory includes the most social of the socioeconomic indicators, and the employment subcategory provides indicators of the forests' capacity to provide work, wages, and subsistence.

What has changed since 2003?

The data—Significant data changes have occurred since 2003, including (1) addition of new indicators with new data, particularly on environmental services, distribution of revenue, resilience of communities and importance of forests, (2) expansion of time trends related mostly to forest products and nonwood products, and (3) expansion of data on regional differences in amounts and trends for more indicators, including forest products, nonwood products, and recreation. Coverage for some data has changed because one time studies done for 2003 were not repeated the same way, for example updates of employment in forest based recreation in tourism for 2010 are for more limited categories of employment.

The indicators—The following table summarizes the revisions. Indicator reference numbers for 2003 and 2010 are provided to assist in comparisons with the previous report. A more detailed rationale for the revisions may be found at http://www.rinya.maff.go.jp/mpci/meetings/18_e.htm.

Criterion 6. Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies (1 of 2).

2003 Reference	2003 Indicator	Revision Action	2010 Reference	2010 Indicator
Production and Consumption				
29	Value and volume of wood and wood products production, including value added through downstream processing	Improve wording, restrict value added to secondary products	6.25	Value and volume of wood and wood products production, including primary and secondary processing
30	Value and quantities of production of nonwood forest products	Improve wording	6.26	Value of nonwood forest products produced or collected
			6.27	Revenue from forest-based environmental services
31	Supply and consumption of wood and wood products, including consumption per capita	Improve wording	6.28	Total and per capita consumption of wood and wood products in roundwood equivalents
32	Value of wood and nonwood products production as a percentage of GDP	DELETE		
34	Supply and consumption/use of nonwood products	Improve wording	6.29	Total and per capita consumption of nonwood forest products
		NEW	6.30	Value and volume in roundwood equivalents of exports and imports of wood products

Criterion 6. Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies (2 of 2).

2003 Reference	2003 Indicator	Revision Action	2010 Reference	2010 Indicator
		NEW	6.31	Value of exports and imports of nonwood products
		NEW	6.32	Exports as a share of wood and wood products production and imports as a share of wood and wood products consumption
33	Degree of recycling of forest products	Include percent of total consumption	6.33	Recovery or recycling of forest products as a percent of total forest products consumption
Investment in the Forest Sector				
38	Value of investment, including investment in forest growing, forest health management, planted forests, wood processing, recreation, and tourism	Include annual expenditure	6.34	Value of capital investment and annual expenditure in forest management, wood and nonwood product industries, forest-based environmental services, recreation, and tourism
39	Level of expenditure on research and development and on education	Confine to “forest-related” only	6.35	Annual investment and expenditure in forest-related research, extension and development, and education
40	Extension and use of new and improved technologies	DELETE		
41	Rates of return on investment Employment and community needs	DELETE		
44	Direct and indirect employment in the forest sector and the forest sector employment as a proportion of total employment	Improve wording	6.36	Employment in the forest products sector
45	Average wage rates and injury rates in major employment categories within the forest sector	Restrict to forest sector	6.37	Average wage rates, annual average income, and annual injury rates in major forest employment categories
46	The viability and adaptability to changing economic conditions of forest-dependent communities, including indigenous communities	Broaden context	6.38	The resilience of forest-dependent communities
47	Area and percent of forest land used for subsistence purposes	No change	6.39	Area and percent of forests used for subsistence purposes
			6.40	Distribution of revenues derived from forest management
Recreation and Tourism				
35	Area and percent of forest land managed for general recreation and tourism in relation to the total area of forest land	Improve wording	6.41	Area and percent of forests available and managed for public recreation and tourism
36	Number and type of facilities available for general recreation and tourism in relation to population and forest area	Merge to new 6.42		
37	Number of visitor days attributed to recreation and tourism in relation to population and forest area	Merge with above to new 6.42	6.42	Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available
	Cultural, social, and spiritual needs and values			
42	Area and percent of forest land managed in relation to the total area of forest land to protect the range of cultural, social, and spiritual needs and values	Improve wording	6.43	Area and percent of forests managed primarily to protect the range of cultural, social, and spiritual needs and values
43	Nonconsumptive use forest values	DELETE		
		NEW	6.44	The importance of forests to people

Indicator 6.25. Value and Volume of Wood and Wood Products Production, Including Primary and Secondary Processing

What is the indicator and why is it important?

The value and volume of wood and wood products indicates the relative importance of forests as a source of raw material for a wide variety of uses. Tracking the values and volumes of goods and services through the production process from the forest to the end of secondary processing explains a key dimension of the economic contribution that forests make to local and national economies.

What does the indicator show?

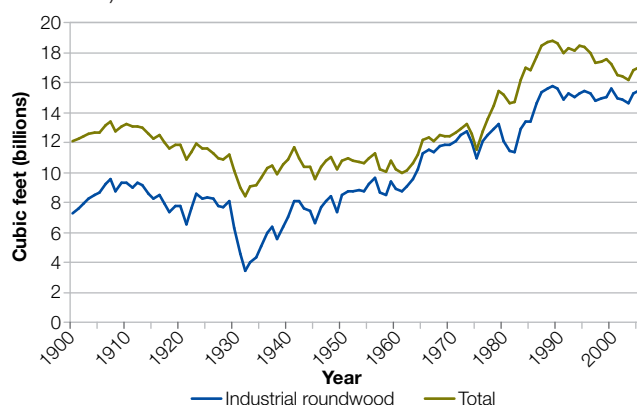
The volume of total roundwood harvest (including fuelwood) in the United States increased fairly steadily from about 10 billion cubic feet in the 1930s to 18.8 billion cubic feet in 1989. Since 1989, harvest has declined, reaching a level of 16.4 billion cubic feet in 2006 (fig. 25-1), a figure equivalent to about 25 percent of world harvest. Industrial roundwood production increased steadily between the mid-1930s and 1989 and has since been roughly constant.

The amount of primary wood and paper products produced in the United States increased relatively steadily from 82 million tons in 1950 to 203 million tons in 1999 and has since then declined to 191 in 2006 (fig. 25-2). In comparison, in 2006, the United States produced 9.5 million tons of steel and 142 million tons of Portland cement.

The decline since 1999 is due primarily to declines in production of pulp and paper, hardwood lumber and softwood plywood. These declines offset an increase of 29 percent in oriented strandboard (OSB) production. In 2006 the largest share of production, by weight, was for pulp and paper (51 percent) followed by softwood and laminated veneer lumber (LVL) (21 percent), hardwood lumber (10 percent), nonstructural panels (6 percent), OSB (5 percent), softwood plywood (4 percent) and other industrial products (3 percent) (fig. 25-2).

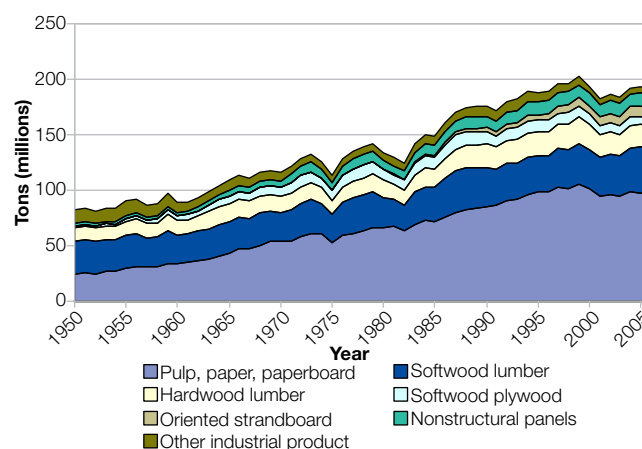
Wood energy use was 2.2 quadrillion BTUs (British Thermal Units) (Quad) in 2006 (roughly 2.4 percent of U.S. consumption), down from 2.7 Quad in 1983. Industrial use (primarily in forest products firms) was 1.5 Quadrillion in 2006 which is somewhat lower than highs in 1983 and 2000. Residential wood energy use has also declined but wood use for electric power has increased from 0.10 Quad in 1989 to 0.18 Quad in 2006 (fig 25-3). (see Indicator 24). Wood pellet fuel production increased from about 0.5 million tons (6 percent moisture content) (0.01 Quad) in 2003 to 1.8 million tons in 2008 (0.03 Quad). In 2008 about 20 percent of production was exported. Most domestic use was for residential heating.

Figure 25-1. Volume of U.S industrial roundwood and fuelwood production (harvest), 1900–2006 (billion cubic feet) (Total line includes industrial roundwood plus fuelwood).



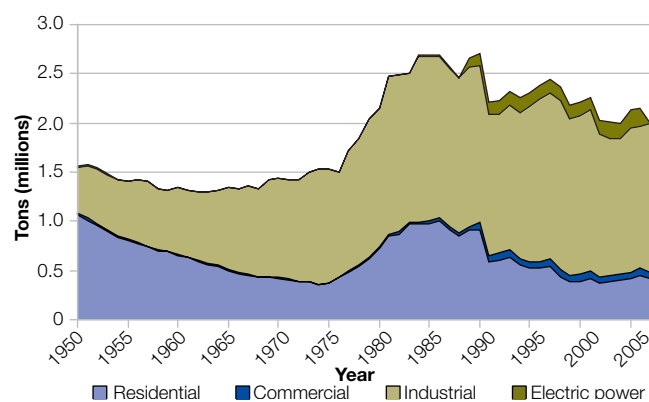
Source: USDA Forest Service

Figure 25-2. Weight of wood and paper products produced by product 1950–2006 (million tons).



Source: USDA Forest Service and other sources

Figure 25-3. Wood energy produced, by consumer, 1950–2006 (10^{15} BTUs).



Source: U.S. Department of Energy

Total value of shipments for wood, paper, and furniture industries, using SIC (Standard Industrial Classification) industry codes, increased between 1973 and 1996 from \$288 to \$356 billion (all values adjusted for inflation and presented in 2005 dollars). Between 1997 and 2006, using U.S. Census (NAICS (North American Industry Classification System)) industry codes, shipments decreased from \$322 billion to \$309 billion (fig. 25-4). The decrease was due to a 10 percent decline for paper industries. Furniture industries increased 13 percent and wood products industries were nearly constant.

What has changed since 2003?

The volume of roundwood harvest and total weight of primary products production remained relatively stable between 2000 and 2006, although the weight of production has increased for softwood lumber, OSB and miscellaneous products and declined for other primary products—pulp and paper, hardwood lumber, softwood plywood, and nonstructural panels.

The value of paper industry shipments decreased 12 percent between 2000 and 2006 from \$187 to \$165 billion, but values were stable between 2000 and 2006 for wood products and wood furniture shipments (fig. 25-4).

Are there important regional differences?

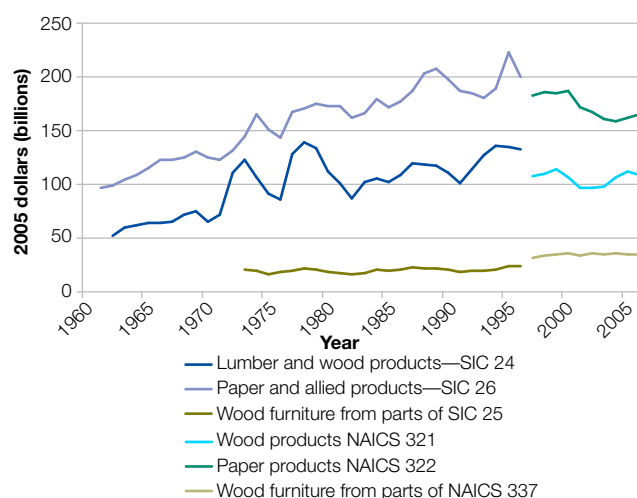
A marked increase in roundwood harvests occurred in the South along with concurrent reductions in the North and Pacific Coast Regions. Industrial roundwood harvest volume increased 80 percent in the South between 1970 and 2006, accounting for 62 percent of the United States total in 2006. In 2006, the North provided 18 percent of the roundwood harvest, followed by the Pacific Coast at 16 percent, and the Rocky Mountains at 3 percent. Harvest decreased between 1991 and 2006 in all regions except the South (fig. 25-5).

Percent changes in harvest are not fully reflected in the value of final product shipments, which have remained much more stable across the regions (fig. 25-6). Although the South had the largest volume of harvest in 2006, the value of shipments for the wood and paper industries was highest for the North, at \$108 billion, followed by the South, at \$104 billion. Value of shipments has declined since 1997 in the North, South and Pacific Coast, and has increased in the Rocky Mountain Region. State level data on the value of wood furniture production were not available but may alter these results.

Relation to other indicators

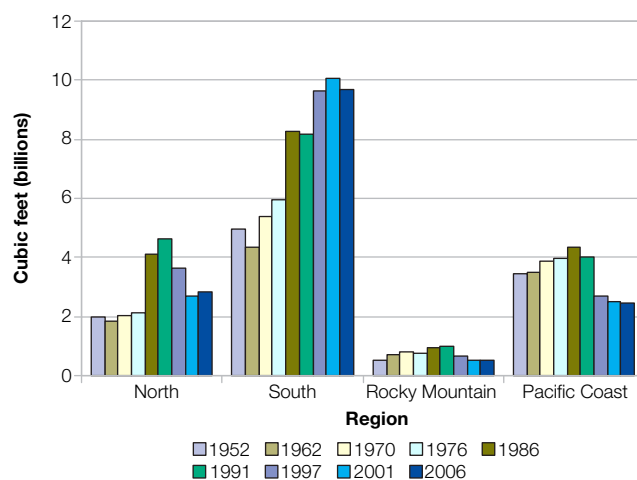
The level and trend in this indicator are factors in sustaining benefits from forests employment and wages (Indicators 6.36 and 6.37), distribution of revenues (Indicator 6.40), and community resiliency (Indicator 6.38). The level of wood and paper production is determined by the competitiveness of U.S. industries compared to foreign industries which, in turn, is influenced by capital investment in new technology (Indicator 6.34), by levels of research and education (Indicator 6.35), and by productivity of forests (Indicator 6.11).

Figure 25-4. Value of shipments for forest products industries by SIC (Standard Industrial Classification) code, 1961–1996, and by NAICS (North American Industry Classification System) code, 1997–2006 (billions of 2005 dollars) (each line is added to the line below).



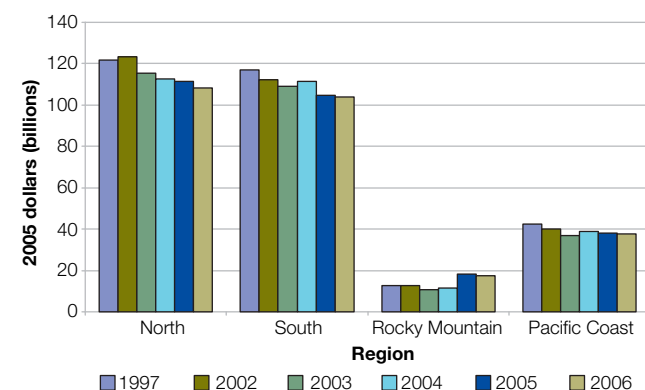
Source: U.S. Department of Commerce, Bureau of Census

Figure 25-5. Volume of all industrial roundwood harvested by region, 1952–2006 (billions of cubic feet).



Source: USDA Forest Service

Figure 25-6. Value of shipments in wood and paper products industries (NAICS 321, 322) by region (billions of 2005 dollars).



Source: U.S. Department of Commerce, Bureau of Census

Indicator 6.26. Value of Nonwood Forest Products Produced or Collected

What is the indicator and why is it important?

Nonwood forest products are items harvested or gathered from forests that are not traditional wood products. Nonwood forest products are important components of the economic value of forests and their collection and processing makes an important contribution to economic activity. Many of these products also are important to indigenous people and others for their contribution to cultural values and subsistence activities.

In this indicator we cover nontimber forest products (NTFP), which includes both (1) nonwood products that do not include the main stem of trees, and (2) selected secondary wood products—fuelwood, posts and poles, and Christmas trees that do include the main stem of trees. The secondary wood products are included because we estimate their value using the same methods as for nonwood products. We also include the value of game animals taken by hunting and trapping.

What does the indicator show?

The value of permit and contract sales of nontimber forest products (NTFP) from Forest Service and BLM land declined overall by about 30 percent between 1998 and 2007, from \$9.5 to \$6.5 million (all dollar figures adjusted for inflation and reported in 2005 dollars). Nonwood products decreased 18 percent and secondary wood products decreased 36 percent (table 26-1). These fluctuations are expected with products that fruit better in some years than others, such as fungi or pine nuts. The nonwood products value declined from \$2.6 to \$2.1 million and the secondary wood products value declined from \$6.9 to \$4.4 million.

Nonwood products include many plants, lichens, and fungi from forests, including understory species used in floral markets, for seasonal greenery, as wild foods, for medicinals, as plant extracts, and for transplants.

Secondary wood products include fuelwood, posts and poles, and Christmas trees. Production of these items is significant in many regions.

Although annual or regularly collected data on domestic production and prices for NTFPs are generally not available, permit and contract data from the Forest Service and the Bureau of Land Management (BLM) can serve as a benchmark to assess use and value for many NTFPs. Information about game animal and fur-bearer populations and harvest is collected by State and Federal agencies, but national information is not generally available for all species. Prices for many NTFPs in the United States are influenced by international supply and demand, by seasonal fluctuation in availability, and by rising domestic demand. Forest Service and BLM sales data are used to assess NTFP first point of sales value by several categories, including landscaping uses; crafts and floral uses; regeneration and silvicultural seeds and cones; edible fruits, fungi, nuts, and saps; grass, hay, and forage; herbs and medicinals; and for three categories of secondary wood products, including fuelwood, posts and poles, and Christmas trees.

Table 26-1. Receipts for wild-harvested nontimber resources from Forest Service and Bureau of Land Management permits and contracts, 1998–2007 (millions of 2005 dollars).

Product Category	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Landscaping	0.8	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2
Crafts/floral	1.1	0.9	0.7	1.0	1.2	1.1	1.0	0.8	0.8	1.2
Seed/cones	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Edible fruits, nuts, sap	0.5	0.3	0.4	0.5	0.4	0.4	0.5	0.4	0.3	0.4
Grass/forage	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2
Herbs, medicinals	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	2.6	2.1	1.8	2.2	2.4	2.2	2.1	1.8	1.6	2.1
Fuelwood	4.0	3.7	3.1	3.1	3.2	3.1	2.9	2.7	2.7	3.0
Posts and poles	0.9	0.7	0.7	0.4	0.3	0.4	0.3	0.3	0.3	0.2
Christmas trees	2.0	1.7	1.7	1.8	1.7	1.7	1.4	1.5	1.2	1.2
Total	9.5	8.1	7.3	7.5	7.7	7.5	6.8	6.3	5.8	6.5

It is possible to make a very rough estimate of total national wholesale value for those types of NTFPs that are provided from Forest Service and BLM land. First, assuming that the value per unit that the Forest Service and BLM receive is 10 percent of value per unit received at the first point of sales. Second, we assume that the Forest Service and the BLM provide particular proportions of total national production depending on the category. As a general guide about proportions we note that the national forest land constitutes about 20 percent of total forest land in the United States, and the BLM about 1.5 percent. Sometimes particular products are harvested more on Federal land than elsewhere, and sometimes less. The third step is to assume the first point-of-sale values are 40 percent of wholesale values. First point of sale value refers to the initial transaction by which a product enters the marketplace. It is comparable to farm values, which commonly run about 40 percent of wholesale value.

The resulting estimate in 2007 for national wholesale value of nonwood products produced was about \$232 million (down 19 percent since 1998) and for secondary wood products was about \$391 million (down 35 percent since 1998) for a total of about \$622 million (down 30 percent since 1998) (table 26-2).

These are very rough estimates, and actual values may be quite different. For example, alternate estimates of national first sale value for moss production value (part of the Crafts/ Floral category)

have ranged from \$6 million to \$165 million compared to our estimate of first sale value of about \$55 million for that entire Crafts/Floral category in 2007.

What has changed since 2003?

NTFP appraisal methods and monitoring of commercial harvesting have improved considerably on Forest Service land as a result of the Federal Pilot Program of Charges and Fees for Harvest of Forest Botanical Products established in 2000. The law defines botanical products as florals, mushrooms, and so on removed from Federal forests (excluding wood products), defines fair market value, and requires that permit fees be based on a determination of fair market value and sustainable harvest levels.

Why can't the entire indicator be reported at this time?

More complete data on sources and values of NTFPs are needed beyond those presented from the Forest Service and BLM. The assumptions used to expand those estimates to total wholesale value cannot be defended as a continuing means to make complete estimates on the level and trend for this indicator. Prominent data gaps include personal use of NTFPs, and production and value from private lands. No single source of data exists for NTFPs, nor is it expected that there ever will be. It is unclear how consistent or comparable data sources are in terms of value and scale.

Table 26-2. Estimated wholesale value of wild-harvested nontimber resources in the United States, assuming Forest Service and Bureau of Land Management sales receipts are 10 percent of first point of sales value; Forest Service sales represent approximately 20 to 30 percent and Bureau of Land Management sales represent approximately 2 to 15 percent of total supply; and first point of sales value is 40 percent of wholesale price (millions of 2005 dollars).

Product Category	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Landscaping	89	73	56	54	51	44	37	35	28	28
Crafts/floral	119	105	83	112	134	126	118	87	89	138
Seed/cones	6	2	5	5	12	6	3	5	3	3
Edible fruits, nuts, sap	56	38	41	56	47	49	58	46	35	42
Grass/forage	15	14	16	19	20	19	17	24	19	19
Herbs, medicinals	1	2	2	0	3	3	2	2	1	2
Subtotal	285	234	202	246	267	247	236	199	175	232
Fuelwood	397	367	306	312	323	310	294	271	273	302
Posts and poles	89	65	67	35	33	40	29	33	26	24
Christmas trees	114	94	96	102	97	96	80	82	66	65
Total	885	760	671	695	720	693	639	585	540	622

Indicator 6.27. Revenue From Forest-Based Environmental Services

What is the indicator and why is it important?

