Criterion 6:

MAINTENANCE AND ENHANCEMENT OF LONG-TERM MULTIPLE SOCIOECONOMIC BENEFITS TO MEET THE NEEDS OF SOCIETIES

Montréal Process Criterion 6 (Montréal Process Working Group 2010); Northern Area Forest Sustainability Indicators 12.1-12.5, 13.1-13.6, 14.1-14.5, 15.1–15.6, 16.1–16.5 (USDA FS 2010d)

The importance of long-term multiple socioeconomic benefits from forests

Forests provide an array of products and services that maintain and enhance benefits to our society and economy. Benefits derived from forests may be categorized into wood products, nontimber products and services, and ecosystem services. The value and volume of these products and services indicate the importance of forests for a wide variety of uses. Tracking

Key Findings for Criterion 6

- Estimated per capita consumption of wood products in the Northern States is 71 cubic feet. A growing population will increase total demand for wood products.
- Northern forests are a major source of wood products, but imports are expected to continue to supply a sizeable amount that is consumed.
- The largest forest products groups are hardwood, saw logs, and pulpwood.
- Most harvested wood is from hardwood species.
- Primary wood products manufacturing in the North had an estimated added value to the economy of $52 billion or 41 percent of the $124 billion value added nationally in this sector.
- From 2002 to 2006 investment in wood products manufacturing increased while investment in pulp and paper production declined.
- In the Northern States 441,000 workers are employed in forest management, logging, forest products, and pulp and paper industries. This is about 40 percent of the 1.1 million employees nationally in these industries.
- Wages for forestry jobs vary with large differences among States, but the average wage for the region is close to the national average.
- The number of injury cases recorded by the forestry and logging, wood product manufacturing, and pulp and paper industries has declined in recent years.
- Logging is the most risky forestry job. The fatality rate in the Northern States is close to the national average.
- Common nontimber forest products in the region include edibles (such as maple sap, nuts, berries, and mushrooms) and decorative materials (such as floral items, boughs, cones, vines, moss, and lichens).
- The North is the source of nearly all U.S. commercial maple syrup production.
- The most common nature-based recreational activities in northern forests are walking for pleasure; family gatherings; viewing/photographing scenery, wildlife, flowers; picnicking; sightseeing; and driving for pleasure.

values, volumes, and employment through the production process—from the forest to the end of secondary processing or other utilization—explains a key dimension of the socioeconomic contributions that forests make to local, regional, and national economies.

A holistic evaluation of the socioeconomic benefits from forests necessarily includes contributions from ecosystem services as well as market values for wood and nontimber products. In the absence of working markets, the value of ecosystem services can be difficult to quantify. Nevertheless, previous sections present detailed qualitative information about key ecosystem services such as carbon sequestration, watershed protection, and sustaining biological diversity. The following section gives greater—but not exclusive—attention to products and services that can be quantified through actual markets, payments to landowners, or other estimates of value. For example, forest-based and forest-related employment is a tangible and widely understood measure of economic and social well-being. Similarly, declining on-the-job injury rates reflect improved employment quality, which provides personal and community benefits.

The indicators reported here summarize the best available data to report revenues or economic activity associated with producing (or consuming) important commodities and ecosystem services, but may not be full measures of all the values that forests supply to society. Many such values are not reflected in market transactions, and market prices fail to fully capture the total contribution of forests to human well-being. The value of ecosystem services from urban and community forests is addressed in detail in subsequent sections.

Indicators of socioeconomic benefits from northern forests

Consumption of wood and wood products

Consumption of wood and wood products reflects the importance of forests as a source of raw materials. Comparison of consumption and production of wood and wood products illustrates the balance (or lack) between supply and demand. Most timber harvesting in the United States is in response to demand for the wood products that people use in their daily lives.

Total U.S. consumption of timber products including wood products, paper products, and fuelwood was 21 billion cubic feet in 2005 (Fig. 40), equivalent to 71 cubic feet of wood per person (Fig. 41) (also see The Wood You Consume, page 5). Over the past 40 years, per capita annual consumption has ranged from 67 to 83 cubic feet, gradually decreasing since 1987. However, because of population growth, total U.S. consumption of wood products over the past 40 years increased from 13 to 21 billion cubic feet. Consumption statistics are not commonly disaggregated below the national level, so we have assumed that the North consumes about 42 percent of the Nation's timber products because it has about 42 percent of the Nation's population.

Socioeconomic Benefits of Forests

The economic value placed on forests reflects the benefit that society derives from them, as indicated by the prices paid for marketed goods and the values estimated, often by indirect measures, for nonmarketed goods. For example, the value of timber products is partly given by the price of those goods in the market. Conversely, the value of recreation on public forest lands is not easily measured in dollars spent, but surveying recreationists can provide measures of willingness to pay. Observing time and money invested for traveling to and from a recreation site can provide travel-cost estimates. In addition, many people seek the scenic views, privacy, and quiet that come from living near a park or natural area, especially in crowded urban settings; the value of these areas can be estimated by determining the premium paid for adjacent lots. Using such methods can help to account for the many values forests have for society.

Economists often classify the value of forests in the following categories (Pearce 2001):

- DIRECT USE VALUES—Values from the consumptive and nonconsumptive uses of products and services such as timber, fuelwood, tree sap, or recreation.
- INDIRECT USE VALUES—Values from various forest services, such watershed protection, storage of carbon, and provision of wildlife habitat.
- OPTION VALUES—Values from desiring to conserve the option for future use even though not taking advantage of current availability; for example, although many individuals may not visit some forests, they value knowing that they could one day enjoy them.
- NON-USE VALUES—Values from individuals supporting forest conservation and sustainability; unrelated to current or planned use of the forest, this is also known as existence or passive value.

FIGURE 40

U.S. timber products consumption by year and product class (Howard 2007).