Although many studies estimate the value of environmental services to society, this indicator focuses on how much society is actually paying landowners for those services. These payments represent the financial incentives landowners actually face in managing their lands to enhance environmental services. Therefore, tracking the actual payments to landowners is essential for designing effective policies for environmental service production, improving forest policy and management decisionmaking, and for assessing the overall contribution of forests to economies and well-being. Note, however, that the results presented here are simply a measure of the amount of revenues landowners actually receive for producing environmental services rather than a measure of underlying values.

What does the indicator show?

The results presented here reflect incentive payments from Federal and State agencies, payments by developers to private wetland mitigation and conservation banks, sales of carbon offsets produced on U.S. forest lands in the voluntary carbon market, purchases of conservation easements by nongovernmental organizations, and payments for leases and entrance fees to hunt and view wildlife on private forest lands. Data were not available for Federal, State, and local tax incentives; water quality trading and watershed source protection; price premiums paid by consumers for sustainable harvested timber and wood products; and incentive payments by forest industry or forest professional associations. Therefore, these results should be considered a lower bound.

Payments for forest-based ecosystem services to U.S. landowners from all sources for which data are available totaled \$1.9 billion in 2007, with private sources accounting for \$1.5 billion (81 percent) and government agencies providing \$366 million

Table 27-1. Total payments for environmental services by source (in thousands of constant 2005 dollars).

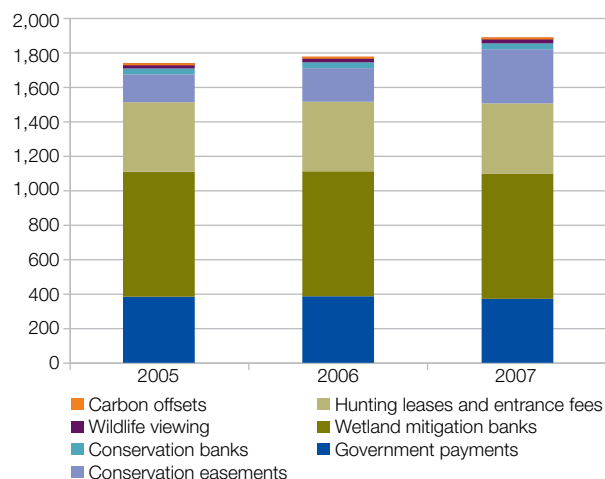
Payor	2005	2006	2007
Government payments	378	381	366
Wetland mitigation banks	727	727	727
Hunting leases and entrance fees	405	405	410
Conservation easements	162	195	315
Conservation banks	34	34	34
Wildlife viewing	31	32	34
Carbon offsets	0.6	1.6	1.7
	1,737	1,775	1,887

(19 percent) (table 27-1). In 2007, sales of forest wetland mitigation credits amounted to \$727 million, conservation bank credits were \$34 million, sales of carbon offsets were \$1.7 million, conservation easements were \$315 million, hunting leases and entrance fees were \$410 million, and wildlife viewing entrance fees were \$34 million. Wetland mitigation accounted for the largest percentage of forest-based ecosystem service payments, with 39 percent of all payments in 2007. These payments were received by only about 173 private forest mitigation banks, however, accounting for only a miniscule proportion of all private forest landowners in the United States. Hunting leases and entrance fees represented about 22 percent of all payments, conservation easements were 17 percent, wildlife viewing and conservation banks each accounted for 1.8 percent, and carbon offsets were 0.001 percent of all forest-based payments for environmental services in 2007.

What has changed since 2003?

This indicator is new for 2008 and, therefore, was not reported in 2003. We, however, report changes in payments for environmental services from 2005 to 2007. Figure 27-1 shows the change in payments made to landowners by category from 2005 to 2007. Available data for wetlands mitigation and conservation banking did not allow calculation of annual changes; average values were used for all 3 years. Government payments increased from \$378 million in 2005 to \$380 million in 2006, but then fell to \$365 million in 2007, resulting in an average annual decline of 1.6 percent. In contrast, payments by nongovernment sources grew from \$1.6 billion in 2005 to \$1.8 billion in 2007. Estimated payments for forest carbon offsets increased by an average of 99 percent annually, conservation easements were 47 percent, and hunting and wildlife viewing revenues were 5 percent, between 2005 and 2007.

Figure 27-1. Total payments by category (carbon offsets, wildlife viewing, and hunting) (millions of constant 2005 dollars).



Are there important regional differences?

Figure 27-3 shows the distribution of payments between States from all sources in 2007. Payments per State increased from an average of \$34 million (median equals \$19 million) in 2005 to \$38 million (median equals \$18 million) in 2007. Wide variation existed between States, however. In 2007, the States receiving the lowest total payments were Alaska (\$428,000), Hawaii (\$615,000), and North Dakota (\$0.95 million). The highest payments occurred in Georgia (\$173 million), Florida (\$158 million), and Louisiana (\$114 million).

These results differ, however, when accounting for the overall amount of forest land in each State. Figure 27-4 shows the total ecosystem service payments per acre of forest land for each State. Average payment per acre for all sources and all States was \$5.22, with a median of \$3.34 per acre of forest land. These payments were lowest in Alaska (\$0.003 per acre) followed by West Virginia (\$0.16 per acre) and Hawaii (\$0.32 per acre). The States with the highest revenues per acre of forest land were Illinois (\$23 per acre), Colorado (\$18 per acre), and Nebraska (\$19 per acre).

Why can't the entire indicator be reported at this time?

Lack of available data limits our ability for complete accounting. Many payments occur in one-off deals between public and private entities, for example, payments by municipalities and regional water authorities for watershed management and protection. Quantifying these requires a national survey, which is beyond the scope and budget of this effort. Data are not available to track tax incentives landowners receive (e.g., donations of conservation easements and local and State property taxes). In addition, we were not able to allocate payments to specific environmental services, because most of the available data does not specify which service was purchased.

Figure 27-2. Total payments by type of service between 2005–2007 (thousands of constant 2005 dollars).

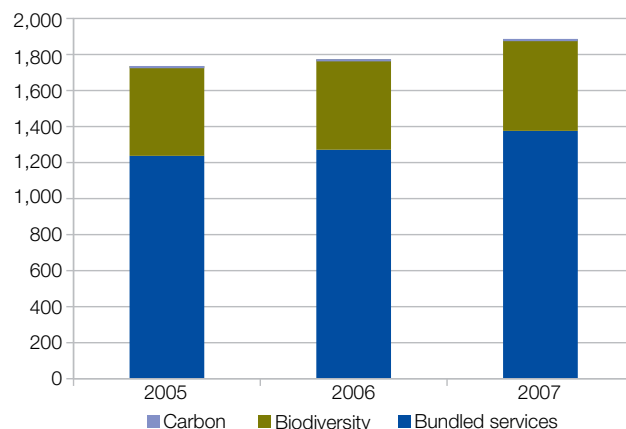


Figure 27-3. Total payments for environmental services in 2007 (thousands of constant 2005 dollars).

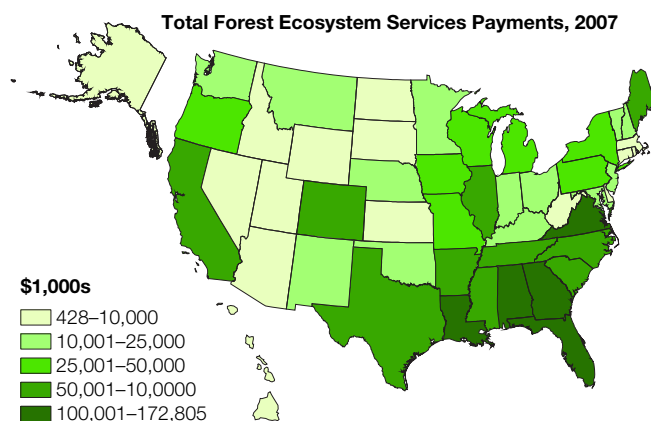
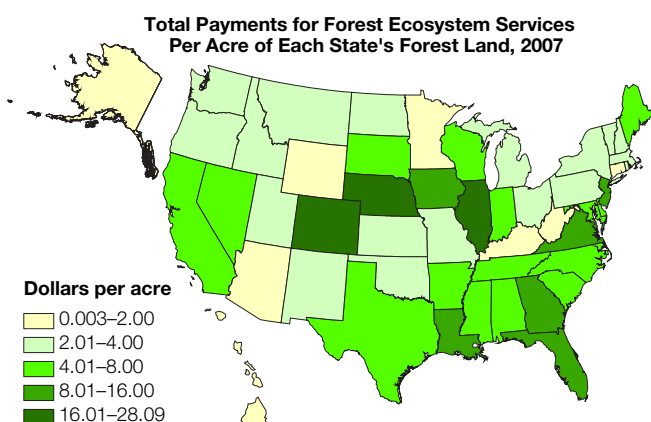


Figure 27-4. Total payments per acre of forested land in 2007 (constant 2005 dollars).



Indicator 6.28. Total and per Capita Consumption of Wood and Wood Products in Roundwood Equivalents

What is the indicator and why is it important?

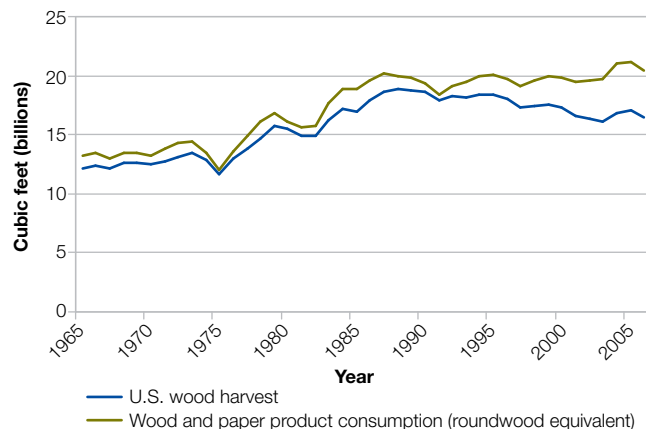
The quantity of wood and wood products consumed is an indicator of the relative importance of forests as a source of raw materials. Information on the consumption of forest products, especially when compared to production levels, helps to illustrate the balance between supply and demand. When demands for consumption are not balanced by supplies—net domestic production plus imports—the imbalance creates price pressures that often have repercussions in the forest sector or elsewhere in the economy and society that may call into question long-term forest sustainability.

Consumption per capita is an indication of the value people and businesses place on wood products, given their prices, prices of substitutes; their perceived use qualities; and environmental benefits and costs. It is also integrally linked to timber harvest and the many factors that influence it, including investment, management, regulation, and owner objectives. These, in turn, change timber productivity and ecosystem conditions in various regions. Harvest of wood for imports to the United States and export of U.S. products influences forestry and the forest industry in other countries.

What does the indicator show?

Total consumption of wood and paper products and fuelwood, in roundwood equivalents, increased between 1965 and 1988

Figure 28-1. U.S. wood production (harvest, including fuelwood) and wood and paper product consumption (including fuelwood), in roundwood equivalents, 1965–2006.



Source: USDA Forest Service

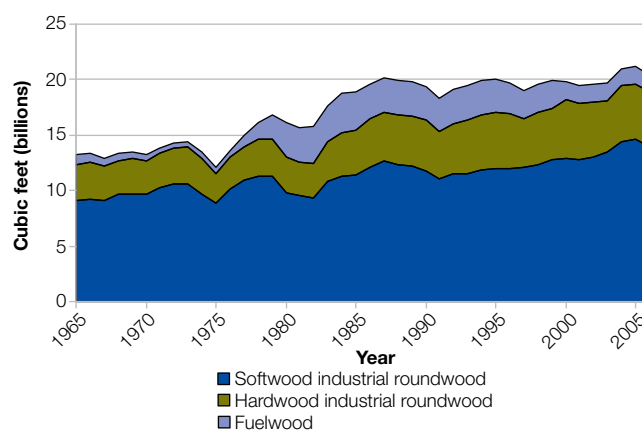
from 13.2 to 18.9 billion cubic feet. Since 1988, total consumption has been between 19 and 21 billion cubic feet per year (fig. 28-1). Although, over this same period, U.S. wood harvest declined.

Excluding fuelwood, wood and paper products consumption, in roundwood equivalents, increased steadily between 1965 and 2006, from 12.3 to 18.8 billion cubic feet (fig. 28-2). During this same period, use of softwood and hardwood roundwood increased 53 and 56 percent, respectively. Fuelwood consumption increased to a high of 3.6 billion cubic feet in 1984 and had declined to 1.6 billion cubic feet in 2006. Most of the increase in wood and paper products consumption occurred between 1965 and 1988. The rate of growth in consumption was significantly less between 1988 and 2006.

Per capita consumption of wood and paper products and fuelwood, in roundwood equivalents, increased between 1965 and 1987, from 68 to 83 cubic feet per year. From 1987 through 2006 per capita consumption has declined by 18 percent to 68 cubic feet per year (fig. 28-3).

Excluding fuelwood, per capita consumption of wood and paper products, in roundwood equivalents, has been relatively stable,—averaging 63 cubic feet per year. So, in roundwood equivalents, wood and paper products consumption has been increasing at roughly the pace of population (fig. 28-4). Fuelwood use per capita increased to 15.3 cubic feet in 1984 and has declined to 5.2 cubic feet in 2006. With increasing net imports to meet consumption needs, per capita harvest declined 28 percent between 1987 and 2006.

Figure 28-2. U.S. wood and paper product consumption—subdivided into softwood, hardwood, and fuelwood in roundwood equivalents—1965–2006 (each line is added to the line below).



Sources: USDA Forest Service; U.S. Department of Commerce, Bureau of Census

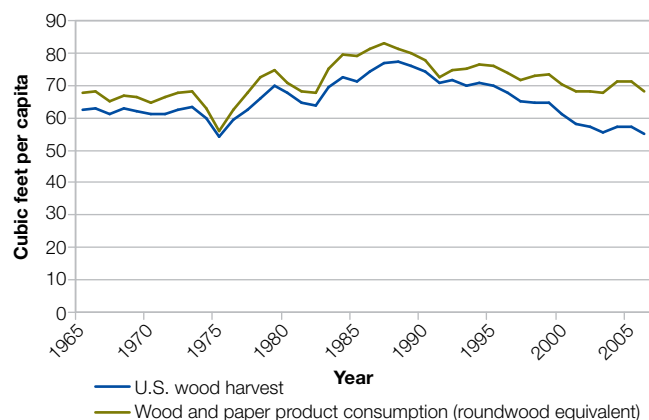
What has changed since 2003?

Trends have not changed markedly since 2003 despite 3 years of robust construction and economic growth in the United States. Total consumption of wood and paper products (including and excluding fuelwood) have continued to increase although at a slower rate. Per capita consumption of wood and paper products alone has remained at about 63 cubic feet. Per capita, and fuelwood consumption has continued to decline.

Are there important regional differences?

The data available for this report does not support the calculation of different rates of per capita consumption for different regions in the United States. Given an assumption of uniform per capita consumption rates, total regional consumption will depend directly on population, with the greatest consumption occurring in the populous east, followed by the South, the Pacific Coast, and lastly, by the Rocky Mountain Region, as shown in figure 28-5. In reality per capita use of wood and paper will vary by region. For example, use of wood for structures is higher in the northwest and lower for the southwest than the U.S. average.

Figure 28-3. Per capita wood production (harvest, including fuelwood) and wood and paper product consumption (including fuelwood) in roundwood equivalent, 1965–2006.

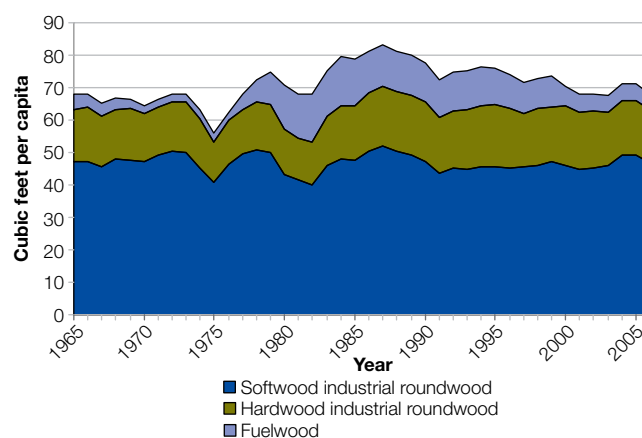


Sources: USDA Forest Service, U.S. Department of Commerce, Bureau of Census

Relation to other indicators

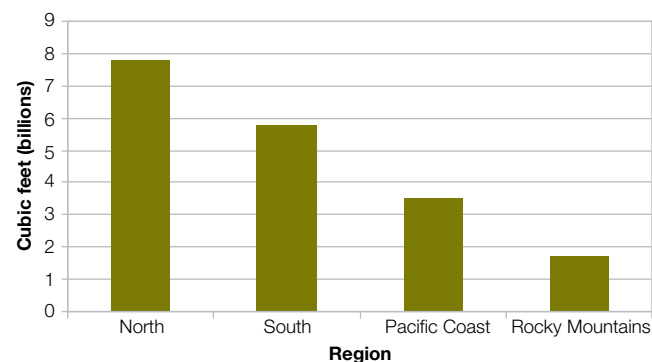
Data from this indicator are being constructed to be consistent with indicators on consumption (Indicator 6.31), recycling (Indicator 6.33), employment (Indicator 6.44), and injury rates (Indicator 6.45) by using consistent data sources and data categories to allow comparisons.

Figure 28-4. Per capita U.S. wood and paper product consumption—subdivided into softwood, hardwood, and fuelwood in roundwood equivalents—1965–2006 (each line is added to the line below).



Sources: USDA Forest Service; U.S. Department of Commerce, Bureau of Census

Figure 28-5. Estimated wood and paper products consumption by Resource Planning Act region assuming uniform per capita consumption, in roundwood equivalent, 2006.



Sources: USDA Forest Service, U.S. Department of Commerce, Bureau of Census

Indicator 6.29. Total and per Capita Consumption of Nonwood Forest Products

What is the indicator and why is it important?

Nonwood forest products are items harvested or gathered from forests that are not traditional wood products. The quantity of nonwood forest products consumed indicates the relative importance of forests as a source of products other than wood and wood products. Information on the consumption of nonwood forest products, especially when compared to sustainable production levels, helps to illustrate the balance between supply and demand. When consumption and available supplies are not balanced, price changes are likely to occur that cause economic effects in the forest sector or elsewhere in the economy. Estimates are provided for nontimber forest products and nonwood forest products. See definitions for these terms under Indicator 26.

The products considered in this indicator are the same as those presented in Indicator 26. They follow the same definition of nontimber forest products (NTFPs), including both nonwood products and selected secondary wood products.

Although annual or regularly collected data on domestic production and prices for NTFPs are generally not available, permit and contract data from the Forest Service and the Bureau of Land Management (BLM) can serve as a benchmark to assess use and value for many NTFPs. Nonwood forest products specifically included in U.S. export data generally have long traditions of international trade. There is also evidence of emerging significance in international trade of some crops from native species, such as American matsutake (mushrooms). For purposes of estimating consumption for this indicator, production data (Indicator 26) were adjusted by known trade (Indicator 31) and the result was assumed to be equivalent to consumption.

What does the indicator show?

From Indicator 26 we have estimates of wholesale value of production for nonwood products and for nontimber forest products. The estimate in 2007 for the national wholesale value of nonwood products produced was about \$232 million 2005 dollars, down 19 percent since 1998 (all values adjusted for inflation and presented in 2005 dollars). For secondary wood products (fuelwood, post and poles, and Christmas trees), it was about \$391 million (down 35 percent since 1998) for a total of about \$622 million (down 30 percent since 1998) (fig. 29-1).

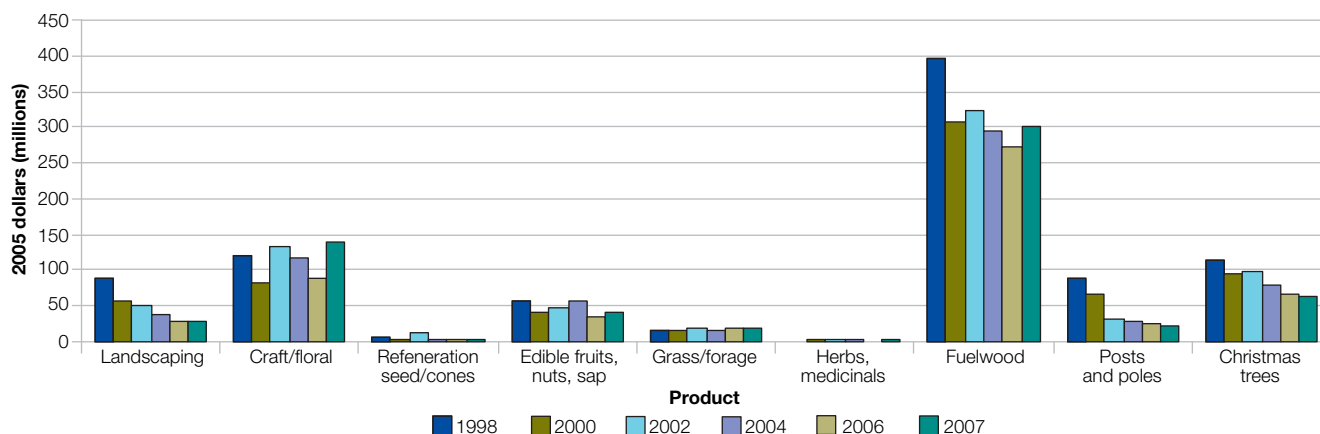
To estimate value of consumption we first estimate the value of net imports of selected nonwood and secondary wood products and then add these estimates to wholesale production estimates. We divide these consumption values by population to obtain the value of consumption per capita.