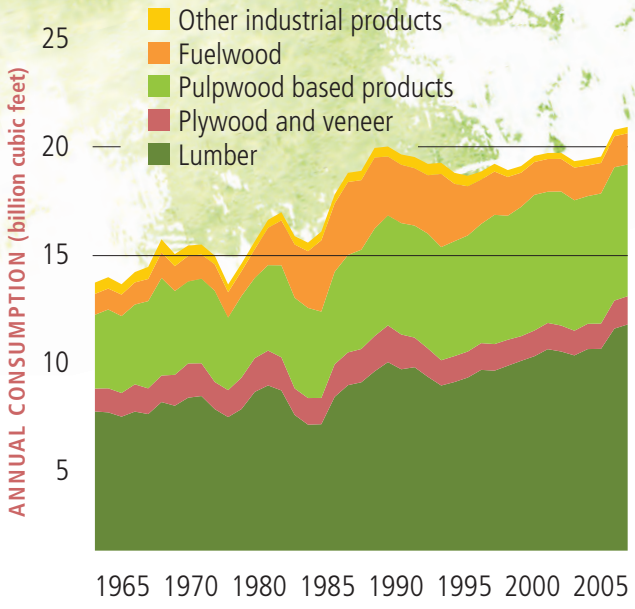
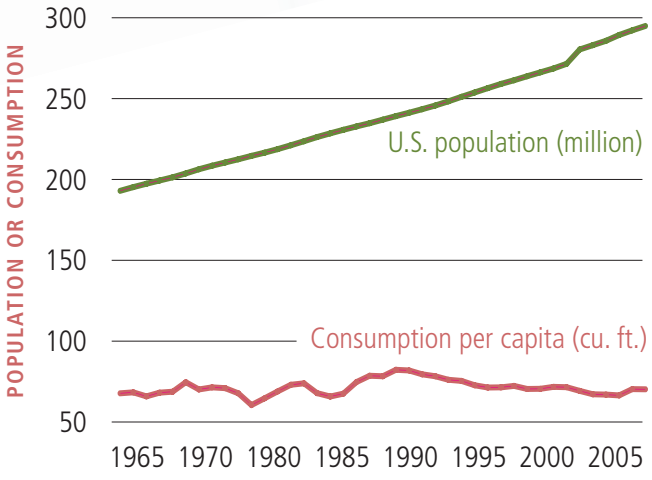


FIGURE 41

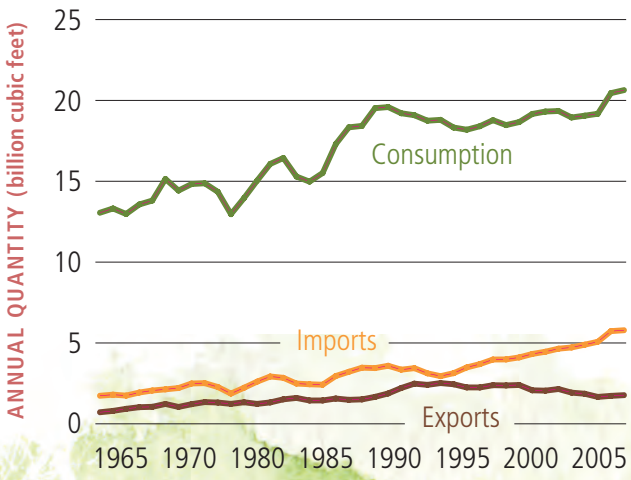
U.S. population and per capita consumption of timber products including wood products, paper products, and fuelwood (Howard 2007, U.S. Census Bureau 2009).



U.S. consumption of timber products is met by a combination of domestic production and net imports (imports in excess of exports). With increased population growth and consumption, imports have increased to supply a greater share of the U.S. wood products market. In 2005, 20 percent of total U.S. wood consumption was from imports (Fig. 42).

FIGURE 42

Total U.S. consumption, imports, and exports of timber products (Howard 2007).



Assessing the Direct Value of Wood Product Manufacturing with the North American Industry Classification System

Information on U.S. product manufacturing is maintained by the U.S. Census Bureau, which classifies wood products under North American Industry Codes (NAICS) 113, 321, 322 and 337.

NAICS 113 industries are involved in growing, cutting, and transporting timber; and in producing wood chips in the field. This includes traditional forestry and logging operations. Because production cycles for NAICS 113 establishments are 10 years or more, Christmas trees and other short-rotation products are classified as crop production, and not included in NAICS 113.

NAICS 321 includes establishments that manufacture wood products such as lumber, plywood, veneers, wood containers, wood flooring, wood trusses, manufactured or mobile homes, and prefabricated wood buildings. NAICS 322 includes industries that make pulp, paper, or converted paper products. Converted paper products include stationary, paperboard, bags, boxes, and other items manufactured from pulp and paper. Together, NAICS 321 and 322 comprise information for the primary wood products manufacturing sector.

NAICS 337 includes manufacturers of furniture and related products such as mattresses, window blinds, cabinets, and fixtures. NAICS 337 captures some of the activity in the secondary wood products manufacturing sector, but does not differentiate wood-based products from other products. Consequently, we exclude information from NCAIS 337.

Value and volume of wood and wood products production

The value of wood products produced by the wood products industry (North American Industry Classification - NAICS 321) and the pulp and paper industry (NAICS 322) was estimated at $281 billion nationally and $112 billion (40 percent) for the Northern States in 2006. Added value of primary wood products manufacturing—calculated by subtracting the cost of manufacturing from the value of shipments—was $124 billion nationally and $52 billion (41 percent) for Northern States.

Table 9 shows the volume of roundwood processed by product categories for Northern States. Roundwood is a term used to represent logs, bolts, or other round sections cut from trees for industrial or consumer use, either in the original round form (such as transmission poles or pilings) or as raw material to be manufactured into sawn wood, panel products, paper, or other industrial products (Stokes et al. 1989, Food and Agriculture Organization 2010).

Northern States produced 3.0 billion cubic feet of roundwood in 2007, 2.3 billion (76 percent) from hardwoods and 0.7 billion from softwoods (Fig. 43). The region's primary roundwood products are hardwood saw logs, pulpwood, and fuelwood. Saw logs are logs whose size and quality meet regional standards to be sawn into boards. Pulpwood is roundwood used as a source of wood fiber in a pulp mill. Fuelwood is

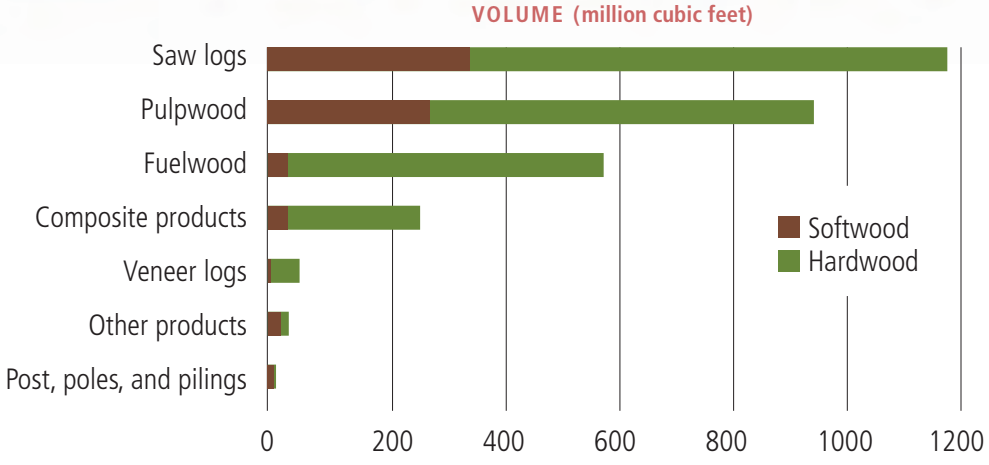


FIGURE 43
Volume of roundwood products by end use in the Northern States, 2007, based on U.S. Forest Service timber product output reports (USDA FS 2011i).

Table 9—Volume of roundwood products by State and type of products, 2006, sorted from most to least total roundwood production (USDA FS 2011i).

State and region	Total roundwood products	Saw logs	Veneer logs	Pulp-wood	Composite products[a]	Posts, poles, and pilings	Fuel-wood	Other products
	(million cubic feet)							
Maine	563	203		239			121	
Wisconsin	414	100	6	219	43	2	38	7
Michigan	373	128	8	135	66	4	30	2
Minnesota	326	48	1	124	113	<1	39	<1
New York	243	82	4	76	3	<1	77	<1
Pennsylvania	223	119	19	64		1	6	13
Missouri	166	113	1	7		1	36	7
West Virginia	164	104	10	6	35	2	5	1
Indiana	108	68	3	2		<1	34	1
Illinois	96	35	1	1		<1	56	3
Ohio	76	48	<1	24			4	1
Vermont	61	33		10			18	
Maryland	60	28		11			20	
Massachusetts	50	7		1			41	<1
New Hampshire	42	25	1	11			5	<1
Iowa	26	15	1			<1	10	<1
New Jersey	26	1		<1		<1	25	
Connecticut	13	5		<1			7	
Delaware	9	4		5			<1	
Rhode Island	5	1					3	
North total	3,045	1,168	56	938	261	12	576	35
U.S. total	14,990	7,179	1,211	4,394	544	100	1,408	155
North as percent of U.S. total	20	16	5	21	48	12	41	23

[a]*Many of the products in the composites category are made from logs in the pulpwood size class.*

wood mill residues, cull logs, and branches used to fuel fires in a boiler or furnace (Stokes et al. 1989). Other products from Northern States are wood composites including particle board, oriented strand board, and other engineered wood products made using adhesives; logs sliced for veneer; and fence posts, utility poles, and pilings. Only a small portion of roundwood is manufactured into composite products, even though during manufacturing they can deliver greater added value per unit of wood than saw logs, pulpwood, or fuelwood.

Production of wood products in the North has fluctuated over time (Fig. 44). Total roundwood production peaked in the late 1980s, driven primarily by increased harvesting for fuelwood, saw logs, pulpwood, and composites. Saw log harvesting peaked in 1996, driven by increased standing inventory (especially select oak species and hard maples), demand from the kitchen-cabinet and pallet industries, and exports (Luppold and Bumgardner 2008). Since then, lumber production and harvesting of saw logs have stagnated because of increasing pressure from low-cost imports of finished products. Growth in production in the region appears to be driven by smaller manufacturers producing more customized products (Luppold and Bumgardner 2008). Although northern roundwood production includes 15 major species groups, about two-thirds is from oaks, aspens, maples, spruce, and pines (Fig. 45).

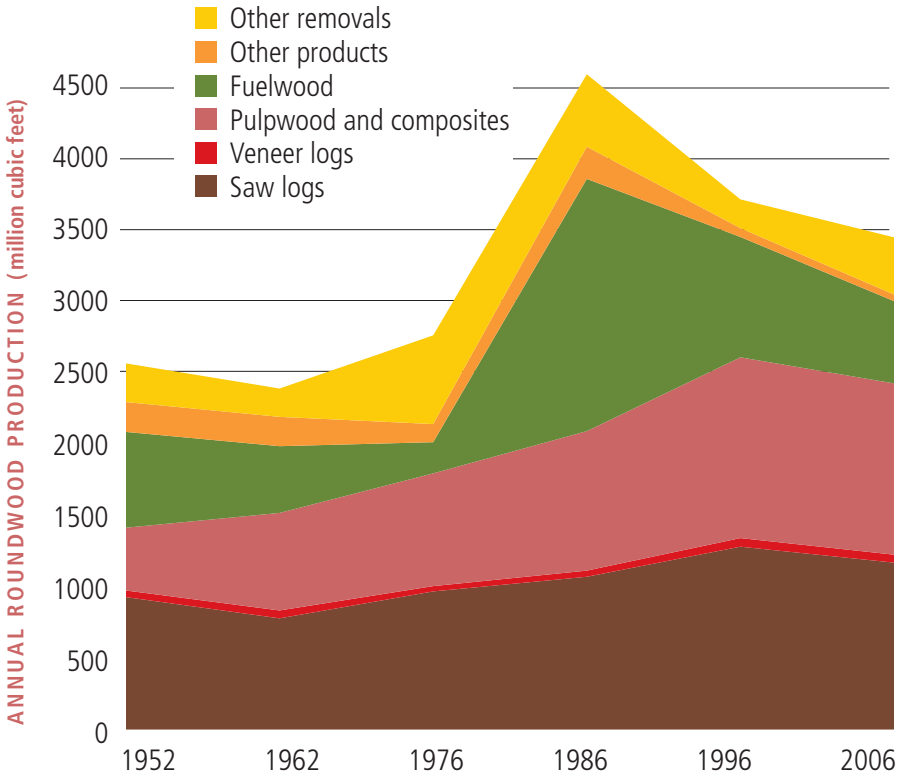
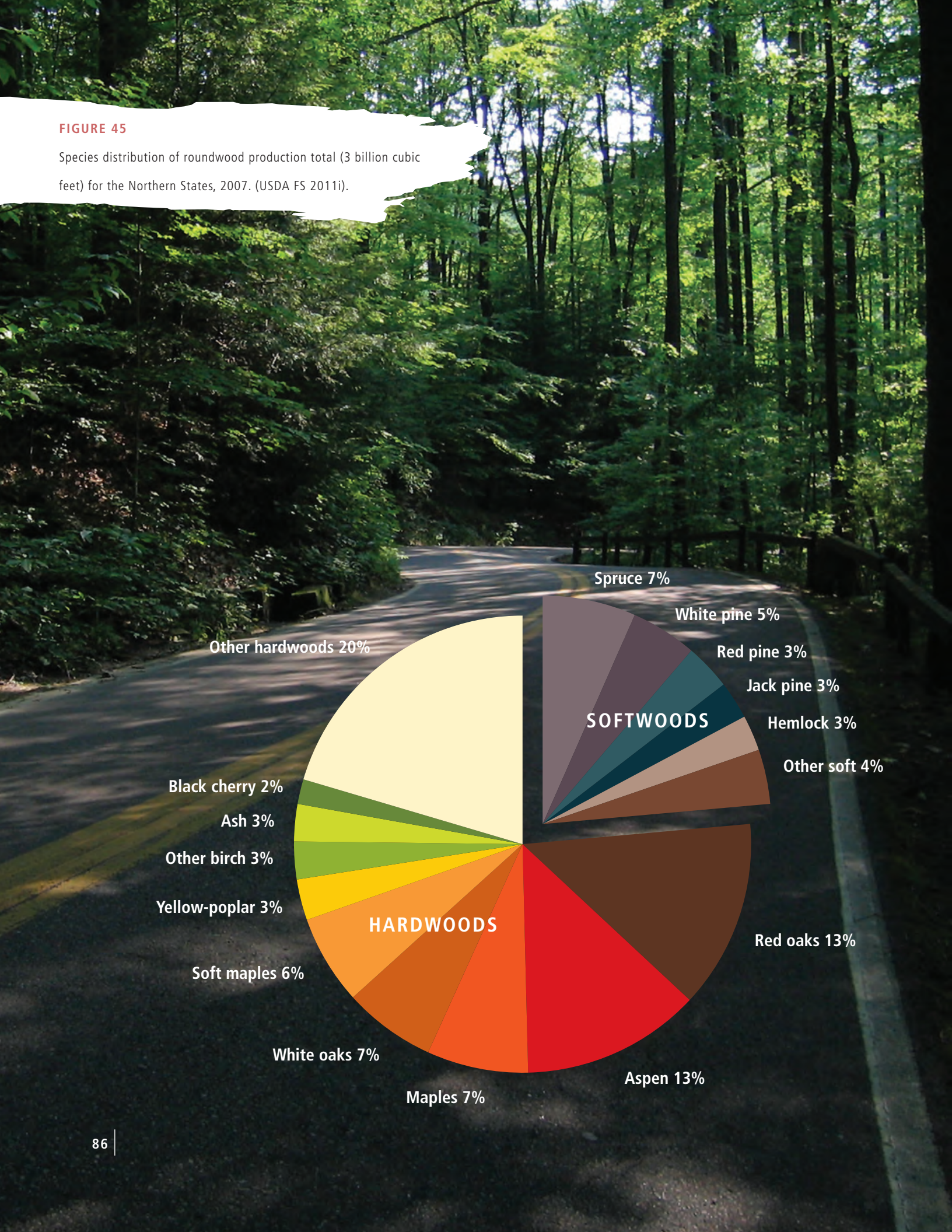