We obtained value of imports and exports for selected nonwood and secondary wood products using Harmonized Trade Data codes. It was assumed that these selected import and exports are representative of all nonwood forest product trade. This assumption is imperfect, because nonwood forest products may be included under many different trade codes, but it is not possible to split nonwood forest products out of all categories.

Under these assumptions we estimated that the United States is a net importer of nonwood forest products. Estimated net imports decreased between 2003 and 2007 from \$157 to \$113 million or 28 percent.

The net value of U.S. nonwood forest product trade (imports minus exports) is heavily influenced by vanilla, most of which is imported. Vanilla beans come primarily from Madagascar, and imports of vanilla beans from that country have dropped precipitously since cyclone Hudda in 2003 devastated Madagascar's vanilla-growing regions.

Figure 29-1. A rough estimate of national wholesale value for selected nontimber forest products, 1998–2007 (millions of 2005 dollars).



After adding net imports to production we estimate that total consumption of nonwood products decreased between 2003 and 2007 from \$404 to \$345 million or 15 percent (table 29-1). These consumption values should be considered a lower bound estimate as they do not include personal use, undocumented harvest, and certain products that cannot be differentiated in the trade data.

In 2007, the value of net imports of nonwood forest products was about 33 percent of consumption.

Per capita consumption of nonwood forest products has decreased between 2003 and 2007 from \$1.4 to \$1.1 per person (table 29-1).

If we add the net imports of nonwood products to production of all nontimber products, we find that total consumption has increased between 2003 and 2007 from \$748 to \$815 million; per capita consumption has increased from \$2.6 to \$2.7.

These consumption estimates are quite uncertain because error in any of a several assumptions could strongly influence the result.

Trade in nonwood forest products has been a small but regionally important part of the U.S. economy for generations. International trade in species native to North America is subject to many different influences, including globalization of labor markets, movement of processing to countries with competitive advantages, and changes in taste and style. International trade in nonwood forest products, in turn, influences sustainable forest practices, or the lack thereof, throughout the world.

What has changed since 2003?

NTFP appraisal methods and monitoring of commercial harvesting have improved considerably on Forest Service lands as a result of the Federal Pilot Program of Charges and Fees for Harvest of Forest Botanical Products, established in 2000. The law defines botanical products as florals, mushrooms, and so on removed from Federal forests (excluding wood products), defines fair market value, and requires that permit fees be based on a determination of fair market value and sustainable harvest levels.

Why can't the entire indicator be reported at this time?

See data limitations noted for Indicator 26. Results do not include consumption for personal use. Regional or national data on both harvest and price of nontimber forest products is not available, other than ginseng.

Indicator 6.30. Value and Volume in Roundwood Equivalents of Exports and Imports of Wood Products

What is the indicator and why is it important?

For many countries, international trade is a significant factor in the commercial use of forests. Exports are, in some cases, a significant source of value for regional and national economies. Imports may either supplement or be a substitute for production from domestic sources. The values and volumes of wood product exports and imports are important because of the increasing importance of global markets in determining economic developments in our domestic forest sector and in influencing the sustainability of forest ecosystems both domestically and throughout the world.

What does the indicator show?

Between 1990 and 2006 the overall value of forest products imports increased 73 percent—from \$24 to \$41 billion (all dollar values adjusted for inflation and reported in 2005 dollars), but increases have been small since 1999. At the same time, the value of exports increased 15 percent—from \$20 to \$24 billion with most of the increase occurring in the early 1990s and subsequent declines in more recent years (figs. 30-1 and 30-2). In 2006, import value was about 71 percent higher than export value. A factor influencing the competitive position of U.S. products versus those in other countries (and trends in imports and exports) is the trend in the value of the U.S. dollar relative to other currencies.

Table 29-1. Total wholesale value of consumption and per capita consumption of nonwood (not including secondary wood products) and nontimber forest products (including selected secondary wood products), adjusted for trade, (millions of 2005 dollars).

	2003	2004	2005	2006	2007
Nonwood forest products consumption	404	396	270	301	345
Nontimber forest products consumption (includes nonwood products)	748	746	656	701	815
U.S. population in millions	290	293	296	299	302
Nonwood forest products consumption per capita	1.4	1.4	0.9	1.0	1.1
Nontimber forest products (includes nonwood products) consumption per capita	2.6	2.5	2.2	2.3	2.7

Import value for all groups of forest products increased between 1990 and 1999. Since 1999, the value of imports of wood and paper products has not increased, and the import value in the other wood and log and chip categories have continued to rise (though the log and chip import value is extremely small relative to the other categories).

Wood products include lumber, veneer, and panels. Other wood includes poles and piling, fuelwood, wood charcoal, cork, wood containers, wood doors, and other miscellaneous products. Paper products include paper, paperboard, pulp, and recovered paper.

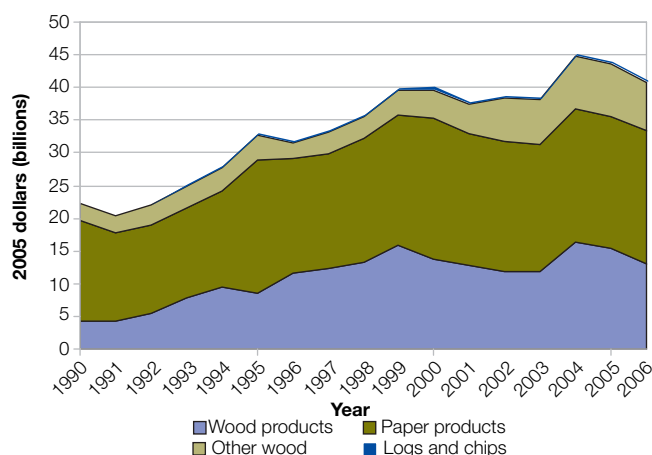
In 2006, the largest share of import value was for paper products (49 percent), followed by wood products (32 percent), other wood products (18 percent), and logs and chips (1 percent).

Export value increased a small amount overall between 1990 and 2006. The export value for paper and other wood increased modestly during the first half of the 1990s but has remained steady since then. In contrast, the export value for both wood products and logs and chips declined steadily between 1990 and 2006. (fig. 30-2)

We now shift to data on imports and exports in terms of **roundwood equivalent**—the amount of wood needed to make various products. These estimates do not include roundwood equivalent of imports and exports of recovered paper.

Between 1990 and 2006, overall imports increased 67 percent—from 2.6 to 4.3 billion cubic feet, and exports decreased 53 percent—from 1.8 to 0.8 billion cubic feet. Note that export volume has decreased and export value has increased. In 2006, import volume is more than 400 percent larger than export volume (figs. 30-3 and 30-4). This margin is much greater than the margin of import value over export value.

Figure 30-1. Value of forest products imports by product group, 1990–2006 (2005 dollars) (each lines value is added to the line below).



Source: U.S. Department of Commerce, Bureau of Census.

Import volume increased for all forest product groups between 1990 and 2005, and declined for all groups in 2005 and 2006 (fig. 30-3). The strong increase in volume through 2004 is in contrast to the limited increase in import value during the same period.

The product groups used when estimating roundwood equivalent of imports and exports are lumber, plywood, and veneer, pulpwood based products (including OSB) and logs and chips.

In 2006, the largest share of import volume—in roundwood equivalent—was for lumber (76 percent), followed by pulpwood based products (18 percent), plywood and veneer (4 percent) and logs and chips (2 percent). The actual shares of product volume imported are lower for lumber and plywood because about one-half of the roundwood used to make these products would be left in the exporting country.

Export volume declined for all product groups between 1990 and 2006. Exports of lumber, plywood and veneer, and logs and chips all decreased by more than 65 percent and pulpwood based products decreased 1 percent. These declines occurred after increases from 1965 to 1990 (fig. 30-4).

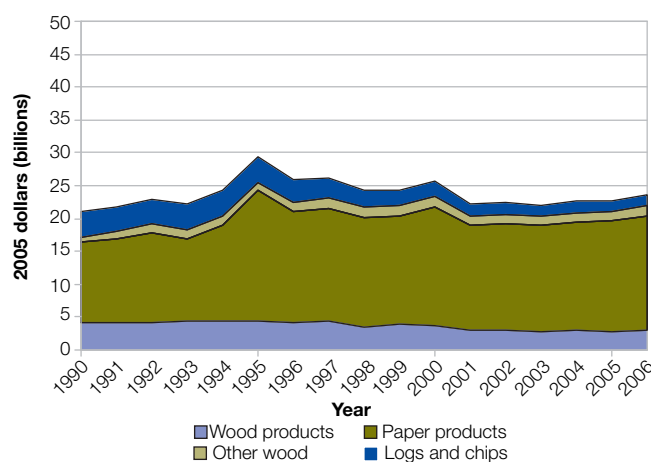
What has changed since 2003?

Trends in imports and exports evident before 2003 have continued. Import value is stable to higher, export value is level to declining, import volume is higher, and export volume is trending lower.

Are there important regional differences?

In 2005, the largest share of export value of forest products (fig. 30-5) was from the South (44 percent), followed by the North (31 percent), Pacific Northwest (13 percent), and other West (12 percent).

Figure 30-2. Value of forest products exports by product group, 1990–2006 (2005 dollars) (each lines value is added to the line below).



Source: U.S. Department of Commerce, Bureau of Census.

Figure 30-3. Imports of forest products in roundwood equivalent (excluding pulp and recovered paper), 1965–2006 (each line's value is added to the one below).

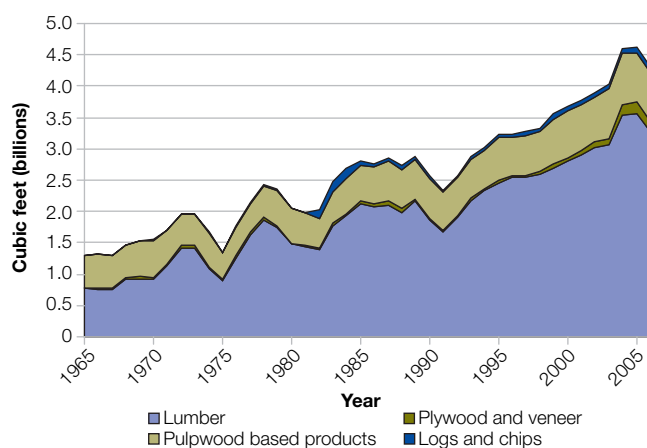


Figure 30-4. Exports of forest products in roundwood equivalent (excluding pulp and recovered paper), 1965–2006 (each line is added to the one below).

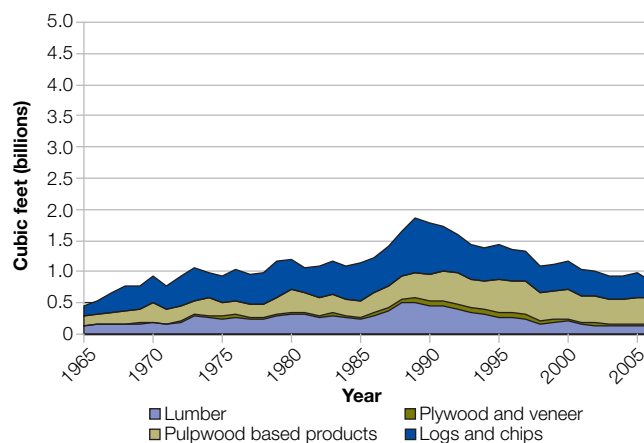
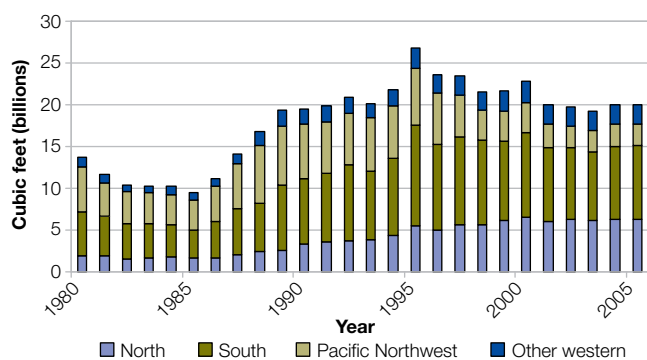


Figure 30-5. Value of forest products exports by region of customs districts, 1980–2005 (2005 dollars).



Between 1990 and 2005:

- Value for the North increased then stabilized above \$6 billion (2005 dollars) after 1999,
- Value for the South peaked in 1995 and has since declined,
- Value for the Pacific Northwest declined steadily, and
- Value for the other West increased until about 1997 then stabilized at above \$2 billion (2005 dollars).

Relation to other indicators

The levels and trends in this indicator are factors in sustaining benefits from forests—employment and wages (Indicators 6.36 and 6.37), distribution of revenues (Indicator 6.40), and community resiliency (Indicator 6.38). Exports and imports also influence level of harvest (Indicator 2.13). The level of exports and imports are determined by the competitiveness of U.S. industries compared to foreign industries which, in turn, is

influenced by capital investment in new technology (Indicator 6.34), research and education (Indicator 6.35), and productivity of forests (Indicator 2.11).

Indicator 6.31. Value of Exports and Imports of Nonwood Products

What is the indicator and why is it important?

For many countries, international trade is a significant factor in commercial use of forests. Exports are, in some cases, a significant source of value for regional and national economies. Imports may either supplement or be a substitute for production from domestic sources. The values and volumes of wood product exports and imports are important because of the increasing importance of global markets in determining prices in domestic markets, the sustainable use of domestic resources, and the profitability of domestic industries.

What does the indicator show, and what has changed since 2003?

The value of 12 types of exported nonwood forest products (fig. 31-1) increased from \$332 to \$457 million between 2003 and 2007 (all values adjusted for inflation and reported in 2005 dollars). The value of imports of the same products decreased from \$757 to \$650 million between 2003 and 2007. Export values may be underestimated as discussed below.

The nonwood forest products included in U.S. export data have long traditions of trade. Products that have become important in export markets recently include wild edible fungi, mosses, and lichens. For some species a distinction in data exists between wild and cultivated species. Pecans and cranberries are mostly

cultivated. Blueberries and ginseng maintain separate trade markets for wild and cultivated crops, with the wild crop being smaller and more valuable per unit of production. Some exports such as American matsutake (*Tricholoma magnivelare*), appear to arise more from international demand than from U.S. marketing efforts.

All internationally traded goods are classified with a six-digit Harmonized Trade Code (HTC) number. Each Nation can then add four additional digits to track goods that are of special interest to that country. National export data can be used to help assess domestic harvest and total trade for products where little other data are available.

For some products additional local export data exist that differ notably from national export data. The harvest and trade figures for moss are a case in point. For moss harvests from the Pacific Northwest and the Appalachian regions there is a difference between moss harvests reflected in land management agency permit data, and national moss and lichen export data. The Forest Service and Bureau of Land Management issued permits for moss from 1997 to 2002 that averaged about 100,442 air-dry kg per year, with average annual permit revenues of about \$19,650. An examination of export permit data from 1998 to 2003 showed 4.6 to 18.4 million air-dry kg per year were exported, with a value between \$6 and \$165 million per year. These values are considerably higher than the national export values of \$4.2 million for 2003 and \$0.8 million for 2007. In fact, the upper bound of the export value estimate (\$165 million) would place moss at the top of the list of export earners as opposed to the relatively minor position it holds in the current export statistics.

The discrepancies and range in the estimates illustrate how little is known about the moss trade. Policymakers and land managers lack critical information about inventories and

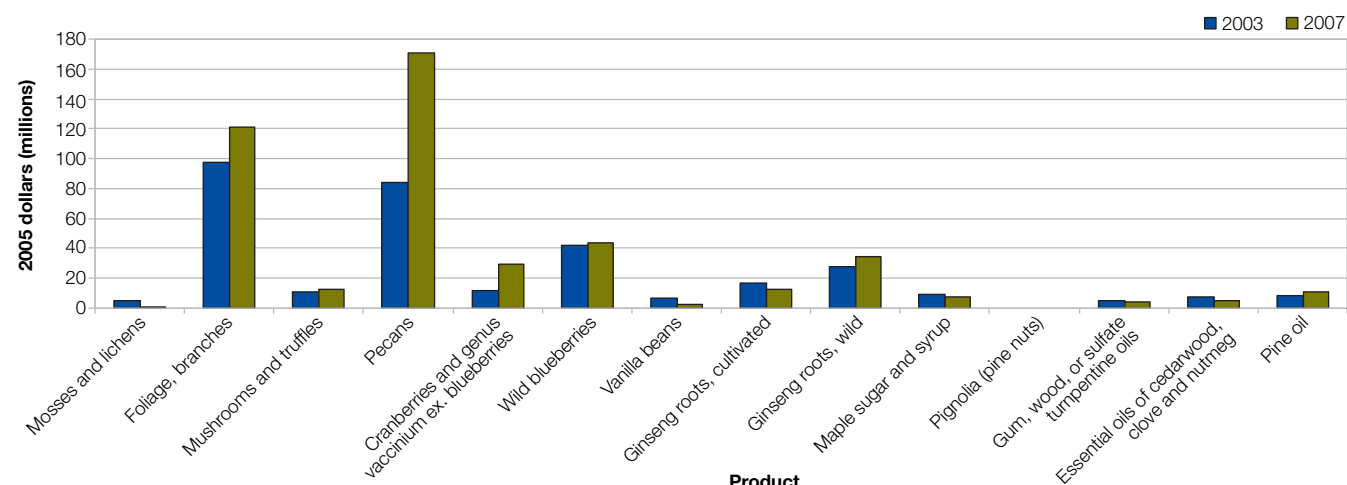
response to disturbances on which to base resource management decisions. This lack of knowledge has been noted about other wild-harvested nonwood products traded in commercial markets, such as floral greens and mushrooms.

Figures 31-1 and 31-2 show the value of nonwood forest products exported from and imported to the U.S. exports listed in this report focus on nonwood products from species native to North America. Included are native species growing wild in forests, forest openings, and woodlands, products from select native species grown agriculturally, and select products from native species growing in nonforest environments, whether wild or domesticated. Some trade codes are so broad that it is impossible to describe trade in specific species. For example, fresh foliage and branches (HTC 0604.91.0000) covers many species, wild and domesticated, from forests and agricultural lands. Some codes may include products that are grown in agroforestry environments, intentionally sown but allowed to grow in wild simulated environments, such as wild ginseng (HTC 1211.20.0040). A few codes are exclusive to wild-harvested nonwood forest products, such as fresh wild blueberries (HTC 0810.40.0024).

The U.S. mushroom trade data since 2002 has split out the most commonly domesticated mushrooms, including the white button mushroom common in grocery stores (*Agaricus* spp.), wood ears (*Auricularia* spp.), and jelly fungus (*Tremella* spp.). Mushroom trade data in Figures 31-1 and 31-2 do not include these domesticated species, and can be assumed to be highly influenced by amounts of wild-harvested fungi such as morels (*Morchella* spp.), chanterelles (*Cantharellus* spp.), American matsutake (*Tricholoma magnivelare*), and various truffle species.

The top four exported nonwood forest products, in both 2003 and in 2007 were (1) pecans, (2) foliage and branches, (3) wild blueberries, and (4) wild ginseng. Values for all four increased from 2003 to 2007.

Figure 31-1. Value of exports of selected nonwood forest products, 2003 and 2007 (millions of 2005 dollars).



Sources: U.S. Department of Commerce, Bureau of Census

The top four imported nonwood forest products in 2003 were (1) vanilla beans, (2) pecans, (3) maple syrup products, and (4) foliage and branches. The top four imports in 2007 were (1) pecans, (2) maple syrup products, (3) wild blueberries, and (4) foliage and branches. Vanilla beans come primarily from Madagascar, and imports from that country dropped precipitously since cyclone Hudda in 2003 devastated Madagascar's vanilla-growing regions. Imports for the other top imports increased between 2003 and 2007.

Commerce in nonwood forest products has been small but regionally important for the U.S. economy for generations. International trade in species native to North America are influenced by a number of factors, including globalization of labor markets, movement of processing to countries with competitive advantages in processing, and changes in taste and style. When one country experiences an event that puts it at a disadvantage, such as the cyclone in 2003 that affected Madagascar's vanilla bean growing areas, other regions or countries will hurry to fill the gap, particularly if prices rise because of the shortage. International trade in nonwood forest products likewise help determine sustainable forest practices. Trade information must be used along with other data, such as estimates of domestic consumption, to assess effects on regions or countries.