FIGURE 44
Production of roundwood products in the Northern States, 1952 to 2006 (Smith et al. 2009).

FIGURE 45

Species distribution of roundwood production total (3 billion cubic feet) for the Northern States, 2007. (USDA FS 2011i).



Recovery or recycling of wood products

Recovery and recycling wood products allows a country or region to maintain or increase consumption without harvesting more trees. Increased recovery and recycling can help reduce environmental impacts associated with harvesting, transporting, and processing trees and can reduce the quantity of materials sent to landfills. The recovery rate is the quantity of material recovered and recycled divided by the amount of sourced product. A high annual recovery rate implies high efficiency in using resources, an important step toward achieving forest sustainability.

Pulp and paper product recovery has become an important activity in Northern States, with both the recovered amount and the recovery rate increasing substantially since the 1970s. From 1976 to 2004, the amount of recovered paper nearly doubled (from 8.7 to 16.4 million tons), mirroring national trends (Fig. 46). Data from the Paper Industry Association Council (2009) indicate that northern access to curbside recycling was higher than the national average.

Recycling is also common for other wood products. Most residues from the U.S. wood products manufacturing process are converted into fuel or engineered wood products (Ince 1996). Recovery of shipping pallets is a widely adopted and financially sound practice. More than 1,000 U.S. firms are in the business of pallet recycling (Recycler's World 2009). As a result of increased efforts toward recycling, less than 1 percent of pallets are landfilled each year (Bush et al. 2007).

Nontimber forest products

In 2007, nontimber forest product sales in the United States had an estimated retail value of $1.4 billion or about $4.50 per capita. Edibles, decorative materials, medicinal plants, cultural items, and landscaping materials amounted to

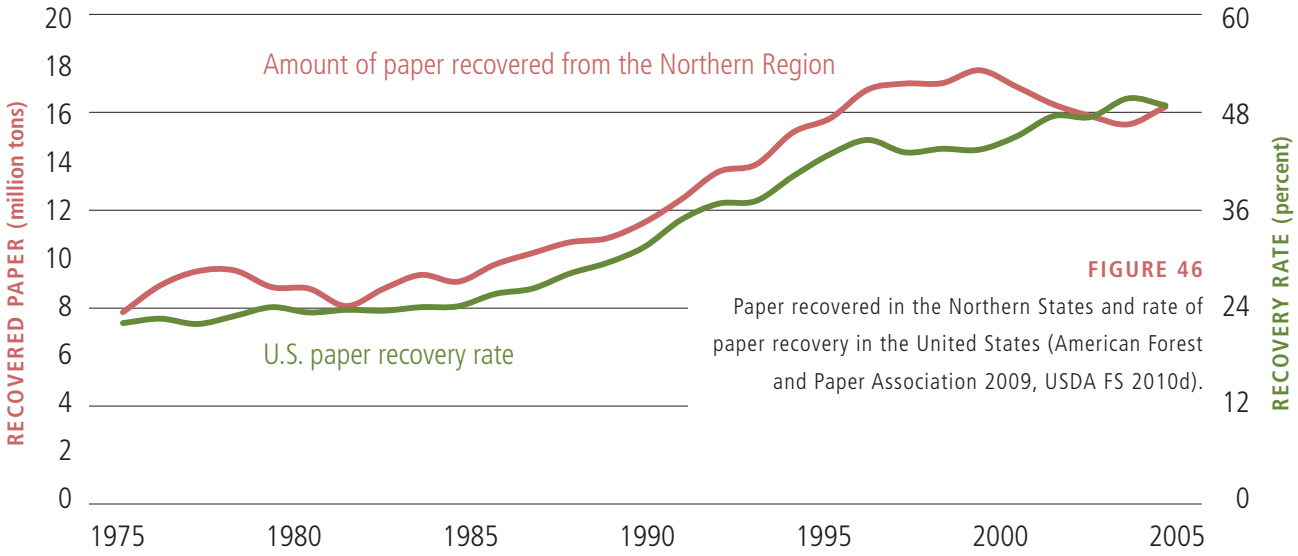


FIGURE 46
Paper recovered in the Northern States and rate of paper recovery in the United States (American Forest and Paper Association 2009, USDA FS 2010d).

roughly $468 million of that total (Alexander et al. 2011, USDA Forest Service 2011e). The remainder was primarily wood products such as firewood or fence posts gathered and sold in small quantities for personal use. National data on nontimber forest products are limited to national forest receipts for permits and small contracts; the dollar estimates presented above are based on collection permits issued for Federal lands that were extrapolated to private forest land lands. Consequently, the estimates are subject to considerable variation and best suited to estimating the relative rankings among product categories rather than the actual dollar value.

Most northern forest land is privately owned. The best available information on collection of nontimber forest products from private forest land comes from voluntary reporting through the National Woodland Owners Survey (USDA FS 2009b). For most States, the most common products collected on private forests are edibles and decorative or medicinal plants (Table 10).

Nontimber Forest Products

Nontimber forest products include edibles (such as nuts, berries, mushrooms, and maple sap), decorative materials (such as floral items, boughs, cones, vines, moss, and lichens), medicinal plants (such as ginseng), cultural items (materials for traditional or ceremonial activities), landscaping materials (such as transplants, rocks, and gravel), and wood products gathered and sold in small quantities (such as wild-grown Christmas trees, residential fuelwood, and fence posts). Gathering nontimber forest products on Federal land is monitored through permits or small contracts, and those can be used to estimate the following national ranking of nontimber forest products which is ordered by greatest to least dollar value of harvested material (USDA FS 2009a).

1. Residential fuelwood
2. Floral/craft items
3. Wild-grown Christmas trees
4. Edibles
5. Landscaping materials
6. Posts and poles
7. Grass/forage
8. Seeds and cones
9. Herbs and medicinal plants

Other rankings of nontimber forest products in the North were compiled from an open-ended survey of National Forest managers who listed the relative importance of each product. Medicinal plants (presumably due to ginseng gathering) rank far higher in this survey than in the national rankings. (McLain and Jones 2005).

1. Residential fuelwood
2. Christmas trees
3. Medicinal plants
4. Mushrooms; tree boughs
5. Sap; Other plants
6. Edible plants; floral greens; moss; rocks, sand, or gravel; posts or poles; transplants
7. Bark
8. Seeds; craft wood; construction wood

Table 10—Collection of nontimber products reported by family forest landowners by State and product category, and forest land acres involved (based on the total area of the forest ownership where the activity occurred). Because products are not mutually exclusive, owners can be tallied in multiple categories and percents cannot be summed across categories (USDA FS 2009b).

State and region	Edibles	Decoratives	Medicinals	Cultural items	Edibles	Decoratives	Medicinals	Cultural items
	(percent of owners)				(percent of acres)			
Vermont	39	20	3	<1	22	11	4	1
Missouri	20	5	3	<1	21	8	4	<1
Iowa	18	16	1		22	5	4	
Wisconsin	18	8	1	1	20	10	2	1
Illinois	15	3	2		21	7	5	
Ohio	15	14	5	1	17	12	9	<1
Minnesota	13	8	<1	<1	14	9	1	1
Michigan	13	7	1	1	14	7	1	1
Maine	13	5	<1	<1	6	6	1	<1
Indiana	12	9	<1	1	16	9	4	1
New York	12	6	2		13	6	1	
Connecticut	11	12			5	5		
Massachusetts	11	5	2		13	10	2	
Rhode Island	11	5		5	10	10		3
New Hampshire	9	33	1	<1	14	10	1	1
Pennsylvania	7	7	2	<1	10	5	2	<1
Maryland	7	4			10	5		
West Virginia	6	2	3	<1	9	4	3	<1
Delaware[a]	--	--	--	--	--	--	--	--
New Jersey[a]	--	--	--	--	--	--	--	--
Northern total	12	8	2	<1	13	7	2	<1
Total number of owners participating (1,000)	613	386	85	14				
Total acres included (1,000)					17,182	9,020	2,932	428

[a]*Not reported separately by state*

On northern private forest land in aggregate, more than 613,000 owners (one in eight) collect nontimber products.

The value of nontimber forest products sold via permits on northern National Forests was estimated at $175,000 in 2007 (Table 11).

More than half of total revenues were from residential fuelwood, followed by evergreen limbs and boughs for decoration, fence posts, and wild-grown Christmas trees (only 2,000 wild-harvested Christmas trees, in contrast to the annual harvest of 5.7 million Christmas trees from plantations).

Table 11—Estimated proportion and value of nontimber products harvested from National Forests in the Northern United States via permits, 2007. Note that missing entries indicate no reported sales (Personal communication from Susan Alexander, U.S. Forest Service, 13 October 2009).

Product	Proportion of nontimber sales	All National Forests	Wisconsin	Missouri	Michigan	Pennsylvania	West Virginia	Minnesota	New Hampshire	Vermont	Ohio	Illinois	New York	Indiana
	(%)	(U.S. dollars)												
Fuelwood	55	97,178	29,207	9,279	18,352	17,075	11,313	1,470	5,250	2,180	1,500	1,020	520	13
Limbs & boughs	17	29,083	15,993		8,850		120	4,020		100				
Posts	17	29,073		29,013				60						
Christmas trees	6	10,270	4,235		1,320		70	2,045	1,540	1,060				
Grass	2	3,296	30	2,646				180			440			
Tree sap	2	2,826			110			1,706	1,010					
Roots	1	1,560					440				1,120			
Mosses	< 1	660	520		140									
Other products	< 1	579	355		70			154						
Transplants	< 1	180	20					160						
Cones	< 1	140	140											
Bark	< 1	123						123						
Needles	< 1	68			68									
Other plants	< 1	60	40		20									
Foliage	< 1	40						40						
Mushrooms	< 1	20								20				
Total	100	175,156	50,540	40,938	28,930	17,075	11,943	9,958	7,800	3,360	3,060	1,020	520	13

Maple sap used in syrup production is an important product collected in northern forests. Commercial maple syrup production in large quantities is limited to 10 States, all of them in the North (Table 12). Total production for 2009 was 2.4 million gallons, with a value exceeding $91 million. In recent years both the value per gallon and the production of maple syrup have risen sharply (Fig. 47).