Indicator 6.32. Exports as a share of wood and wood products production and imports as a share of wood and wood products consumption

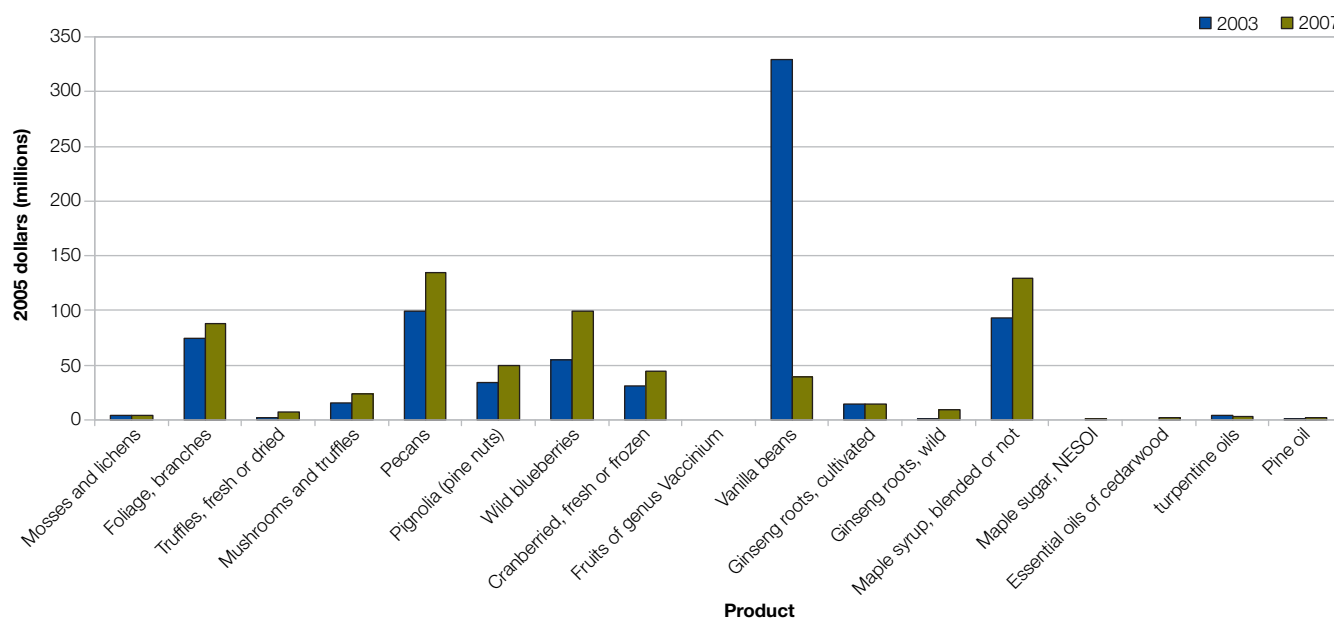
What is the indicator and why is it important?

This indicator provides information on the relative importance of international trade in wood and wood products to domestic production and consumption. This indicator is used to evaluate the role of trade in the forest sector and thereby its effect on forest sustainability across social, economic, and ecological dimensions.

What does the indicator show?

The United States has become progressively more reliant on imports to meet consumption needs. In terms of roundwood equivalents, imports of wood and paper products as a share of consumption increased from 13 to 30 percent between 1965 and 2005. During this same period there was initially a concurrent trend toward increasing exports as a share of production, which reached a high in 1991, but these exports have since declined. Exports as a share of production increased from 5 percent in 1965 to a high of 16 percent in 1991 then decreased to 10 percent in 2006 (fig. 32-1).

Figure 31-2. Value of imports of selected nonwood forest products, 2003 and 2007 (millions of 2005 dollars).



Sources: U.S. Department of Commerce, Bureau of Census

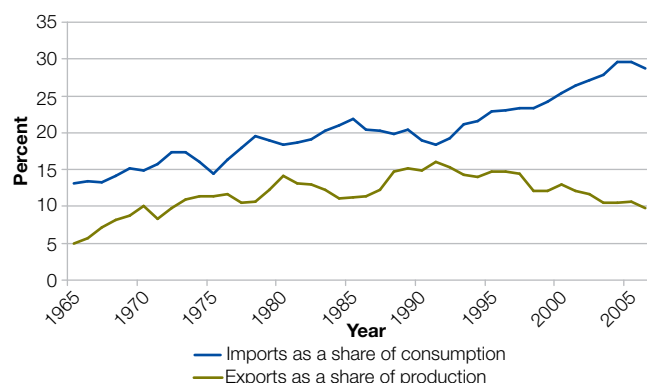
The sustained increase of the overall import share to the historically high level of 30 percent is due largely to growth in the softwood lumber import share, which reached a level of 38 percent in 2006. The overall import share is up from 15 percent in 1965. The import share for other products was relatively stable between 1965 and the 1990s, but has since also increased (figs. 32-2 and 32-3).

The trend in overall export share of production, an increase then a decline, is because of initial increases and subsequent declines for softwood lumber, softwood plywood, and paper and paperboard. For hardwood lumber the share has continued to increase, and for pulp the share increased then leveled off after the mid-1990s. (figs. 32-4 and 32-5).

What has changed since 2003?

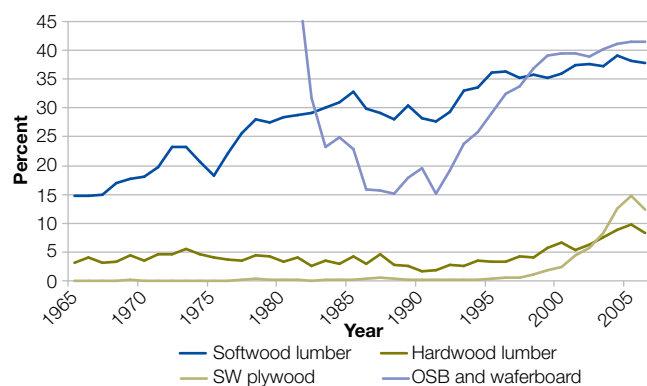
The overall trends in import share (increasing) and export share (decreasing) that appeared before 2003 have continued through 2006.

Figure 32-1. Wood and paper products imports as a share of consumption, and exports as a share of production, 1965–2006 (on volume basis in roundwood equivalents).



Source: USDA Forest Service

Figure 32-2. Wood products imports as a share of consumption, 1965–2006 (cubic units imported per cubic unit consumed).



Source: USDA Forest Service

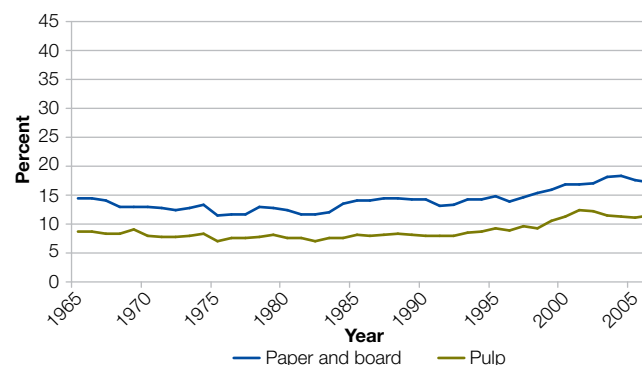
Are there important regional differences?

Data are not available for interstate imports and exports for U.S. regions, so import and export shares cannot be provided by U.S. regions. It is possible, however, to roughly estimate which regions are net importers of wood and paper products, in roundwood equivalent, if we assume that consumption per capita is uniform across regions. In terms of roundwood equivalent, of the four Resource Planning Act (RPA) Regions, only the U.S. South is a net exporter of wood and paper products (fig. 32-6).

Why can't the entire indicator be reported at this time?

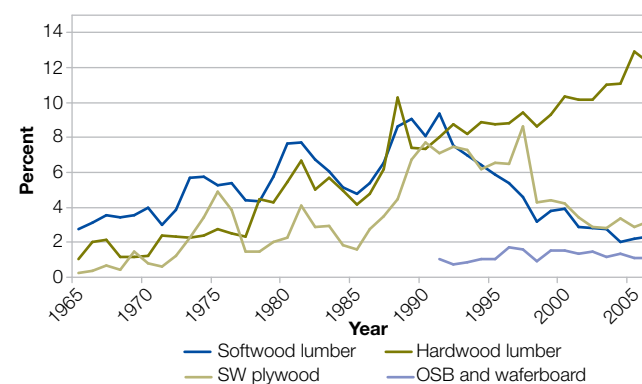
It is not clear if data on value of wood and paper industry shipments covers the same range of products as the value of wood and paper imports and exports, so import and export shares on a value basis have not been provided.

Figure 32-3. Pulp, paper, and board imports as a share of consumption, 1965–2006 (tons imported per ton consumed).



Source: USDA Forest Service

Figure 32-4. Wood products exports as a share of production, 1965–2006 (cubic units exported per cubic unit produced).

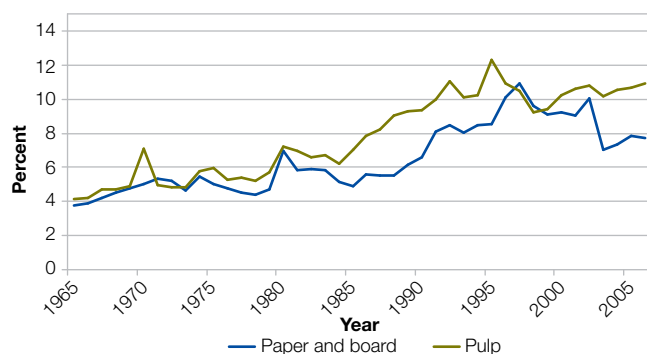


Source: USDA Forest Service

Relation to other indicators

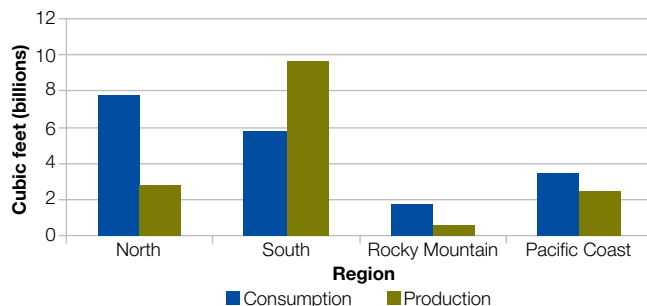
The level and trend in wood and paper export share of consumption are a key factor in sustaining certain benefits from forests—benefits of employment and wages (Indicators 6.36 and 6.37), benefits in revenue to various groups (Indicator 6.40), and contribution to community resiliency (Indicator 6.38). Level and trend in import share of production also has an influence on the same indicators but in a direction opposite from export share. For example—for a given level on wood products consumption in the United States increased export share would increase employment and wages and increase import share would decrease employment and wages. The level of export and import shares are determined by the competitiveness of U.S. industries in relation to foreign industries which, in turn, is influenced—in the long run—by the level capital investment in new technology (Indicator 6.34), by levels of research and education in the United States (Indicator 6.35), and by the productivity of U.S. forests (Indicator 6.11).

Figure 32-5. Paper and paperboard, and pulp exports as a share of production, 1965–2006 (tons exported per ton produced).



Source: USDA Forest Service

Figure 32-6. Wood and paper products consumption and production by region in roundwood equivalents, 2006 (billions of cubic feet) (Regional consumption is estimated by assuming national per capita consumption of 63.5 cubic feet is uniform across regions).



Source: USDA Forest Service

Indicator 6.33. Recovery or recycling of forest products as a percent of total forest products consumption

What is the indicator and why is it important?

This indicator identifies the extent to which forest products are recycled or reused and provides a measure of the national efficiency of forest products usage. Recovered products are an important raw material for many forest products industries and some industries outside the wood products sector. Recycling forest products reduces the quantity of waste deposited in land fills or incinerated and enables a country to increase consumption of wood products without an increase in timber harvesting. With increased recycling and stable exports timber harvest and timber prices would decrease.

Key sources of post-consumer wood and paper materials that are recovered for reuse in products include paper and paperboard, wood pallets, construction waste, demolition waste, and wood and paper in municipal solid waste. For this indicator recovered amounts do not include amounts of waste wood and paper that are used for energy.

Two basic measures are used for this indicator:

- The recovery rate is the amount of wood or paper recovered for reuse in products (includes exports) divided by the amount of source products consumed in a year.
- The utilization rate is the amount of wood or paper recovered divided by the amount of products produced in a year.

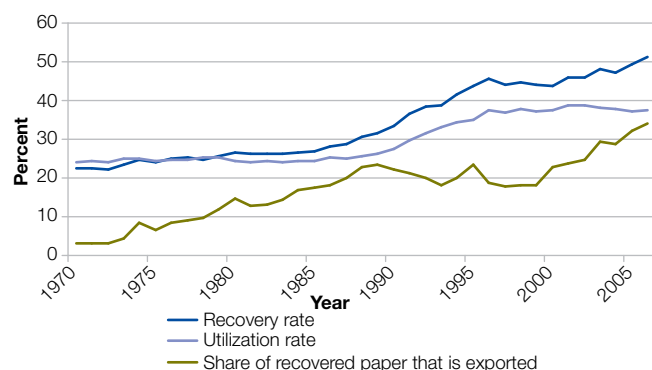
The utilization rate indicates the degree to which use of recovered wood or paper holds down or substitutes for use of virgin wood in U.S. production of wood and paper products.

What does the indicator show?

The recovered paper utilization rate increased from 22 to 38 percent between 1970 and 1996, but then stabilized at 37 to 38 percent between 1996 and 2006 (fig. 33-1). In contrast the recovery rate for paper and paperboard increased from 22 percent in 1970 to 45 percent in 1999 and then continued to rise to 51 percent in 2006. In the past decade, the recovery rate has continued to increase although the utilization rate has leveled off because almost all the increase in recovery since 1996 has gone to exports. Exports of recovered paper increased from 3 percent in 1970 to 18 percent and then nearly doubled since 1999, rising to 34 percent in 2006. For the purpose of comparison, in 1999 the total consumption of paper and paper products by all developed countries was 252 million tons annually, and their average recovery rate was 43 percent.

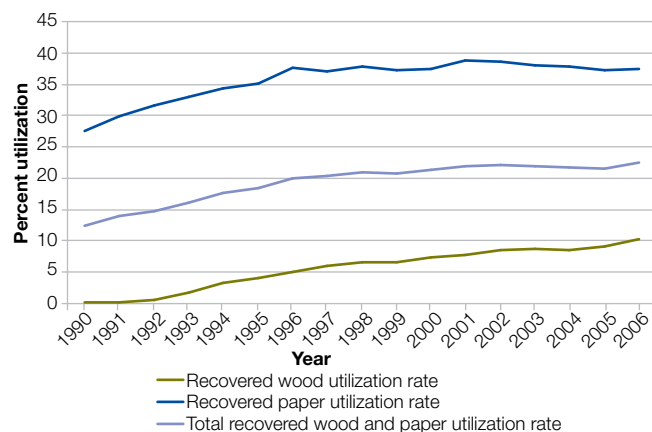
The utilization rate of recovered wood products (for reuse as wood products) is uncertain because of incomplete data. We estimate the amount of recovered wood that is reused for products to include all recycled wood pallets and one-half of the wood recovered from municipal solid waste. We further assume that: (1) the other half of wood from municipal solid waste (MSW) is used for fuel or uses that do not displace wood products use; (2) wood recovered from demolition and construction sites goes for uses (e.g., fuel or mulch) that do not displace wood products use; (3) the amounts of wood recycled via deconstruction are still small; and (4) recovered amounts are all used in the United States with no exports. With these assumptions the estimated recovered wood utilization rate has increased from an insignificant amount in 1990 to 10 percent in 2006 (fig. 33-2). The recovered wood utilization rate for wood pallets alone has increased from 2 percent in 1993 to 34 percent in 2000 and 38 percent in 2006.

Figure 33-1. Paper and paperboard recovery rate, utilization rate, and share of recovered paper that is exported, 1970–2006.



Sources: USDA Forest Service and American Forest and Paper Association

Figure 33-2. Recovered wood and paper utilization rates, separately and combined, 1990–2006.



Sources: USDA Forest Service and American Forest and Paper Association

What has changed since 2003?

U.S. recovery of paper is has increased from 45 percent in 1999 to 51 percent in 2006 with virtually all of the increasing recovery share going for exports.

Are there important regional differences?

Total U.S. recovered paper consumed at U.S. mills increased by 2 percent between 2003 and 2006, from 33.7 to 34.5 million tons. Industry reported data indicate recovered paper consumption increased in mills in every region except the North. In 2006 the South had the highest recovered paper consumption (15.4 million tons) but the lowest recovered paper utilization rate (29 percent). The next highest level of consumption was in the North (13.4 million tons) where the utilization rate was (50 percent), followed by the Pacific Coast (4.8 million tons and a 49 percent utilization rate) and the Rocky Mountains (1.2 million tons, where utilization rate was highest [59 percent]) (fig. 33-3).

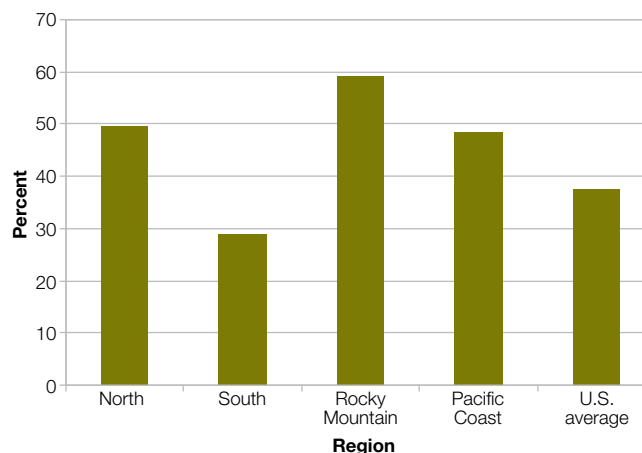
Why can't the entire indicator be reported at this time?

Data are not available on the amount of wood reused for products from demolition and construction sites and from deconstruction of building. We have assumed amounts are currently small. Value of recovered material, except for grades of recovered paper, are not available on a national scale.

Relation to other indicators

The recycling rates (utilization rates) for wood and paper influence the amounts and kinds of wood that is harvested in the United States (Indicator 2.13) and the effect of the harvest

Figure 33-3. Recovered paper utilization rate by region, 2006.



Sources: USDA Forest Service and American Forest and Paper Association

treatments on forest growth (Indicator 2.11). To the extent that recycling decreases harvest jobs, income, and revenue to landowners is affected (Indicator 6.36, 6.37, and 6.40). These rates also influence the amounts of carbon stored in forests (Indicator 5.22), the length of time carbon is stored in products (Indicator 5.23), and the energy that is obtained by burning post-consumer wood and paper (Indicator 5.24). The degree to which recovered paper is recycled in the United States rather than being exported depends on price competitiveness. This competitiveness is determined in part by the amount of U.S. investment in capital (Indicator 6.34) and in research and education (Indicator 6.35).

Indicator 6.34. Value of capital investment and annual expenditure in forest management, wood and nonwood product industries, forest-based environmental services, recreation, and tourism

What is the indicator and why is it important?

This indicator measures investments made to maintain and enhance the ability of forests to produce goods and services for the benefit of a Nation's economy and people. Sustainable forest management is not possible in the long run without regular investments. When capacities to protect, manage, and use forests erode, through lack of funding, the benefits that forests provide also decline.

What does the indicator show?

Capital investment toward protecting and managing forests includes investment in facilities, roads, and trails by the Forest Service, which was \$501 million in 2005 and \$390 million in 2007 (adjusted for inflation and expressed in 2005 dollars). Annual expenditures for Forest Service programs for national forests and grasslands decreased between 2004 and 2007 from \$3.0 to \$2.7 billion and expenditures for wildfire management increased from \$1.7 to \$2.1 billion (all in 2005 dollars).

Total annual expenditures for State forestry agency programs have been about the same in 1998, 2002, and 2004 at \$2.0 to \$2.2 billion (2005 dollars) (fig. 34-1). During this time State expenditures increased for States in the Pacific Southwest and Pacific Northwest Regions by 27 percent after inflation, primarily in California, and decreased in the Northern Region mostly as a result of an urban forestry expense in 1998 in New Hampshire not present in 2002 or 2004.

Capital investment in forest recreation and tourism are made by a variety of entities on both public and private land, and for infrastructure for businesses that provide the goods and services

that make forest recreation possible. On the national level, investments into public recreation facilities include those made by the Forest Service and the U.S. Department of the Interior National Park Service (NPS). For 2009 the Forest Service budgeted \$405 million in capital improvement and maintenance costs, which is an 8-percent decrease from 2008 (\$474 million). NPS expenditures on facility maintenance increased from \$389 million in 2006 to \$393 million in 2007, and are budgeted for \$461 million in 2008.

Private capital investment in forest recreation infrastructure was estimated for businesses that provide forest recreation services and those that provide the equipment, which makes forest recreation possible. In 2006, total capital expenditures within the forest recreation sector were an estimated \$1.47 billion, with \$1.03 billion toward structures and \$442 million in equipment expenditures. These expenditures are approximately 8.5 percent of total expenditures in the leisure industry.

In 2006, NPS concessions provided an estimated \$48.3 million in the form of franchise fees paid to NPS and in the form of facility improvements for national parks, with \$21.6 million of this being solely dedicated to facility improvements. As much as 90 percent of the fees and improvements may support forest-based recreation.

Capital investment in wood products industries decreased from \$3.4 billion in 1997 to \$2.2 billion in 2003 but increased to \$3.5 billion in 2006 (all in 2005 dollars) (fig. 34-2). Capital investment in paper products industries declined more—from \$10.2 billion in 1997 to \$5.3 billion in 2004 but increased to \$7.4 billion in 2006 (all in 2005 dollars). Capital investment in the wood furniture industry was \$837 million in 1997 and \$873 million in 2002. Capital investment in logging industry was \$0.9 billion in 1997 (2005). More recent data from U.S. Bureau of Census is not available.

Annual expenditures for payroll and materials by the wood products industries decreased between 1997 and 2003 about 9 percent from \$82 to \$75 billion then increased to \$84 billion in 2006 (2005 dollars). Annual expenditures for payroll and materials for paper product industries decreased 15 percent from 1997 to 2003 from \$121 to \$104 billion then increased to \$107 billion in 2006 (in 2005 dollars).

What has changed since 2003?

Annual capital investment in wood and paper industries declined 40 percent between 1997 and 2004 and increased 34 percent between 2004 and 2006. In contrast annual expenditures for payroll and materials remained relatively stable between 1997 and 2006 (in 2005 dollars).

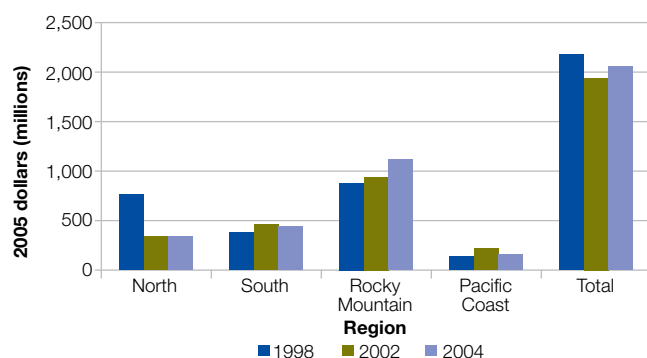
In recent developments, during 2007 and early 2008, the U.S. Department of Energy (DOE) announced grants of up to \$585.3

million for capital costs to build 13 commercial or demonstration cellulosic liquid biofuels plants. Six of the plants—with DOE capital funding up to \$230.3 million—will use wood biomass or wood pulp extract as feedstock. Additional funds will be invested by individual businesses. In addition to the DOE funded plants, three other wood based biofuels plants are being prepared. All together these wood-based plants expect to use 2,300 tons per day or more of wood biomass (720,000 tons per year).

Are there important regional differences?

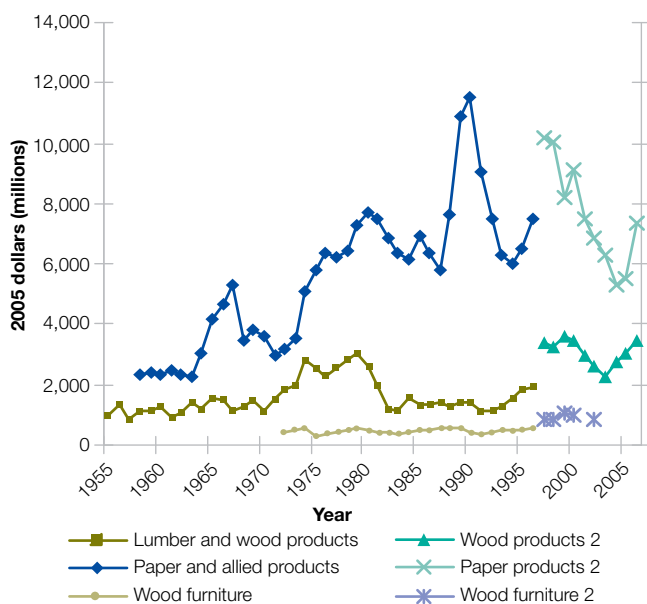
The regional share of U.S. expenditures for State forestry agency programs in 2004 is highest for the Pacific Coast (54 percent), followed by the South (21 percent), North (16 percent), and

Figure 34-1. Annual State forestry program expenditures and costs by region, 1998, 2002, 2004 (millions of 2005 dollars).



Source: National Association of State Foresters

Figure 34-2. Capital expenditure in forest products industries, 1955–2006 (millions of 2005 dollars) (data after 1996 use NAICS (North American Industry Classification System) industry codes).



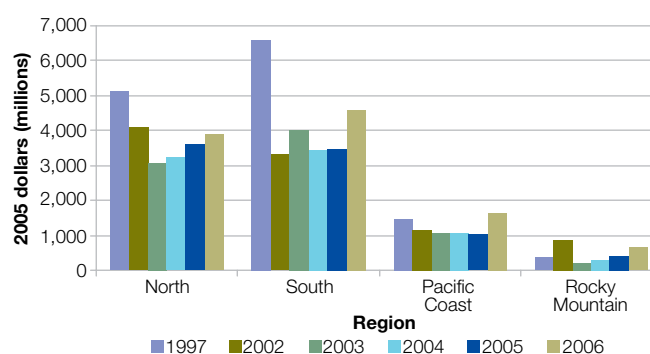
Source: U.S. Department of Commerce, Bureau of Census

Rocky Mountains (8 percent). Between 1997 and 2006 the share of total U.S. annual capital investment in wood and paper product industries ranged from 35 to 49 percent in the North, 36 to 43 percent in the South, 11 to 15 percent in the Pacific Coast, and 3 to 9 percent for the Rocky Mountain Region (fig. 34-3). The share increased from 11 to 15 percent for the Pacific Coast Region and decreased for the North and South Regions. The regional shares of annual payroll and material expenses have been a little more stable and are highest in the North and South, 39 percent, 38 percent, respectively, followed by the Pacific Coast (15 percent), and Rocky Mountains (7 percent) (fig. 34-4).

Why can't the entire indicator be reported at this time?

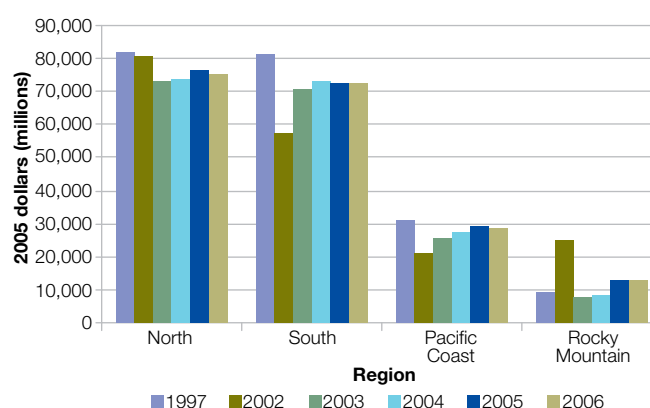
Capital expenditure and annual expense data are not available for a number of entities that protect and manage forests, including county and local governments, conservation organizations, and certain corporate land owners (e.g., TIMOs, REITs).

Figure 34-3. Capital expenditure in wood products and paper products industries by region, 1997, 2002–2006 (millions of 2005 dollars).



Source: U.S. Department of Commerce, Bureau of Census

Figure 34-4. Payroll and material costs for wood and paper products industries by region, 1997, 2002–2006 (millions of 2005 dollars).



Source: U.S. Department of Commerce, Bureau of Census

Capital and annual expense data are not available by region for forest based recreation and tourism. Data specifically on capital and annual expenses for providing forest-based environmental services are not available although some cited total expenses by the Forest Service and State forestry agencies support these services.

Relation to other indicators

The levels and trends in capital investment and annual operating expenses are key factors in sustaining benefits of all types from forests—from wood products (Indicators 6.25 and 6.28), from nonwood products (Indicators 6.26 and 6.29), from recreation (Indicators 6.41, 6.42, and 6.43), and for environmental services (Indicator 6.27). Levels of capital investment and operation expenses also influence the competitiveness of U.S. wood and nonwood products firms in comparison to foreign firms (Indicators 6.30, 6.31, and 6.32). Levels of capital investment also influence levels of employment (Indicator 6.36), wages (Indicator 6.37) and community resilience (Indicator 6.38).

Indicator 6.35. Annual investment and expenditure in forest-related research, extension and development, and education

What is the indicator and why is it important?

Capital investments and annual operating expenditures on forest-related education, research and development increase human capital. Funds invested in communicating the results of research and development to practitioners and the public build awareness, and hopefully support, for sustainable forest management. These investments and expenditures increase knowledge and skills and, over time, increase a country's ability to practice sustainable forest management.

Research and development, extension, and education areas include all disciplines that influence forest resource management decision making. Forests in the United States are threatened by fragmentation, invasive species, the effects of climate change, and the disconnect of our children and increasingly urban populations from the natural world. Forest related education and extension, and the communication of research and development to both forestry practitioners and the general public can build awareness and support for sustainable forest management. Thus, it is critical to examine the level of funds invested annually toward forest-related education, extension, and research and development.

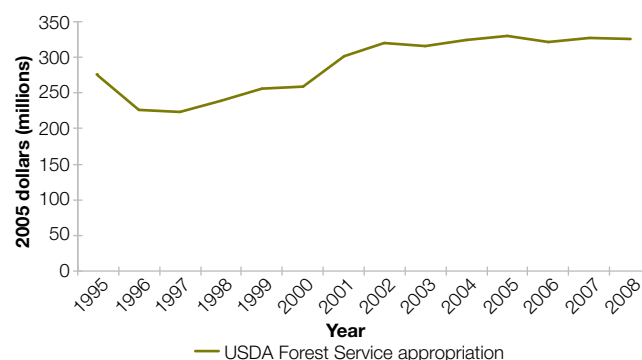
What does the indicator show?

Forest resource management-related research and development efforts are centered in the Forest Service, in universities, and in industry, with additional efforts by other agencies and nongovernmental organizations. Forest Service funding for research, including construction, and net of inflation, has increased from \$259 million in 2000 to \$326 million in 2008 (both in year 2005 dollars) although funding has been relatively constant above \$300 million per year (2005 dollars) since 2002 (fig. 35-1).

Forest Service publications (including those in peer reviewed journals) have increased from 1,886 in 1981, to 2,718 in 1998, and most recently to 3,182 in 2007.

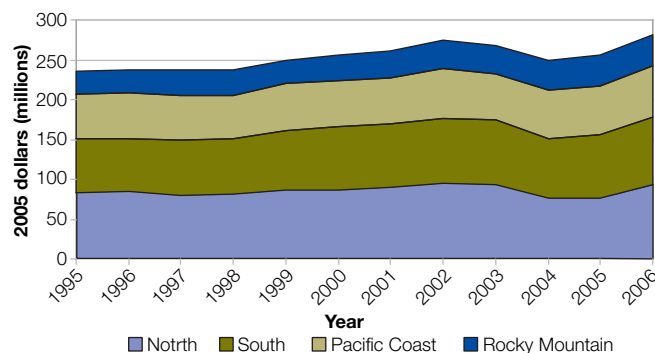
Funding available for forestry research at universities that receive Federal funding increased from \$256 million in 2000 to \$282 million in 2006 (2005 dollars). Funding in 2006 was highest in the North (\$92 million), followed by the South (\$84 million), Pacific Coast (\$65 million), and the Rocky Mountains (\$39 million) (fig. 35-2).

Figure 35-1. USDA Forest Service Research and Development appropriations, 1995–2008 (millions of 2005 dollars).



Source: USDA Forest Service

Figure 35-2. Forestry research funding at U.S. universities that are partially funded by the USDA National Institute of Food and Agriculture by Resource Planning Act Region, 1995–2006 (millions of 2005 dollars).



Source: USDA National Institute of Food and Agriculture

Forest industry also provides funding for both internal and external research. The Agenda 2020 is a key Federal and industry partnership that provides funds from the Federal Government and industry for research on a wide range of topics, including improved fiber recovery and use, decreasing capital costs, reducing environmental effect, the forest biorefinery, and improved housing systems. Funding for 2003 was about \$30 million each from industry and the Federal Government.

Additional sources of funding for forestry research are available, from other Federal sources and nongovernmental organizations (NGOs).

Baccalaureate, masters, and doctorate degrees awarded in forest science programs decreased 20 percent from 2,263 in 2001 to 1,810 in 2006. During that period, the number of baccalaureate degrees decreased 28 percent, doctorate degrees decreased 15 percent, and master's degrees increased almost 4 percent.

In 2007, funding appropriated through the Renewable Resources Extension Act for forest stewardship and health extension programs, resulted in 1,495 education events nationwide, the development of 1,574 stewardship plans, and affected more than 12 million acres.

Forest Service Conservation Education activities and programs, which are funded from numerous sources within and external to the Forest Service, reached 4,400,000 people in FY 2006. 35 percent of those reached came from urban areas, 10 percent were underserved, and 33 percent were youth and their educators. FY 2006 data indicate a significant increase over previous years for the number of activities conducted, audiences reached, partnerships developed and improved, and total dollars spent, although these data are collected from a voluntary, self-reporting database (table 35-1).

Forest resource education is also provided by public schools, and by a wide range of nongovernmental organizations (NGOs).

What has changed since 2003?

The amount of funds available for forest research since 2003 has increased both for Federal and university research. In the same time period, the amount of forest science degrees awarded has decreased by 20 percent.

Table 35-1. Level of Forest Service Conservation Education activities and dollars spent, 2004–2006.

	2004	2005	2006
Number of activities	655	1,007	1,335
Audience reached	2,100,000	982,000	4,400,000
Number of partnerships	641	825	1,578
Total spent (millions of 2005 dollars)	8.3	9.7	17.9

Why can't the entire indicator be reported at this time?

Investment in forest education for primary school-aged children is important for this indicator but a forestry-specific, nationwide data set was not found. Information is not available on funding for forestry related research and education from other Federal sources, such as U.S. Department of the Interior or National Aeronautics and Space Administration, nor are data available funds for research done by many NGOs.

Indicator 6.36. Employment in Forest Products sector

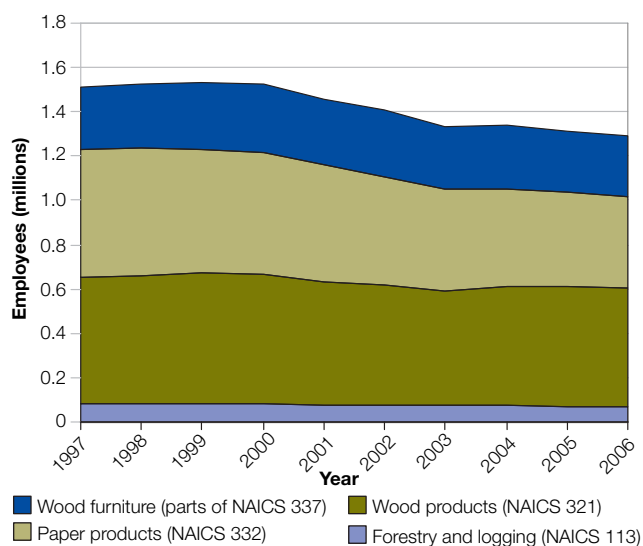
What is the indicator and why is it important?

Employment attributable to forests is one measure of the social and economic importance of forests. It includes employment that is both forest-based and forest-related. Employment is a tangible and widely understood measure of economic and social well being.

What does the indicator show?

Jobs in the forest products industries decreased by about 15 percent between 1997 and 2006, falling from 1.51 to 1.29 million jobs. Job declines included 21 percent for forestry and logging, 6 percent for solidwood products, 28 percent for pulp and paper, and 3 percent for wood furniture (fig. 36-1). Within the furniture category nonupholstered wood furniture decreased 44 percent from 127,703 to 71,544 jobs and architectural

Figure 36-1. Number of employees in forest products industries, 1997–2006.



Source: U.S. Department of Commerce, Bureau of Census

woodwork and millwork increased 31 percent from 24,390 to 32,033 jobs. Forestry and logging jobs had been relatively constant between 1986 and 1996.

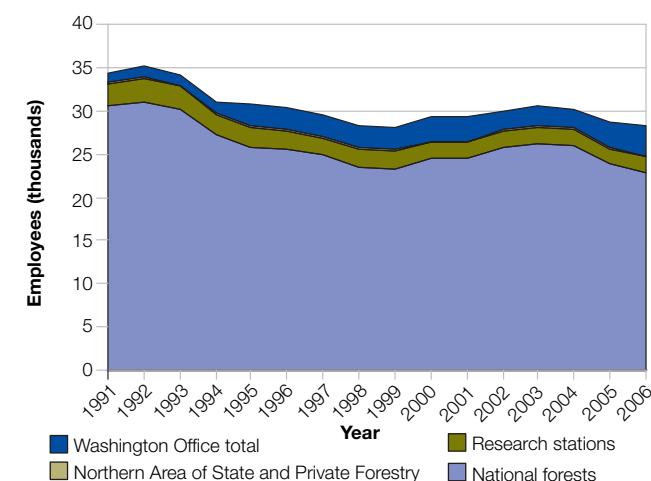
In 2006, 74 percent of forest industry jobs noted above were in the wood products and paper products industries (536,094 and 414,049 jobs, respectively). Combined, they were 1.1 percent of all U.S. jobs and 7.1 percent of manufacturing jobs. This number of jobs is down from 824,000 and 485,000 jobs in 1950 when combined they were 2.5 percent of all jobs and 8.6 percent of manufacturing jobs.

Jobs in forest management and protection include:

- Permanent Forest Service, National Forest System jobs, which have declined from 30,632 jobs in 1991, to 24,605 jobs in 2000, and 22,867 jobs in 2006 (fig. 36-2);
- Permanent employees in State forestry agencies—which has been about constant between 1998 (15,836) and 2004 (15,455) (fig. 36-3);
- Total State agency employees which have increased by about 2000 after including temporary employees—22,269 in 1998 to 24,507 in 2004;
- Employees in Department of Interior agencies that manage forests was about the same level in 2007 (43,085) as in 1998 (44,003); and
- An undetermined number in county and municipal governments, private land management organizations, private consultants, and private forest-resource related organizations.

Nationwide, firefighting and support jobs during fire season have ranged between 12,000 to 15,000 jobs in recent years. Many such jobs are temporary and excluded from the number of permanent employees in figures 36-2 and 36-3.

Figure 36-2. USDA Forest Service permanent employees by branch, 1992–2006.



Source: USDA Forest Service

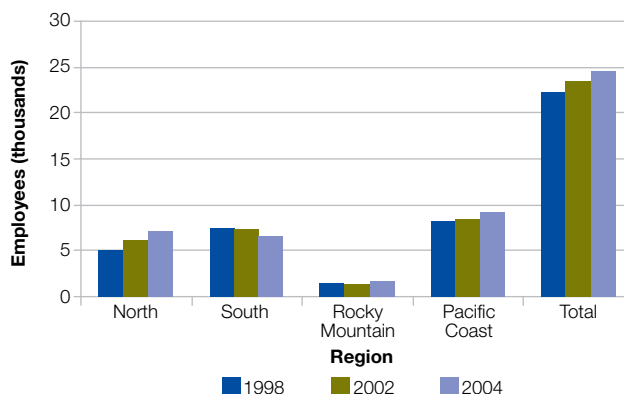
The number of jobs associated with forest-based recreation is uncertain. For 2006, we estimate about 551,000 forest-based recreation jobs. An increase may be inferred by the increase in participation in U.S. forest recreation. To underscore the uncertainty of this estimate, we note that the estimate for the 2003 report made using different methods was 1.1 million direct forest-based recreation jobs. For 2005, direct jobs associated with recreation on national forests are estimated to be 97,600 jobs.

Jobs in producing nonwood forest products, including medicinals, food and forage species, floral and horticultural species, resins and oils, arts and crafts, and game animals and furbearers probably number in the tens of thousands. Many, if not most jobs, are in informal businesses whose characteristics are not recorded in Bureau of Census surveys. Two exceptions. The sector Forest Nurseries and gathering of forest products included 231 businesses in 2006 with 2,098 employees. The sector hunting and trapping included 348 establishments with 1,875 employees in 2006. These jobs have decreased from 2,702 in 2002.

Jobs in forest related education and research include those at colleges and universities and research jobs include those in the Forest Service. For the 2003 report, we estimated 1,361 jobs in forest related education and research for 2001. Jobs at Forest Service research stations have decreased from 2,469 in 1991, to a low of 1,708 in 2000, and were 1,760 in 2006. For the 2003 report, we estimated 124 industry research jobs for 2001. In addition there are an undetermined number of forest resource education jobs within private associations and organizations.

Total forest-related direct jobs are estimated to be close to 3 million or about 2 percent of all U.S. employment. This number does not include indirect jobs generated by expenditures of government agencies, businesses, or others.

Figure 36-3. Permanent and temporary State forestry agency employees, by region, 1998, 2002, and 2004 (State data missing: 2002—PA and NV; 2004—OH, ME, IL, and AR).



Source: National Association of State Foresters

What has changed since 2003?

Jobs in forest products industries have declined considerably—by 167,995 or 12 percent between 2001 and 2006.

Are there important regional differences?

In 2006, forest products industry employment (number of jobs excluding wood furniture) was highest in the North (400,000), followed by the South (341,000), Pacific Coast (130,000), and Rocky Mountains (73,000) (fig. 36-4). Between 2001 and 2006 these jobs decreased in the North, South, and Pacific Coast but increased in the Rocky Mountain Region. Forestry and logging jobs in 2006 were highest in the South (36,013), followed by the Pacific Coast (14,538), North (11,839) and Rocky Mountains (3,914).

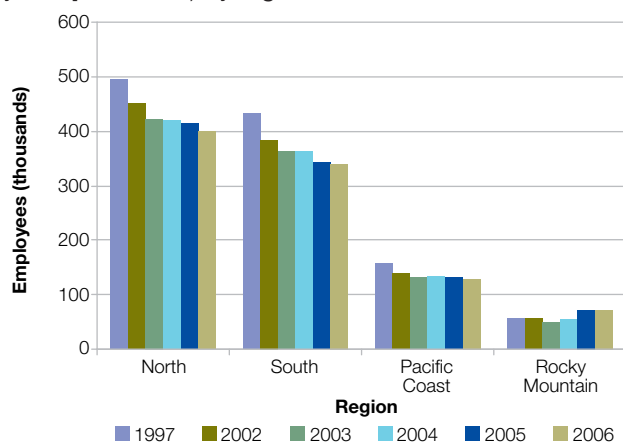
In 2004, total employment in State forestry agencies was highest in the Pacific Coast (6121 permanent and 3109 temporary) followed by the North (2,791 permanent and 4,320 temporary), the South (5492 permanent and 1,043 temporary), and Rocky Mountains (1,051 permanent and 581 temporary). Between 1998 and 2004 State forestry agency seasonal and temporary jobs increased for the North (more than doubled), and for the Pacific Coast and Rocky Mountains, but declined for the South.

Why can't the entire indicator be reported at this time?

Little data are available on jobs in producing nonwood forest products because many businesses are very small and part of the informal economy, which has casual hiring practices and nonreported income.

Data are not available on jobs related specifically to the provision of environmental services such as carbon storage, biodiversity, or water supply. Updated data are likewise not available on

Figure 36-4. Employees in wood and paper products industries (NAICS [North American Industry Classification System] 321, 322) by region, 1997, 2002–2006.



Source: U.S. Department of Commerce, Bureau of Census

forest-related education and research jobs at colleges and universities nor for forest related jobs in county and municipal governments, private land management organizations, private consultants, and private forest-resource related organizations.