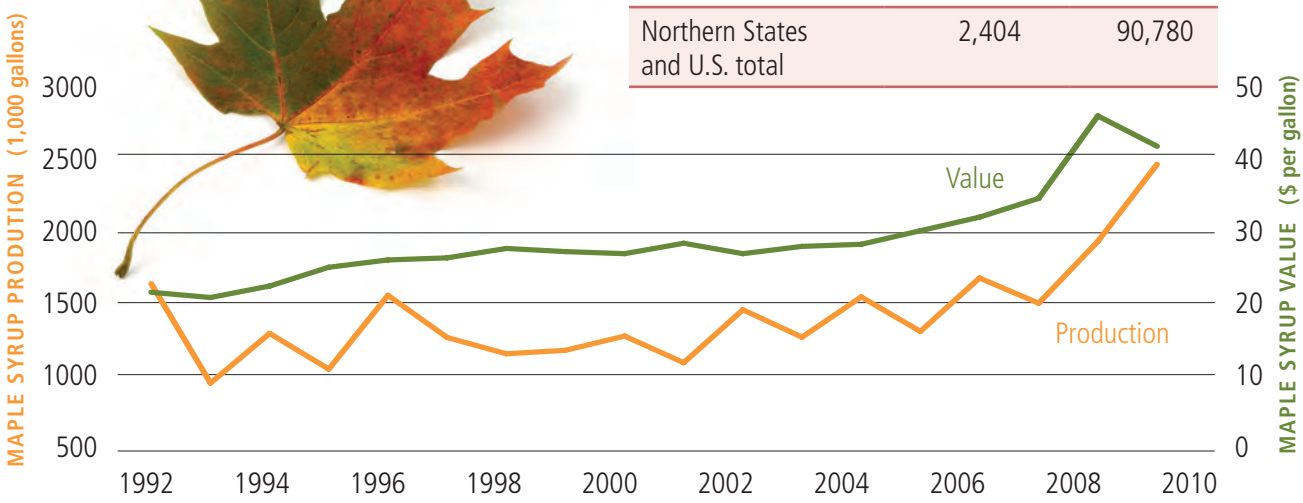
The total value of nontimber products consumed in the United States exceeds the value of nontimber products produced domestically, because the United States is a net importer of many nontimber products. For example, annual exports exceed $15 million each for foliage and branches, wild blueberries, mushrooms, and ginseng. However, annual imports exceed $30 million each for foliage and branches, wild blueberries, pine nuts, vanilla beans, and maple syrup (USDA FS 2011e).

Table 12—Maple syrup commercial production in the United States, 2009 (USDA NASS 2010). All reported commercial maple syrup production is in these 10 States.

State and region	Production	Value
	(1,000 gallons)	($1,000)
Connecticut	13	800
Massachusetts	46	2,466
Ohio	90	3,627
Pennsylvania	92	3,505
New Hampshire	94	4,756
Michigan	115	5,175
Wisconsin	200	7,340
Maine	395	12,996
New York	439	17,823
Vermont	920	32,292
Northern States and U.S. total	2,404	90,780

FIGURE 47

Maple syrup production and value, 1992 to 2009; note that virtually all U.S. commercial maple syrup production occurs in the Northern States (USDA NASS 2010).



Revenues from forest-based ecosystem services

Private and public markets are evolving to compensate forest landowners for the ecosystem services that their forests provide for the common good. Primarily voluntary markets have emerged to pay for services such as carbon sequestration, watershed protection, and preservation of sensitive forest lands. Future Federal and international regulations to facilitate payments for ecosystem services will be strongly influenced by the adoption or avoidance of mandatory compensation systems.

From 2003 to 2010, payments for carbon sequestration contracts were sold through the Chicago Climate Exchange in these categories: afforestation/reforestation, sustainably managed forests, and long-lived wood products. Landowners entered into contracts for 15 years or longer to sell future increases in the carbon stocks that were sequestered in their trees or wood products (Chicago Climate Exchange 2009). Absent mandatory carbon cap-and-trade legislation or similar restrictions on carbon emissions, the value of carbon credits in the United States has declined to the point where new U.S. carbon sequestration contracts are no longer being sold (Gronewold 2011), although sales continue in some international markets.

Forests can play an instrumental role in addressing climate change challenges. Management practices that avoid deforestation, increase afforestation, or increase net growth offer the greatest potential for carbon sequestration (Table 13). Additionally, using wood for energy—typically considered a commodity rather than an ecosystem service—provides an added benefit by reducing emissions from fossil fuels that would be used instead.

The important role that forests play in protecting watersheds can also result in revenues paid to landowners for maintaining

Table 13—Estimated carbon sequestration potential for selected U.S. land-use practices.

Activity	Carbon sequestration	Source
	(tons per acre per year)	
Avoided deforestation	92.3 to 189.7	U.S. Department of State (2000)
Afforestation (previously cropland/pasture)	2.4 to 10.5	Birdsey (1996)
Reforestation	1.2 to 8.5	Birdsey (1996)
Changes in forest management	2.3 to 3.4	Row (1996)
Riparian or conservation buffers (nonforest)	0.4 to 1.1	Lal et al. (1998)
Reduced/conservation tillage	0.7 to 1.1	West and Post (2002)
Grazing management	0.1 to 2.1	Follet et al. (2001)

tree cover. A well publicized example is the New York City Watershed Agreement (US EPA 1996), under which 9 million residents of New York City and surrounding suburbs rely on drinking water from reservoirs located miles away in the Catskill and Delaware watersheds. The Watershed Forestry Program was formally established as a voluntary pollution prevention partnership between New York City and the upstate New York forestry community in September 1997. The program provides cost sharing to landowners for the development of long-term forest management plans written with the help of professional foresters who are specially trained by the partnership. By April 2003, more than 290 management plans were completed covering more than 55,000 acres, of which 45,000 are forested. The project also includes a Best Management Practices component, logger training, and coordination of research, demonstration and education efforts (New York City Department of Environmental Protection 2009).

The Forest Legacy Program, administered by the Forest Service in partnership with individual States, is an example of a voluntary public program aimed at protecting environmentally sensitive forests on private lands (USDA FS 2009a, 2010c). Forest lands supply multiple benefits including timber products, wildlife habitat, soil and watershed protection, aesthetics, and recreational opportunities. When forests become fragmented and disappear, so do some of the benefits they provide. The Forest Legacy Program encourages and supports acquisition of land-protection agreements (legally binding agreements transferring a negotiated set of property rights from one party to another) without removing the property from private ownership. Most conservation agreements restrict development, require sustainable forestry practices, and protect water quality and other values. In 2009, 1.9 million acres nationally were enrolled in the Forest Legacy Program, of which 1.3 million acres (68 percent) were in Northern States—contributing to the extent of protected areas in the region. Forest Legacy Program goals in most States focus on maintaining water quality, wildlife habitat, and biodiversity (Table 14).