Relation to other indicators

The levels of employment are a factor in the resilience of forest-based communities (Indicator 38) and in the importance of forests to people (Indicator 44). Employment levels are influenced by capital investment (Indicator 34) and education and research (Indicator 35). Employment levels in forest products industries are also influenced by competition from imported forest products, as indicated by trends in imports as a proportion of U.S. consumption (Indicator 32).

Indicator 6.37. Average wage rates, annual average income, and annual injury rates in major forest employment categories

What is the indicator and why is it important?

Wages, income and injury rates are measures of the quality of employment. Wages and income are indicators of the economic returns to workers in forest-based and forest-related enterprises. Decreasing injury rates may reflect improved occupational health and safety and employment quality, which provide both personal and community social benefits.

What does the indicator show?

Average annual incomes related to forest management and protection employment includes the salaries of full time permanent employees of the Forest Service which have increased from a median of \$41,300 in 1992 to \$48,200 in 2000, and to \$50,500 in 2006 (all figures are adjusted for inflation and expressed in 2005 dollars).

Salaries of full-time permanent employees in State forestry agencies in 1998, for entry-level foresters, ranged from a high of \$48,000 for the Pacific Coast, \$39,000 in the North, \$35,000 for the Rocky Mountains and \$28,000 for the South. Values for district foresters for the same regions were \$62,000, \$63,000, \$43,000, and \$50,000, respectively. Salary data are not available for more recent years.

In the forest products industries annual income per full-time equivalent employee is higher and has increased more for workers in the paper products industries than those in the wood products industries. For paper products, annual income increased from \$39,954 to \$52,572 between 1975 and 2006 and wood products annual income increased from \$30,866 to \$34,239 (fig. 37-1). Annual income for paper products

continues to be above the average for all manufacturing and below the average wood products. Production worker wages for forestry and logging, including timber tract operations, nurseries, and logging, ranged from \$33,000 to \$34,620 in 2008.

Average annual income for persons working in the forest recreation and tourism sector during 2006 was estimated to be \$22,782, which is only a slight increase from the \$21,939 figure estimated for 2003. This amount is about 37 percent less than the 2006 national average per capita annual income of \$36,276. One likely reason for the lower income is that jobs offered in this sector tend to be lower wage and seasonal jobs.

Injury and illness rates for forest products industries have steadily declined since the early 1990s with rates for wood products and furniture industries being somewhat higher than for all manufacturing, and paper products industries being somewhat lower (fig. 37-2). In 2006 injury and illness cases per 100 employees were 5.3 for forestry and logging, 8.5 for wood products, 7.1 for wood furniture, 4.3 for paper products, and 6.0 for all manufacturing.

Are there important regional differences?

Hourly wages for wood products industries production workers are slightly higher than the national average for the Pacific Coast and slightly lower for the South (fig. 37-3). Wages for paper products industries are slightly higher in the South, Pacific Coast and North than in the Rocky Mountains.

Average income in forest-based recreation and tourism in 2006 was highest for the Pacific Southwest and Pacific, \$24,566 and lowest for the Rocky Mountains, \$17,620 (both in 2005 dollars) (fig. 37-4). Although these differences could be a function of forest-based recreation and tourism demand driving labor markets, fluctuations in regional economies are likely to be the major drivers of these rankings.

Why can't the entire indicator be reported at this time?

Wage and annual income estimates are not available for State forestry agencies, nonwood products industries, forestry schools in colleges and universities or for local governments and NGOs that contribute to forestry. Special surveys would be required to collect this information.

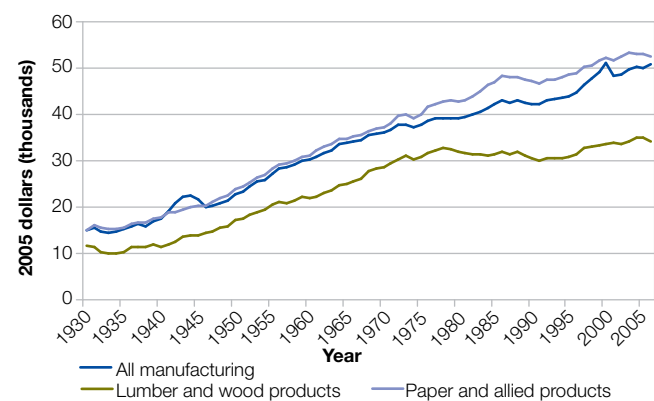
Injury rate information is not available for most forest management jobs nor are they available for the nonwood forest products sector or jobs in forest recreation and tourism jobs. Injuries for some forest management jobs are included in wood and paper industry data. Although nonwood forest products workers operate in the informal economy (not covered by traditional surveys), gathering products in the forest can

be dangerous, and there are reports in the media of people becoming lost or injured every year.

Relation to other indicators

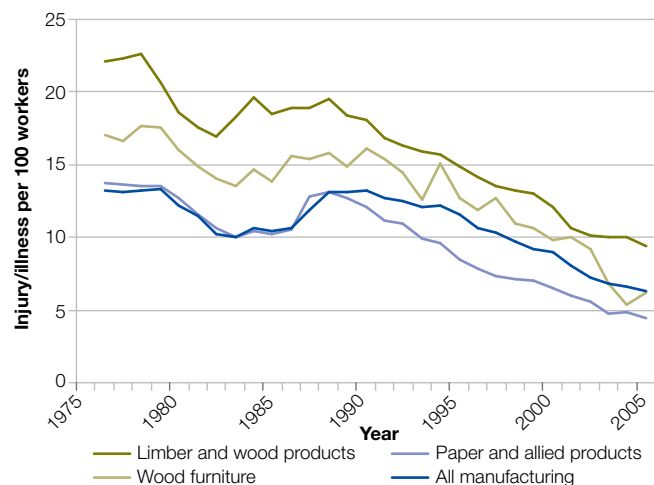
The level of wages and income and level of injuries are a factor in the resilience of forest-based communities (Indicator 6.38) and a factor in the importance of forests to people (Indicator 6.44). The level of wages is influenced by the levels of capital investment (Indicator 6.34) and by the levels of education and research (Indicator 6.35). The level of wages in forest products industries may also be influenced by competition with other countries to provide products for the United States as indicated by trends in imports as a proportion of U.S. consumption (Indicator 6.32).

Figure 37-1. Wage and salary accruals per full-time equivalent employee for all manufacturing, lumber, and wood products industries and paper and allied product industries, 1930–2006 (thousands of 2005 dollars).



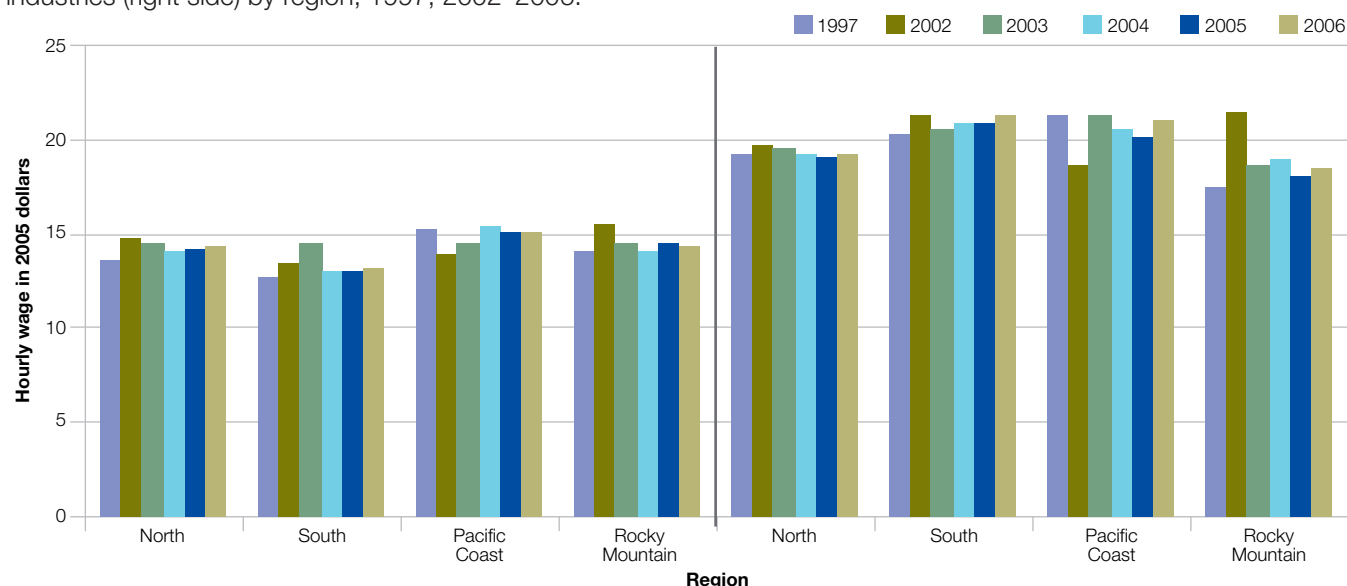
Source: U.S. Department of Commerce, Bureau of Economic Analysis

Figure 37-2. Rate of injury and illness cases per 100 full-time workers for lumber and wood products, paper and allied products, and all manufacturing industries, 1976–2006.



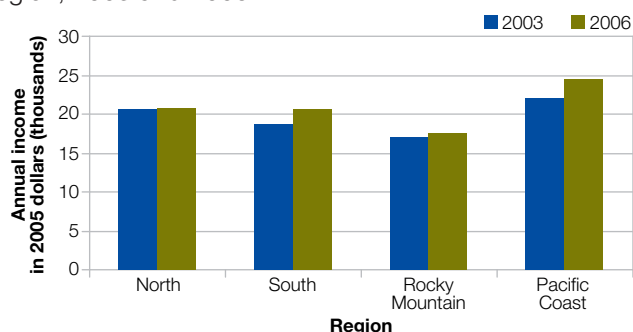
Source: U.S. Bureau of Labor Statistics

Figure 37-3. Wage per hour for production workers in wood products industries (left side) and paper products industries (right side) by region, 1997, 2002–2006.



Source: U.S. Department of Commerce, Bureau of Census

Figure 37-4. Annual average income for persons employed in the forest recreation and tourism sector by region, 2003 and 2006.



Sources: USDA Forest Service analysis, multiple data sources

Indicator 6.38. The Resilience of Forest-Dependent Communities

What is the indicator and why is it important?

Resilience of Forest Dependent Communities is a new indicator of social sustainability. In the development of this indicator, the Montréal Process Technical Advisory Committee suggested that countries provide definitions and select approaches to measurement that best reflect their national experiences. The resultant methodology should enable reporting on the health of forest-dependent communities and trends over time. The definition, operationalization, and data gathering protocol presented herein emerged from research commissioned by the U.S. Roundtable. Additional information on the concepts and

techniques underlying this work can be found in the supporting documentation on the project Web site (<http://www.fs.fed.us/research/sustain/>) and in Magis (2004).

Community resilience (CR) is defined as the existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise. Members of resilient communities intentionally develop personal and collective capacity that they engage to respond to and influence change, to sustain and renew the community and to develop new trajectories for the community's future.

The contribution of community resilience to the MP C&I is a deeper understanding of social sustainability, specifically as it relates to a community's ability to thrive in contexts of change. A community's resilience will determine its ability to successfully mobilize and respond to societal stress, making it integral to social sustainability. Further, human societies are intimately interconnected with ecological systems. Hence, the resilience of forest-communities will influence their capacity to act as forest stewards, thus, affecting the forest's sustainability.

Eight dimensions operationalize CR into actionable, observable, and measurable elements; *Community Resources, Development of Community Resources, Engagement of Community Resources, Active Agents, Collective Action, Strategic Action, Equity, and Impact*. The *Community Resilience Self Assessment* (CRSA) was developed to provide a comprehensive portrayal of a community's resilience via its performance along the eight dimensions. From it, information is gleaned regarding: the community's resources; how the resources are developed and

used; the participation and collective involvement of community members in community endeavors; and the effect of those collective efforts.

What does the indicator show?

The goal of this ongoing research project is to depict a national picture of the extent to which communities dependent on forests for their wellbeing, livelihoods, subsistence, quality of life, or cultural identity are able to respond and adapt to change.

The CR definition and dimensions emerged from multidisciplinary research to understand and describe the well-being and resilience of communities. The Community Resilience Self Assessment (CRSA) and sampling protocol were developed to measure a community's resilience along the eight CR Dimensions. The CRSA contains 66 questions arranged across the eight dimensions. Respondents were chosen through a purposive sampling method involving key informants, and responses to the CRSA were gathered via the Internet.

The next stage in this project is to establish and administer a sampling process to periodically gather resilience data from forest-based communities across the United States. These data will provide a national picture of community resilience as it relates to forest sustainability, thereby accomplishing the intent of Indicator 6.38.

Initial Results

Administration of the CRSA generates data that describes conditions prevailing in particular communities. Key informants rank the community's resilience along each CR Dimension. Their answers are tallied to generate dimension

scores. The CRSA uses a scale of 1–6. A score of 1 equates with very low resilience; 2—low resilience; 3—low to medium resilience; 4—medium resilience; 5—low and high resilience; and 6—high resilience. The following graphics exemplify one way to display the CR data. A radar chart is used in the first four figures to display CR scores for the pilot communities (figs. 38-1 and 38-2).

Six communities were sampled as a proof of concept for this report. Because this sample is very small, generalizations cannot be made. With a broadened sampling base, however, data can be compared across communities and relationships between dimensions and forest sustainability can be demonstrated. Figure 38-3 shows comparisons between three of the sample communities, that is, Alberton, Superior, and St. Regis.

What has changed since 2003?

Indicator 6.38 is essentially a new indicator, although it is related to Indicator 46 in the 2003 report, which measured the viability and adaptability of forest-dependent communities. The approach taken in 2003 relied on nationally available data on county level conditions, and was therefore restricted in terms of spatial specificity and the sorts of variables it could measure. The CRSA generates community-scale data, which portrays a community's resilience from the perspective of key informants. Key informants are individuals whose active engagement in the community gives them broad knowledge regarding social, political, economic, cultural and ecological conditions and trends in their community. The CRSA and key informant methodology enable direct measurement of CR, but with some costs in terms of breadth of coverage. Given these changes, it is impossible to draw direct comparisons to the results displayed in 2003.

Figure 38-1. Sample radar plot showing Community Resilience Self Assessment (CRSA) scores for Alberton, MT (sampled in 2009–2010).

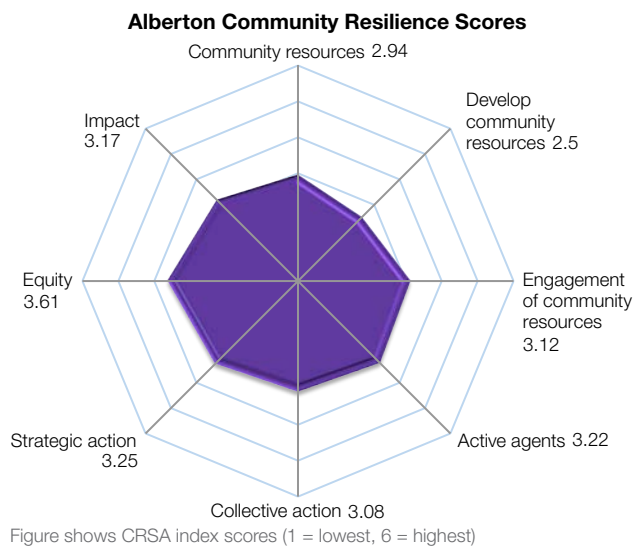


Figure 38-2. Sample radar plot showing Community Resilience Self Assessment (CRSA) scores for Superior, MT (sampled in 2009–2010).

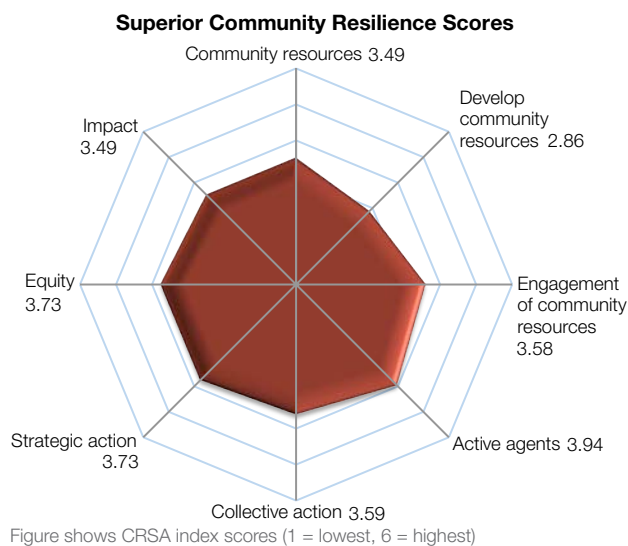
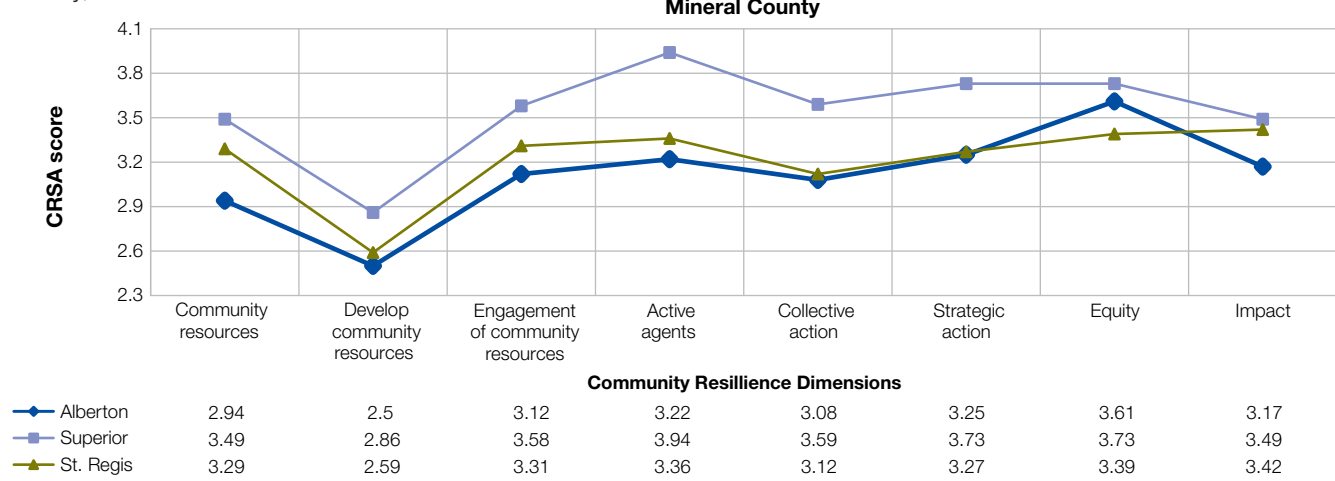


Figure 38-3. Combined Community Resilience Self Assessment (CRSA) scores for three communities in Mineral County, MT.



Regional differences

As the sample size to date is so small, regional differences cannot yet be discussed. An enhanced sample size will enable this level of analysis, however.

Why can't the entire indicator be reported at this time?

The approach presented here addresses the nature of Indicator 6.38 for the communities that have been sampled. The next phase of this project is to develop a rich-enough sample to reveal the traditions and trends in the Nation's forest-dependent communities and specific relationships between CR and forest sustainability. Hence, the next phase of the development of Indicator 6.38 in the United States is to expand considerably the number of communities utilizing a purposeful framework aimed at developing comparability across space and time.

Indicator 6.39. Area and percent of forests used for subsistence purposes

What is the indicator and why is it important?

In many countries, indigenous groups, rural communities, and others use forests for subsistence purposes, although this use of forests may not be broadly recognized. This indicator measures the extent to which forests are used as a source of basic commodities, such as food, fuel, shelter, and medicinal plants. In addition to the tangible benefits it provides, for many people, subsistence use has a deep cultural, and often, spiritual significance.

What does the indicator show?

Our growing understanding of subsistence use of forests indicates that people from diverse ethnic backgrounds make use of subsistence resources from forests in every region of the United States. These activities have particular cultural importance for indigenous peoples. Three canons of law provide legal guarantees for subsistence practices of selected populations: (1) treaty law, (2) the Hawaii State Constitution, and (3) the Alaska National Interest Land Conservation Act (ANILCA). Subsistence activities tend to be associated with poverty in the popular imagination. Many residents who hunt, fish, trap, and gather to meet their basic needs, however, regard these practices as a form of wealth, which frequently benefits not only the individual but also the extended family and a larger community. Access to forests for subsistence resources appears to be declining with changes in land use and land ownership that include increases in posting to restrict trespassing and the establishment of exclusive hunting leases.

What has changed since 2003?

We were able to gather more evidence of subsistence activities in the State of Hawaii, particularly on Molokai, where subsistence activities are reported to provide more than 50 percent of food for some residents and an average of 28 percent for all islanders. Additional data on Alaska, where subsistence access is guaranteed on Federal lands (fig. 39-1), was available, thanks to ongoing research by the Subsistence Division of Alaska's Department of Fish and Game. Table 39-1 provides a summary of annual wild food harvests and contributions to food intake in Alaska's 27 census areas. We also had more time to look into the contested nature of subsistence. Although subsistence is guaranteed by ANILCA, the Hawaiian State Constitution, and

Table 39-1. Annual wild food harvests for 27 Alaska census areas

	Lbs./Person	Daily Protein (Percent)	Daily Calories (Percent)
Mean	268	173	24
Median	206	133	19
Minimum	16	10	1
Maximum	698	451	64

Source: Alaska Department of Fish & Game, Subsistence Division (<http://www.subsistence.adfg.state.ak.us/>)

treaties with Indian tribes, litigation over the exercise of those rights has been, and continues to be, ongoing. In several places around the country, Federal and State agencies have entered into Memoranda of Understanding and Agreement that assure access by members of local tribes to hunting, fishing, and gathering resources for purposes that include subsistence. In 2007, the Inland Consent Decree between the State of Michigan and five tribes affirms treaty-guaranteed access to hunt, fish, and gather on State and some private lands and inland waters in an area that covers 13,827,207 acres (fig. 39-2). Finally, Norris's 2002 history of the National Park Service provides a detailed picture of how NPS policies toward subsistence have evolved during the past 90 years.

Are there important regional differences?

Yes, in Alaska, subsistence is formally recognized by the State and Federal Governments as a vital social, economic, and cultural activity. ANILCA (P.L.96-487, Dec. 2, 1980)

Figure 39-1. Federal lands in Alaska, which are generally open to rural Alaskans for subsistence harvest (map courtesy of U.S. Fish and Wildlife Service).



provides for the subsistence use of forest resources by all rural Alaskans regardless of race or income. The Hawaiian Constitution protects the customary and traditional rights of Native Hawaiians, including subsistence use of marine and terrestrial resources. Some federally recognized tribes retain treaty rights to hunt, fish, trap, and gather on specified off-reservation lands. Subsistence activities by other groups in other locations do not enjoy formal legal status under U.S. or State laws.

Why can't the entire indicator be reported at this time?

The indicator addresses area and percent of forests used for subsistence, yet relevant data currently are collected by Federal and State agencies only in Alaska. These agencies quantify subsistence by metrics such as numbers of users, weight of subsistence resources harvested, and numbers of persons giving or receiving subsistence goods in barter or gift exchange. Providing a spatial display of forested areas used for subsistence is challenging because subsistence does not occur in discreet areas, but is diffused and, if anecdotal evidence is indicative, widespread. It is not possible to summarize these sorts of data into simple numerical measures.

The fact that Hawaii and Alaska have specific State provisions protecting subsistence use indicates the importance of subsistence in these States. The absence of such provisions (or data for that matter) in other States, however, does not necessarily indicate that subsistence activities are largely absent or unimportant.

Figure 39-2. The 2007 Inland Consent Decree area (map courtesy of the Great Lakes Indian Fish and Wildlife Commission).

Lake States National Forests and Cippewa Ceded Territories: Treaties of 1836, 1837, and 1842



* The ceded territory and tribal reservation boundaries are representation and may not be the legally binding boundaries.

Indicator 6.40. Distribution of revenues derived from forest management

What is the indicator and why is it important?

Revenues derived from forest management activities, including the sale of forest products and environmental services, are one of the principal sources of funds for paying annual operating costs and making capital investments in the forest estate. This indicator tracks who shares in the revenues—workers through wages and income, communities through taxes, and others at different geographic scales. Therefore, information on the collection and distribution of these revenues will be useful in understanding economic support for sustainable forest management.

What does the indicator show?

We first look at who shares in the revenues from the operation of forest products industries. These industries include forestry and logging, wood products, paper products, and wood furniture. Figure 40-1 shows the shares of revenues in these industries that go to workers in the form of wages, to business owners in the form of profits, and governments in the form of taxes. In 2002, of a total \$72.5 billion (2005 dollars) in wages, profits and taxes, 80 percent went to wages, 18 percent to profits, and 2 percent to taxes. It is notable that these amounts are only part of the uses of the total revenue from product shipments of about \$300 billion (2005 dollars) in 2002. Revenue is also used to pay for other costs of production, including materials, energy, insurance, and interest on debt. The profits received in 2002 by owners (\$11 billion (2005 dollars)) were about 3.7 percent of the value of shipments.

Of the \$72.5 billion in wages, profits, and taxes, 43 percent was provided by paper products industries, 35 percent by wood

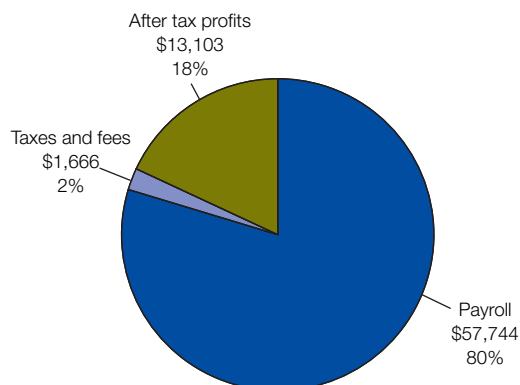
products industries, 17 percent by wood furniture industries, and 5 percent by forestry and logging. The share of revenue going to workers was somewhat higher for the paper and wood furniture industries, 82 and 83 percent, respectively (with correspondingly lower profit shares), than for the wood products and forestry and logging industries, at 76 and 79 percent respectively.

We next look at who shares in the revenues from sale of timber from forest land. We have data for 1997 that indicate how this revenue is shared among various forest land owners, including owners of national forests, other public forest land, industry forest owners, and other private forest owners. Based on rough estimates for the total stumpage sales value in 1997 of \$22 billion (2005 dollars), 5 percent went to national forests, 6 percent went to other public lands, 33 percent went to industry land owners, and 56 percent went to other private landowners (fig. 40-2). Since 1997, a significant amount of industry forest land has been sold to Timber Management Organizations and Real Estate Investment trust, so the share of stumpage revenues going to industry land owners has probably declined.

A considerable amount of Native-American land is forested. These forests provide wood and nonwood forest products and other values that are vital to Native-American communities. Therefore it also important to note the share of U.S. timber stumpage revenues that goes to Native Americans.

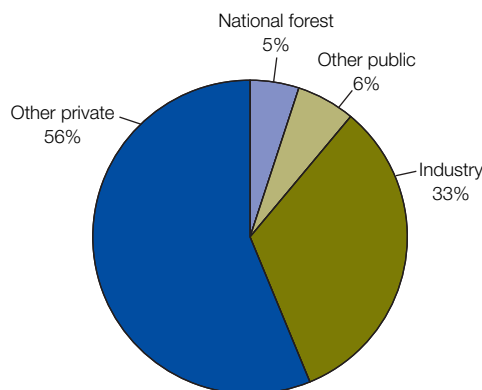
Approximately 18 million acres of forest land exist on Indian reservations in the United States, of which 5.7 million acres are classified as commercial timber land. In 2001 these lands provided \$95 million of revenue (2005 dollars) mostly from industrial timber harvest. This 2001 stumpage revenue is 0.4 percent of the estimated total U.S. 1997 stumpage revenue of \$22 billion (2005 dollars). The 18 million acres of Native-

Figure 40-1. Payments going to forest products business owners (profits), to forest products firm employees (payroll), and to governments (taxes and fees), 2002 (in millions of 2005 dollars and percent).



Sources: USDA Forest Service analysis, multiple data sources

Figure 40-2. Share of stumpage revenue from U.S. timber harvest by owner, 1997.



Sources: USDA Forest Service analysis, multiple data sources

American *forest land* is about 2 percent of total U.S. forest land (749 million acres). The 5.7 million acres of Native-American *timber land* is about 1 percent of total U.S. timber land (504 million acres).

For Native-American forest land in 2001, the Pacific Northwest Region accounted for more than 70 percent of the harvested timber volume and more than 85 percent of revenue, followed by the Lake States at 13.5 percent of the harvested timber volume and more than 7 percent of revenue.

What has changed since 2003?

Data are not available to determine a time trend in share of revenue received by various groups from forest industry activities or from timber sales.

Are there important regional differences?

The estimated share of timber stumpage revenues going to various landowners varies widely among regions (fig. 40-3). In 1997, the share going to public owners (national forest and other public) was highest in the Rocky Mountain Region (37 percent) followed by the Pacific Coast (23 percent), North (14 percent), and South (1 percent). The share going to other private owners (nonindustry) was highest in the South (75 percent) followed by the North (70 percent), Rocky Mountains (33 percent), and Pacific Coast (24 percent).

Another way to look at the geographical distribution of revenue shares is by looking at where various types of owners receive most of their stumpage revenue.

For national forest or other public land owners in 1997, the largest share of stumpage revenue came from the Pacific

Coast (68 percent), followed by the North (18 percent), Rocky Mountains (10 percent), and South (4 percent). For industry owners the largest share of revenue came from the Pacific Coast (54 percent) followed by the South (36 percent), North (7 percent), and the Rocky Mountains (3 percent). For other private landowners, the largest share for revenue came from the South (66 percent), followed by the North (18 percent), Pacific Coast (14 percent), and Rocky Mountains (2 percent) (fig. 40-4).

Why can't the entire indicator be reported at this time?

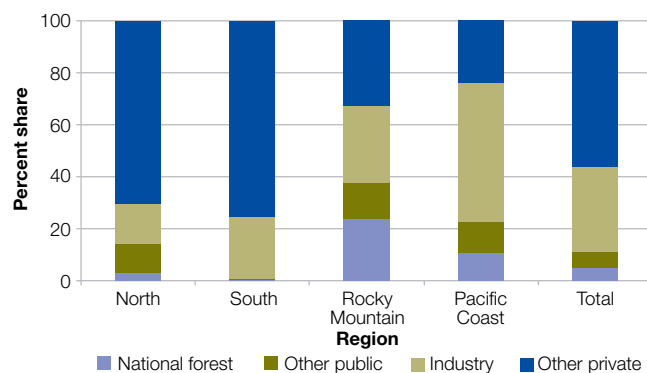
Data are not available to determine a time trend in share of revenues received by various groups.

Information of overall revenues from environmental services is shown under Indicator 27. Data, however, are not available on the shares of such revenues going to workers, businesses, and governments. Nor are data available on the shares of revenues from such services going to various types of forest land owners.

Relation to other indicators

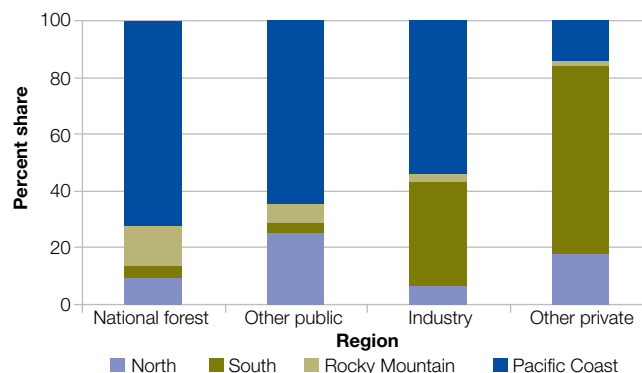
The trends in who obtains benefits from forests would aid our understanding of the importance of forests (Indicator 6.44), and would aid our understanding of the influence of changing benefits on resilience of forest-dependent communities (Indicator 6.38)—to whom and where are benefits flowing. The trends in who obtains benefits from forest would also suggest how the stakeholders in forests are changing. As benefits increase to certain stakeholder groups, their voices may become more influential in determining forest investment (Indicator 6.37), research and education (Indicator 6.35), and institutions (Criterion 7).

Figure 40-3. Share of stumpage revenue from U.S. timber harvest for each type of forest owner by region, 1997.



Sources: USDA Forest Service analysis, multiple data sources

Figure 40-4. Share of stumpage revenue from U.S. timber harvest for each region by type of forest owner, 1997.



Sources: USDA Forest Service analysis, multiple data sources

Indicator 6.41. Area and percent of forests available and managed for public recreation and tourism

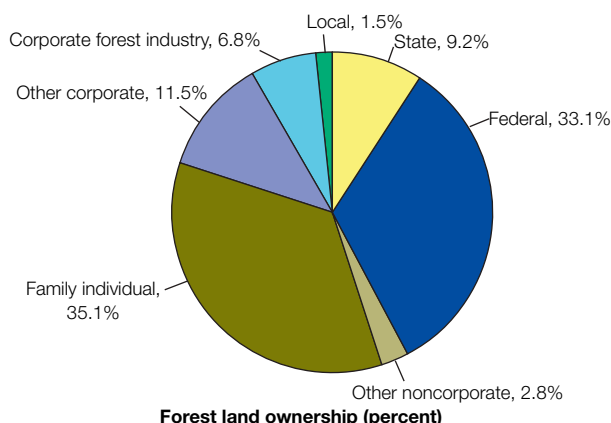
What is the indicator and why is it important?

This indicator is intended to measure the extent to which forests are managed to provide opportunities for recreation and tourism as a specific objective in forest management plans of public agencies and private landowners. When the economic well-being of a country increases, transportation infrastructure is improved, and disposable income grows, public use of forests for recreation grows. These activities are increasingly important as a source of forest-based employment and income. Engaging in outdoor recreation and tourism in forests tends to build support among participants for protecting and managing those forests, indirectly building support for sustainable forests.

What does the indicator show?

Forest area in the United States is estimated at just more than 751 million acres, and has remained relatively constant for the past 100 years. Almost 44 percent of U.S. forest land area is publicly owned (fig. 41-1); one-third is federally owned. More than 18 percent of forest land is owned by private corporations, and almost 38 percent is privately owned by noncorporate entities. Of this noncorporate private forest land, more than 92 percent is family or individually owned. With negligible exceptions, even including Federal experimental forests, government forest lands at all levels are open to someone for some form of outdoor recreation. Given, however, that an inventory of forest tracts by management objectives is not available for the

Figure 41-1. Percent of forest land in the United States by ownership category, 2007 (percentages sum to 100) (Almost all forest lands are open for some form of recreation, although who may have access may be restricted).



Source: USDA Forest Service

United States, it is not possible, for the most part, to ascertain the degree to which forests under different ownerships are managed specifically for recreation and tourism.

Government, corporation, and organization-owned forest lands

Open Federal forest lands include forested national forests, national parks, Bureau of Land Management lands, wildlife refuges, and any other federally managed public land. State forest lands include forested State forests, State parks, and other State management areas. Local forests include municipal watersheds, local parks, local forest preserves, greenways, and other local government forests. Private forest lands include those that are owned by forest-industry, by other types of corporations, by individuals and families, and by other noncorporate entities. Like public lands, it is assumed for this indicator report that forest industry, other corporate, and other noncorporate lands are open to someone for some forms of recreational uses, although access to them is most likely restricted. For corporation lands, data are not available for estimating the acreages generally open to anyone versus acreages restricted for use by employees, executives, lessees, or exclusively to others. More than one-half of the forest industry forests are in the South. Large portions of other corporation lands not owned by forest industry are located in the Pacific Coast and South regions. Other noncorporate private forest lands (not including family and individual ownerships) lie mostly in the Northern and Rocky Mountain Regions.

Family and individual forest lands

Almost one-half of the family and individually owned private forest land is in the South Region, nearly 36 percent is in the North Region, and much smaller percentages are in the Rocky Mountain and Pacific Coast Regions. Figure 41-2 shows the percentages of family and individually owned forest land nationally by category of recreational access. More than 42 percent of this forest land is posted to limit access. Posting does not mean not used for recreation, it means access is restricted. The percentage of land posted is highest in the Pacific Coast Region and lowest in the North Region. The National Woodland Ownership Survey estimated that about 54 percent of family forest land was open only to family or friends and no others. Just 14.6 percent of the family forest area was open to the public with permission of the owner. Almost 8 percent of the family forest area was leased in the past 5 years for recreational uses. Percentages open to the public were highest in the North and Rocky Mountain Regions. Leasing was greatest in the Rocky Mountain Region.

Figure 41-3 shows area of family forest land by reasons for owning in 2006. Beauty appreciation is at the top with 65 percent of owners, followed by passing the land to heirs, gaining privacy,

protection of nature, and having it as part of a home or cabin site. Smaller percentages of owners considered owning forest land important because of hunting, fishing, or other recreation opportunities.

What has changed since 2003?

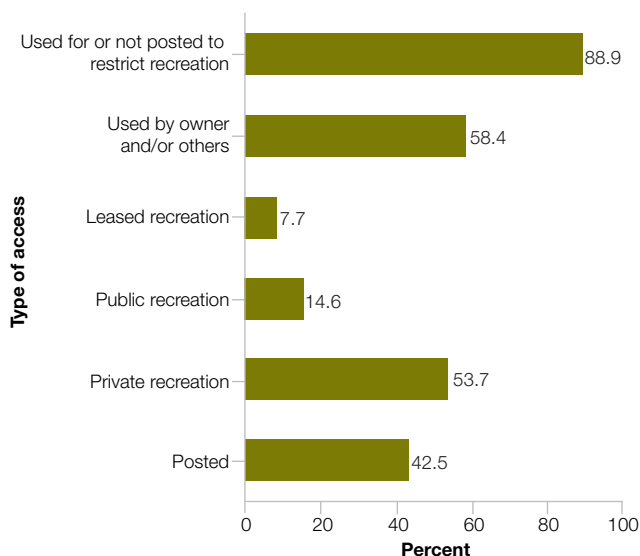
Total area of public forest land at all levels of government has increased slightly. Thus, the trend for public land available for recreation is up slightly. Percentages of nonindustrial land available to the public at large across U.S. regions, however, are modest and have been trending downward during the past several decades. From 1985 to 1986, nearly 25 percent of owners permitted some public access. This percentage dropped by 1995 to nearly 14.5 percent (Cordell 1999). In 2000 to 2001, it was estimated that only 10.9 percent of owners permitted access to the general public. The lowest percentage was in the West, at 8 percent, and highest was in the North, at 13 percent. Based on the National Woodland Ownership Survey, it was estimated that 14.6 percent of family forest owners allow public access. This estimate closely resembles those reported earlier, although the source is different and not directly comparable.

Are there important regional differences?

Almost all of the 751 million acres of forest land in the United States is open to someone for some form(s) of recreation. Almost 29 percent of this forest land is in the South, and just more than 28 percent is in the Pacific Coast Region, which includes Alaska. Almost 23 percent is in the North, followed by the Rocky Mountain Region with 20 percent. Most of the public forest land (especially Federal forests) is in the western two regions. Public lands in the West are essentially open to anyone for recreation, except for certain military or laboratory sites.

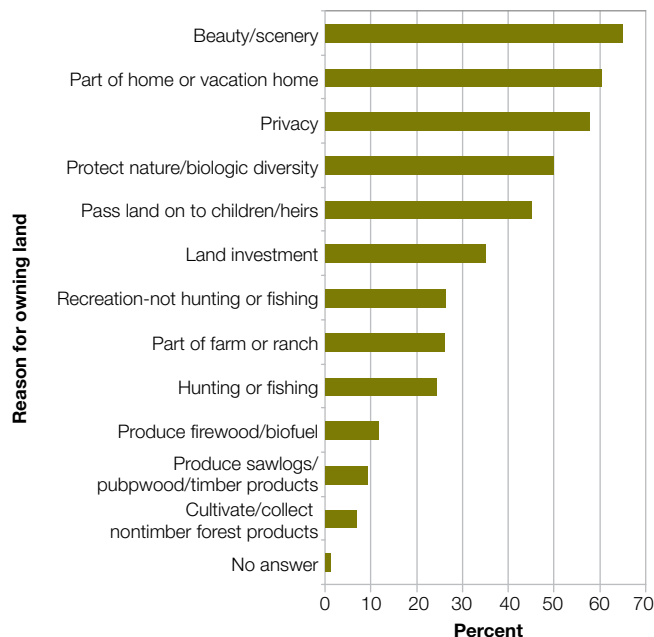
Most of the private land is in the Eastern States (North and South regions). Recreation use is more restricted on private lands than on public lands. The South has by far the greatest area of family or individually owned forest land in the United States, followed in order by the North, the Rocky Mountain and Pacific Coast regions. The North, however, has the greatest area of family forest land open to the general public, 17.2 million acres, 18.3 percent of the region's total. Next is the South with 12.2 million acres, 9.9 percent of the region's total family forest land. The South has the greatest area of family forest leased for recreation, at 12.4 million acres, or 9.7 percent. The next largest area of family forest leased for recreation is the Rocky Mountain Region at 4.1 million acres, 16.9 percent of family forest in that region.

Figure 41-2. Percentage of family or individually owned forest land area by category of recreational access, 2006.



Source: Butler 2008

Figure 41-3. Percent of family forest owners in the United States by reasons for owning, 2006 (excluding interior Alaska, Hawaii, Nevada, western Oklahoma, and western Texas).



Source: Butler 2008, includes owners who rated the objective as very important or important on a seven-point Likert scale, with seven defined as not important

Indicator 6.42. Number, type, and geographic distribution of visits attributed to recreation and tourism and related to facilities available

What is the indicator and why is it important?

Indicator 6.42 provides a measure of recreation and tourism use of forests. These activities are increasingly important as a source of forest-based employment and income. Engaging in outdoor recreation and tourism in forests tends to build support among participants for protecting and managing those forests, indirectly building support for sustainable forests. This indicator focuses on forest recreation visits, facilities, and capacities.

What does the indicator show?

Number of recreation visits to forests for selected recreation activities

The top 10 forest recreation activities, in terms of numbers of visits, are walking for pleasure; viewing and photographing natural scenery; viewing and photographing flowers, trees and other forest vegetation; viewing and photographing birds; viewing and photographing wildlife; day hiking; visiting wild areas; off-highway driving; family gatherings; and visiting nature

centers (table 42-1). The numbers of annual forest recreation activity days for these 10 activities (roughly equivalent to visits) range from a high of almost 7.5 billion (walking for pleasure) to just more than 680 million (visit nature centers, and so on). Snowmobiling, mountain climbing, cross country skiing, rock climbing, and snowshoeing account for a much smaller number of recreation activity days, but still they add up to a sizeable number of visits (ranging between about 20 to more than 62 million). Obviously, Americans are strongly interested in viewing and photographing forest natural life.

Over all activities listed in table 42-1, the percentage of forest-based activity days that occurs on *public lands* ranges from under 50 percent (for example, small-game hunting and gathering mushrooms and berries) to more than 75 percent (for example, visiting wilderness, day hiking, visiting nature centers, and backpacking). Over all activities, the percentage of forest-based recreation activity days that occur in *urban forests* ranges between roughly 15 to 45 percent. Activities with the lowest percentages in urban forests are hunting, camping, and backpacking. Activities with the highest percentages in urban forests include walking, picnicking, family gatherings, and visiting nature centers. Public lands and urban forests clearly play significant roles in providing opportunities for outdoor recreation.