Table 14—Goals commonly identified by State Forest Legacy Programs and their frequency (USDA FS 2011e).

Goal	Number of States
Water quality, wetlands, and riparian buffers	37
Wildlife, habitat, biodiversity	35
Recreation	23
Threatened and endangered species	17

The U.S. Forest Service estimates that government and nongovernment payments for ecosystem services nationwide reached $553 million in 2007 (Table 15). Although this figure is not complete because data are unavailable for several States, the trend in payments from public and private sources (from nongovernmental organizations, for example) is increasing (USDA FS 2009a).

Table 15—Approximate total U.S. payments for environmental services from Federal and State agencies, nongovernment organizations, and individuals in constant 2005 dollars (USDA FS 2011e).

Program	Years		
	2005	2006	2007
	($ million)		
Government			
Federal programs	248	243	248
State programs	8	9	12
Nongovernment			
Voluntary carbon market	<1	<1	6
Conservation agreements	69	92	111
Fee simple purchases	142	177	177
Total payments			
	468	521	553

Investments and expenditures in forest management, industries, services, and research

Investment in forest management is needed to improve capacity of forests to produce wood and nonwood products and to increase ecosystem services. Research and development investments are required to improve forest management and manufacturing efficiency.

From 1997 to 2006, annual capital expenditures in wood products manufacturing in Northern States increased 46 percent, from $0.8 to $1.2 billion (Fig. 48). However, during that same period, capital expenditures in pulp and paper products manufacturing decreased 18 percent from $3.5 to $2.9 billion (U.S. Census Bureau 2009).

Most Federal investments in forest management in the North were allocated though Forest Service budgets, via Forest Service Region 9 (Eastern Region) for National Forest management or via Northeastern Area State and Private Forestry for forest management, planning, pest management, wildfire management, and other programs with the States. From 2005 to 2010 annual discretionary appropriations increased from $155 million to $160 million for Forest Service Region 9 and from $85 million to $95 million for State and Private Forestry (Fig. 49). In 2010, $42 million of those combined appropriations were allocated to wildfire management and $1 million to land acquisition.

State forestry programs are funded from multiple sources including State government, Federal government, and revenue from services and products. According to the National Association of State Foresters (2011), non-Federal funding for forests in the Northern States (total funding minus Federal funding, excluding missing data for Illinois and Ohio) was $396 million in 2008.

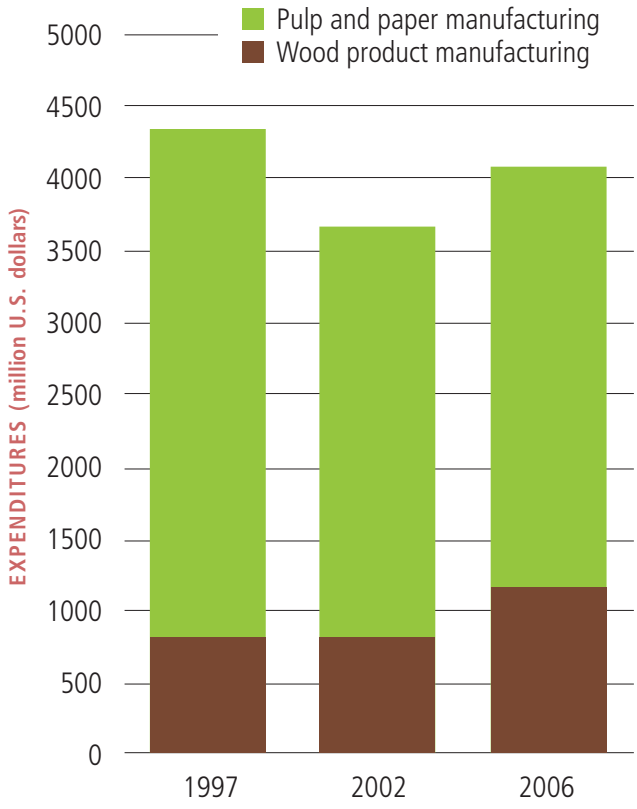


FIGURE 48

Capital expenditures in wood products (NAICS 321) and in pulp and paper (NAICS 322) manufacturing in the Northern States, 1997, 2002, and 2006 (U.S. Census Bureau 2009).

U.S. Forest Service discretionary research appropriations to the Northern Research Station, which serves the 20-State region, increased from $55 million in 2005 to $64 million in 2010 (Fig. 49), some of which went to cooperative research studies with universities. In 2006, forest research funding to universities in the North (all sources) was $95 million compared to $87 million for the South, $67 million for the Pacific Coast, and $40 million for the Interior West. State appropriations funded about half of forest-related research at northern universities, followed by Federal sources for about a third, and industry and other sources for the remainder. (USDA FS 2011e)

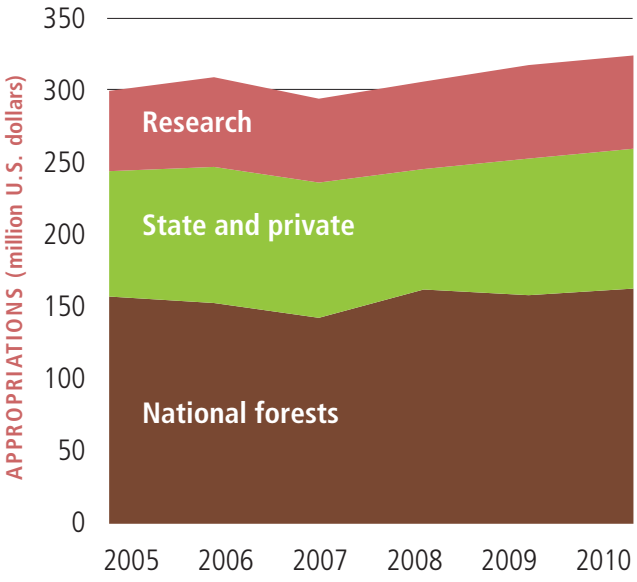


FIGURE 49

U.S. Forest Service discretionary appropriations by fiscal year within the Northern States for national forests in Forest Service Region 9, Northeastern Area State and Private Forestry, and the Northern Research Station.