Table 42-1. Millions of annual forest recreation activity days by activity and estimated percentages on public forest lands and in urban forests, 2007–2008.

Forest Recreation Activity	Number of Activity Days (millions)	Public Forest (percent)	Urban Forests (percent)
Walking for pleasure	7,493.3	53.8	44.5
Viewing and photographing natural scenery	6,170.6	61.9	31.8
Viewing and photographing wildflowers, trees, and so on	4,858.9	55.4	36.3
Viewing and photographing birds	3,738.3	51.3	37.6
Viewing and photographing other wildlife	3,086.8	57.7	32.2
Day hiking	1,234.8	76.2	34.0
Visiting a wilderness or primitive area	947.6	76.4	24.6
Off-highway driving	837.5	50.4	23.2
Family gathering	805.3	55.9	43.5
Visiting nature centers, and so on	683.8	77.6	45.2
Gather mushrooms, berries, and so on	623.4	47.9	32.3
Mountain biking	463.3	60.2	32.1
Picnicking	455.9	68.4	44.4
Developed camping	356.0	72.8	21.3
Big game hunting	279.8	45.7	16.5
Primitive camping	211.4	75.8	21.4
Backpacking	198.8	78.5	22.1
Visiting historic sites	182.8	60.0	39.1
Horseback riding on trails	177.5	50.8	34.4
Small game hunting	161.5	46.8	17.4
Visiting prehistoric/archeological sites	138.9	70.0	41.6
Snowmobiling	62.1	55.1	27.4
Mountain climbing	57.1	78.6	20.5
Cross country skiing	41.9	60.5	33.7
Rock climbing	34.1	68.8	26.9
Snowshoeing	19.9	60.2	27.6

Source: National Survey on Recreation and the Environment, 2005–2008 (historical data specific to forest-based recreation were not available, thus, the trend in figure 42.3 below is for all outdoor recreation)

Number and capacity of recreation facilities in forests for selected types of recreation activities

Across the United States, more than 6,000 Federal campgrounds exist; most are in the West, especially in the Rocky Mountains/ Great Plains and Pacific Coast, where Federal lands are abundant. Private sector businesses in the United States analyzed for this indicator include recreational vehicle parks and campgrounds, snow skiing areas, marinas, historic sites, nature parks and similar sites, and sightseeing and related tourism transportation services.

In 2005, an estimated 1,586 privately operated forest-based RV parks and campgrounds existed. More than 180 forest-based, privately run, snow skiing facilities existed in 2005, mainly downhill ski slopes. Most of these skiing facilities were in the North Region. Privately operated historic sites in forested areas were estimated at about 330, almost all of which, 89 percent, are in the East. Estimated number of private, forest-based nature parks and similar sites in the United States was about 200 nationally, of which about 77 percent are in the East, mostly in the Northeast portion of this region. Nearly 160 private forest-based scenic and sightseeing transportation businesses existed, mostly in the East.

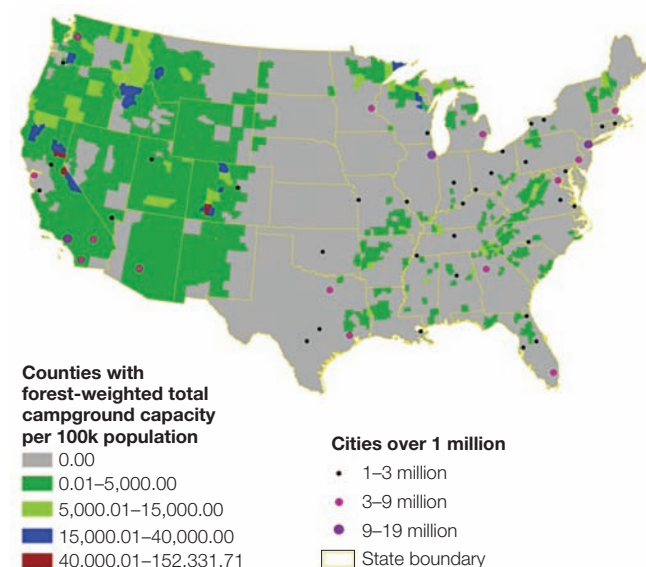
Figure 42-1 shows the county-level distribution of Federal forest campground capacity relative to county population and the location of major cities. The greatest amount of Federal forest campground capacity is in the southern Appalachian

Mountains, the Ozarks, the Great Lakes area, the southern Rocky Mountains, California, and the Pacific Northwest. Figure 42-2 shows the distribution of private sector capacities summed across a variety of forest-based recreation and tourism businesses. The greatest concentrations of forest-based recreation and tourism businesses are in the New England States, the Great Lakes area, the Pacific Northwest, California, and the southern Rocky Mountain Region. Private facilities, sites, and services are also scattered throughout the Southeast. Many of these businesses are located near Federal and State public lands. Significant amounts of the private forest recreation capacity mapped here lies within a 2-hour drive of U.S. population centers of 1,000,000 or more (shown as red dots and scaled by size).

What has changed since 2003?

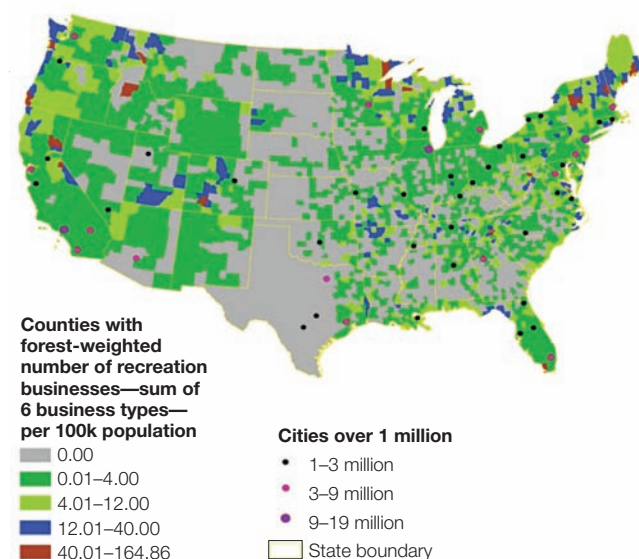
Overall, between 2000 and 2007, the trend has been increased participation in outdoor recreation overall. As reported in *Forest History Today* (Cordell, 2008), the total number of people who participated in one or more outdoor activities grew by 4.4 percent between 2000 and 2007 (fig. 42-3). At the same time, the number of recreation activity days, summed across all activities, increased by approximately 25 percent. (Trend data for forest recreation only were not available.) The number and capacity of public and private forest-based recreation sites have remained about constant or increased slightly.

Figure 42-1. Location of forest-based Federal campground capacity per 100,000 people.



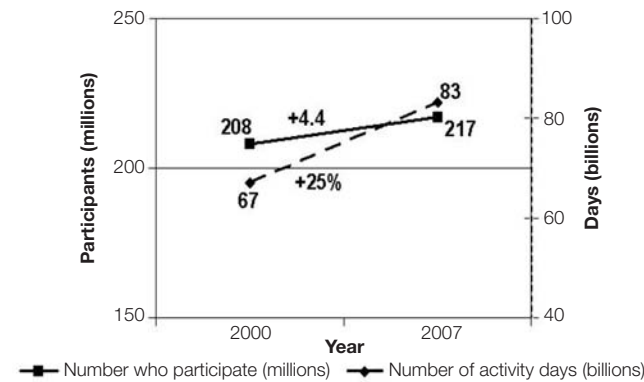
Sources: The primary source is the U.S. Census Bureau, County Business Patterns, 2001 and 2005

Figure 42-2. Location of cities and forest-based recreation businesses (5 types) per 100,000 people.



Sources: USDA Forest Service and U.S. Census Bureau

Figure 42-3. Growth in number of people and number of recreation activity days in 60 outdoor recreation activities in the United States, 2000–2007 (reproduced from Cordell 2008).



Source: Cordell 2008

Indicator 6.43. Area and percent of forests managed primarily to protect the range of cultural, social, and spiritual needs and values

What is the indicator and why is it important?

This indicator measures the area of forest land managed primarily to protect cultural, social, and spiritual values. These values are important dimensions of social well-being for people concerned about forests—whether they live in or near forests or at great distances from them. Where people with unique needs for cultural, social, or spiritual values are only able to meet their needs in unique places; this places a premium on the protection and management of those locations.

What does the indicator show?

Americans favor protecting wild forest areas. Primary reasons for wanting protection are for air quality, water quality, and wildlife habitat, use by future generations, protection of unique plants and animals, and for protection of rare and endangered species. People living in different regions of the country differ very little in what they value about protected wilderness and other public lands (Cordell, 2008—<http://warnell.forestry.uga.edu/nrrt/nsre/IRISWild/IrisWild1rpt.pdf>).

Protected public forests

Government-owned forest land in the United States by region is listed in table 43-1. This indicator assumes that all government land is protected to some degree. An estimated 328 million acres of Federal, State, or local government forest land exist in the United States, about 44 percent of U.S. total forest area (USDA Forest Service, 2007).

The World Commission on Protected Areas (WCPA) employs a classification system to categorize protected natural areas. Using this system of categories, protected public forests in the United States are described. WCPA Category 1a (science natural areas) is represented by experimental forests across the country. A total of more than 940,000 acres of forest are designated as experimental forests in the United States. More than 58 percent of the total experimental forest area is in the Pacific Coast region; about one-fourth is in the Rocky Mountain Region. Experimental forests represent about 0.1 percent of the United States’ total forest area. Table 43-1 also shows acres of public forest land in WCPA Categories Ib through VI. Just more than 20 percent of public forest is protected as wilderness (National Wilderness Preservation System,

Table 43-1. Acres (in 1,000s) and percent of public forest by region and by category using the World Commission on Protected Area (WCPA) classification system. (Percentages sum down to 100, except in the last column, where they represent all 751 million acres of U.S. forest land, both protected and not protected.)

WCPA Category	North		South		Rocky Mountains		Pacific Coast		U.S. Total		All U.S. Forest (percent)
	Acres	(%)	Acres	(%)	Acres	(%)	Acres	(%)	Acres	(%)	
Ia: Strict nature reserves	86.5	0.2	71.2	0.2	233.8	0.2	548.7	0.4	940.2	0.3	0.1
Ib: Wilderness	1,559.1	3.5	2,384.9	8.3	21,338.7	18.9	40,853.1	28.6	66,135.9	20.2	8.8
II: National parks	951.9	2.2	2,941.5	10.3	7,836.1	6.9	10,124.5	7.1	21,854	6.7	2.9
III: Natural monuments	3.7	0	28.7	0.1	865.2	0.8	423.0	0.3	1,320.7	0.4	0.2
IV: Habitat/species management	1,563.8	3.6	3,440.9	12	7,226.7	6.4	31,083.0	21.8	43,314.4	13.2	5.8
V: Protected landscape/seascapes	179.9	0.4	332.9	1.2	0	0	33.8	0	546.6	0.2	0.1
VI: Managed protected areas	39,634	90.1	19,479	67.9	75,255	66.7	59,720	41.8	194,087	59.1	25.8
All public forest	43,979		28,679		112,755		142,786		328,199		43.7

Sources: Include Government agencies, <http://wilderness.net>, USDA Forest Service, 2009 (appendix table 2)

Category Ib), just under 7 percent, is in national parks (Category II), and 0.4 percent of public forest area is designated as natural monuments. Of government-owned U.S. forest, 13 percent is in WPCA Category IV, mainly wildlife refuges; and 0.2 percent is within the boundaries of protected national lakeshores and seashores. The largest category of government protected forest (Category VI) includes managed lands such as national forests, BLM lands, and other State and local government lands. This category makes up almost 60 percent of total U.S. protected public forest lands. The region with the greatest acreage of government-owned forests is the Pacific Coast Region, which run from California to Alaska, and include Hawaii. The next highest government-owned acreage is in the Rocky Mountain Region.

Protected private forests

Conservation of private land through land trusts has been increasing during the past few years. Figure 43-1 shows the increase in State and local trusts. The National Land Trust Census Report indicated that total acreage conserved through private means in 2005 was 37 million acres, representing a 54-percent increase, since 2000. This acreage includes land protected by local and State land trusts, and land protected by large national land conservation groups. Examples of large national groups include The Nature Conservancy, Ducks Unlimited, The Conservation Fund, and The Trust for Public Land.

A land trust is a nonprofit organization that actively works to conserve land through conservation easements, direct fee simple acquisitions or by stewardship of easements. The Land Trust Alliance of the United States has been organized to unite organizations in local communities for natural area conservation (<http://www.landtrustalliance.org>). Internationally, organizations such as the World Commission on Protected Areas works within the framework of the United Nations to track and stimulate countries around the globe to designate forests and other lands as protected areas.

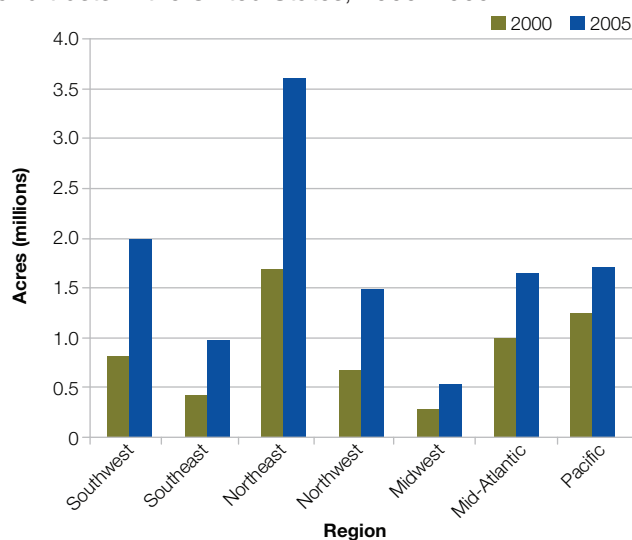
The Forest Legacy Program (FLP) is a Federal program managed by the Forest Service in partnership with States. This partnership is aimed at protection of environmentally sensitive private forest lands. Mostly, FLP easements restrict development and require sustainable forestry practices. FLP can also directly support land acquisition. As of 2008 in the United States, almost 1.6 million acres of privately owned forest land have been protected (table 43-2). About 85 percent of this national total (roughly 1.3 million acres) has been protected through State-level conservation easements (FLP supported specifically). Another 0.2 million acres (about 15 percent) was protected through fee simple acquisition. Much of this protected private forest land is in the North Region, more than

70 percent. By far, the State of Maine was the most successful single State in protecting forest land through the FLP. Maine's program added well more than 600,000 acres through easements and purchases. New Hampshire and Montana were the next largest States for protecting forest land.

What has changed since 2003?

A significant total area of forest land has been added to the U.S. experimental forest system (national increase of 65 percent since 2003). Much of this increase has been in the Pacific Coast Region, mainly by adding a Hawaiian tropical forest (almost 313,000 acres of State land) and more than 7,000 acres of the Tahoe National Forest in California. Slight losses of public land overall in the North and South are primarily reflecting differences in land area estimation methods between the different time periods. For private forest land, a dramatic increase has occurred since 1985 in the total private forest acres protected through trusts and easements.

Figure 43-1. Private land protected by local and State land trusts in the United States, 2000–2005.



Source: National Land Trust Census Report for 2005

Table 43-2. Total private forest acres protected by conservation easements or fee simple purchases through the Forest Legacy Program as of February 2008 by Resource Planning Act (RPA) Region.

RPA Region	Protected Acres	Percent
North	1,116,810	70.9
South	114,099	7.2
Rocky Mountain	281,209	17.8
Pacific Coast	64,176	4.1
U.S. Total	1,576,294	100.0

Source: USDA Forest Service, Forest Legacy Program (http://www.fs.fed.us/spf/coop/programs/loa/flp_projects.shtml)

Indicator 6.44. The importance of forests to people

What is the indicator and why is it important?

Forests are important to people for a wide variety of reasons. Research studies have enumerated the breadth of values that people associate with forests. These values are provided, to greater and lesser degrees, by different types of forests, groves of trees, and even by individual trees. The lists suggest a mix of values that extend from consumptive to nonconsumptive uses and include items that relate to economic, ecological, and social benefits.

This indicator provides information on the range of values communities and individuals hold for forests. These values shape the way people view forests, including their behaviors and attitudes toward all aspects of forest management. This indicator can be used to help understand regional or demographic differences in the importance of trees and forests to people and to monitor changes in perception of the importance of trees and forests over time.

What does the indicator show?

Over the course of 2008, 26 focus groups with 202 individuals were conducted with a diversity of populations across the United States to determine similarities and differences with respect to the importance of forests. Diversity was represented by age, gender, geographic location, race, and ethnicity. The sample consisted of: six college student focus groups, five groups of urban African Americans, two groups each of urban high school students, Native Americans, and rural adults; and one group each of rural high school students, urban Arab Americans, urban senior citizens, Asian Americans, Hispanic Americans, and Caucasians.

Participants offered a very wide range of reasons why forests were important to them personally and to their communities (table 44-1). The depth and breadth of the discussions support and expand on earlier research indicating trees and forests are important to Americans in diverse ways and they are able to clearly articulate this importance.

Focus group participants also discussed ways their interactions with trees and forests have changed over their lifetime, (table 44-2), negative feelings they have about forests (table 44-3) and concerns they have about forests (table 44-4).

The results of the focus groups clearly indicate that forests are important to Americans in many ways and that a broad cross-section of Americans are able to articulate these factors. The results also show that Americans have multiple concerns about the future of forests.

Although many similarities exist across the diverse focus group participants, the data suggest some differences based on race and ethnicity (feelings of exclusion and fear associated with forests among African-Americans), rural versus urban geography (rural respondents were more concerned with forest policy and management issues and forest degradation and urban respondents were more concerned with damage to their home), and age (younger respondents actively interacted with forests and to older respondents aesthetics and the trees they could see out their windows were more important). These differences

Table 44-1. Frequency of mention by categories of importance of trees and forests to individuals and their communities.

Category	Descriptors	Frequency
Environmental/Biological		406
Animals	Wildlife/animals	75
Air	Breathing, cycle	69
Shade	Shade in summer	60
Water	Water, clean, cycle	51
Processes	Succession, C, N, fire	39
Ecological relationships	Links, phenology	30
Shelter		28
Climate change	Global climate change	11
Plants	trees and other plants	9
Cultural Heritage		320
Memories	Memories, childhood	78
Community	Unite, pride, patriotism	82
Family relations	Associate with family	62
Traditional knowledge	Rural, TEK, medicine	43
Community service	Service trip, planting	31
Literature and folklore	Fairytales, archetype	20
Products		287
Wood products	Fuel, timber, material	176
Nonwood Products	Medicine, food, fish, and so on	87
Recreation		271
Nonconsumptive activities	Camping, hiking, play	189
Consumptive activities	Hunting, fishing, etc.	58
Adventure	Exploring, challenge, risk	24
Sense of Place		200
Identity	Community, history	74
Attachment	Rootedness, part of life	67
Individual trees	Favorite tree, neighbor	38
Dependence	Nearby nature, daily use	20
Health and Well-being		199
Psychological benefits	Quiet, comfort, refuge	112
Well-being activities	Sensory, reading, etc.	64
Aesthetics	Beauty, splendor	160
Spiritual	Happiness, growth, intrinsic, stewardship	114
Diversity		80
Habitat		35
Biodiversity		22
Forest type		18
Economics	Revenue, livelihood	72
Education		67
Privacy	Separation, borders	33

TEK = Traditional Ecological Knowledge.

Note: Frequencies within categories do not sum to the total because some responses were coded to the first-level category only.

reinforce the need to reflect the demographic diversity of the United States when considering the acceptability of forest management activities focused on sustainability.

Why can't the entire indicator be reported at this time?

Although this research has provided a number of categories and descriptions of values related to the environment and forests, no studies were found presenting a statistically robust national sample that would allow for analysis of differences in values

based on geographic location across the country, ethnicity, occupation, age, urban or rural residence, gender, or many other socio-demographic or cultural variables. In addition, no known studies have documented the intensity, structure, or correlation of values for forests at this scale. Finally, no known research exists that has monitored how these values change over time. Future research is needed to provide this information and develop a protocol to elicit information that can be replicated over time to monitor trends in these values across population segments.

Table 44-2. Changes in people's interactions with trees and forests over their lifetime.

Changes over lifetime	Frequency
Interactions/perspectives: more/less interaction, care more, understand more	125
Reduced natural resources: fewer fish/wildlife, water trees	42
Policy/Politics: more conservation, less access, more management, loss of rights	23
Competition: competing resources, development	17
Economic changes: increased costs, fewer rural jobs	6
Pollution: trash, traffic, noise	4
Increased natural resources: more fish/wildlife, water, trees	3

Table 44-3. Negative feelings people have about trees and forests.

Changes over lifetime	Frequency
Tree/home interactions: fall on house, disturb plumbing, maintenance costs, leaf litter	59
Safety and fear: being lost, images of lynching	29
Animals: bugs, spiders, disease, negative wildlife interactions	32
Plants: poison ivy, allergies, invasive species, thorns	22
Management: privatization, restricted use, lack of management, deforestation	20
Restricted use/exclusion: feeling "out of place," discriminatory, exclusionary	16

Table 44-4. Concerns people have about trees and forests.

Changes over lifetime	Frequency
Degradation: pollution, GMOs, plantations, fire, clearcutting, fragmentation, land conversion	143
Sustainability: use of resources, environmental effect, human overpopulation	73
Management and policy: mismanagement, loss of grazing rights, activism, local knowledge	58
Forest condition: changes, disturbance regimes, invasive species, global warming	57
Lost connections: detachment, shallow understanding, less experience with large forests	43
Competition: competing resources, development	24
Economics: jobs, livelihoods, revenue	8
Urban ecosystems: development, lack of trees in urban areas, urbanization	6

GMO = genetically modified organisms.