Employment in the forest products sector

Nationwide, the forestry and logging wood products industries (excluding furniture) and the pulp and paper industries employed 1.1 million people in 2006 (U.S. Bureau of Labor Statistics 2007a). This included more than 72,000 employees in the forestry and logging sector, 556,000 in the wood products manufacturing sector and 468,000 in the paper sector. Forty percent of these employees (441,000) were employed in the Northern States (Table 16). Northern industries supported about 35 percent of the Nation's wood products jobs (194,000 out of 556,000 jobs) and 50 percent of pulp and paper manufacturing jobs (235,000 out of 468,000 jobs).

Quantifying Employment in the Forest Products Manufacturing Sector

The forest products manufacturing sector in the United States is comprised of primary wood products and pulp and paper manufacturers (NAICS 321 and 322). In 2006, the sector employed an estimated 7.3 percent of all manufacturing-related workers and 8.2 percent of all U.S. production workers. The more general category of "manufacturing-related jobs" consists of the average number of production workers plus the number of other employees engaged in factory supervision above the line-supervisor level, sales, sales delivery, advertising, credit, collection, installing and servicing of own products, clerical, executive, purchasing, financing, legal, personnel, professional, and technical activities. The category "production jobs" includes individuals—up through the line-supervisor level—engaged in fabrication, processing, assembly, inspection, receiving, storage, handling, packing, warehousing, shipping but not delivery, maintenance, repair, janitorial services, guard services, product development, auxiliary production of power and other inputs for a plant's own use, recordkeeping, and other services closely associated with these production operations. Neither category includes proprietors and partners of unincorporated businesses (U.S. Census Bureau 2009).

Table 16—Number of jobs in forestry and logging (NAICS113), wood products (NAICS 321), and pulp and paper industries (NAICS 322) of the North in 2006 (U.S. Bureau of Labor Statistics 2007a).

State and region	Forestry and logging	Wood products	Pulp and paper[a]	Total
Connecticut	19	1,745	4,886	6,650
Delaware	--[b]	419	951	1,370
Illinois	171	9,209	24,841	34,221
Indiana	455	19,399	11,488	31,342
Iowa	32	12,549	4,342	16,923
Maine	2,732	6,213	9,040	17,985
Maryland	416	3,568	5,249	9,233
Massachusetts	149	3,378	12,311	15,838
Michigan	1,662	10,737	13,966	26,365
Minnesota	841	16,320	11,866	29,027
Missouri	235	10,437	8,758	19,430
New Hampshire	470	2,758	2,228	5,456
New Jersey	23	4,559	14,070	18,652
New York	934	9,712	20,171	30,817
Ohio	613	16,476	24,726	41,815
Pennsylvania	832	30,291	26,843	57,966
Rhode Island	--	--	1,339	1,339
Vermont	--	2,283	1,291	3,574
West Virginia	1,174	8,252	723	10,149
Wisconsin	970	25,898	36,008	62,876
North total	11,728	194,203	235,097	441,028
U.S. total	72,140	556,110	468,422	1,096,672
North as a percent of U.S. total	16	35	50	40

[a]*The paper category includes manufacturers of converted paper products such as packaging and stationery.*

[b]*Not disclosed.*

Fig. 50 shows how national annual average employment fluctuated in forestry and logging, wood products manufacturing, and pulp and paper. From 2003 to 2006, the average number of employees in wood manufacturing increased slightly, but employment declined in 2007, partly as a result of a slowing economy. Declines were more severe in the pulp and paper industry, and the logging industry remained steady.

Wages, income, and injury rates in the forest sector

In 2006, total U.S. wages in the wood products and paper manufacturing industries represented 8 percent of wages paid to production workers across all manufacturing sectors (U.S. Census Bureau 2009). Workers in the North earned 41 percent of U.S. wages paid collectively in the forestry and logging (14 percent of U.S. total), wood products (35 percent), and pulp and paper manufacturing (49 percent) sectors (Table 17).

The wage rates of workers in northern wood products and pulp and paper manufacturing industries were similar to national averages for these industries, but northern wage rates for forestry and logging were only at 85 percent of the national average. Forestry and logging workers in Massachusetts were paid an average of $50,000 per year, the highest of any Northern State and twice as much as their counterparts in Illinois received in average annual wages. Average annual wages were more than $51,000 in the North paper industry, compared to a little over $34,000 for wood products and $29,000 for forestry and logging.

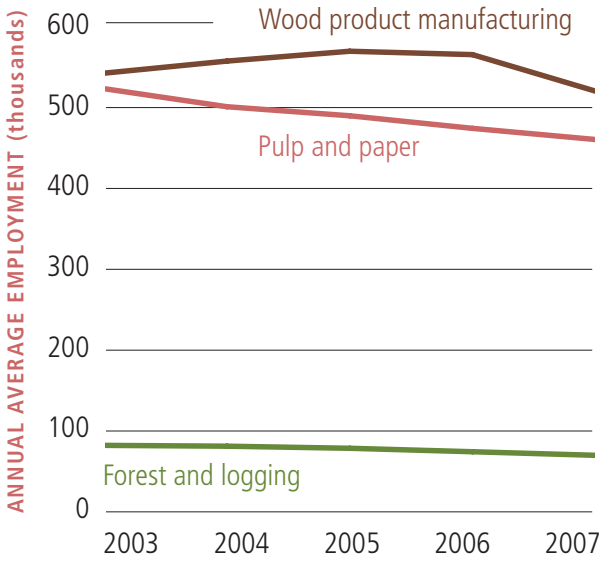


FIGURE 50

National annual average employment in forestry and logging, wood products manufacturing, and pulp and paper industries (U.S. Bureau of Labor Statistics 2007a).

Table 17—Total wages and average wage rates of workers in forestry and logging (NAICS 113), wood products (NAICS 321) and pulp and paper (NAICS 322) industries in the Northern States, 2006. (U.S. Bureau of Labor Statistics 2007a).

State and region	Forestry and logging	Wood products	Pulp and paper[a]	Forestry and logging	Wood products[a]	Pulp and paper
	(thousands of dollars)			(dollars per worker per year)		
Connecticut	572	76,705	309,562	30,131	43,957	63,357
Delaware	-- [b]	15,912	50,801	--	37,975	53,418
Illinois	4,275	324,258	1,242,423	25,000	35,211	50,015
Indiana	11,417	637,781	516,374	25,092	32,877	44,949
Iowa	839	464,564	199,854	26,208	37,020	46,028
Maine	92,552	205,483	543,638	33,877	33,073	60,137
Maryland	11,851	131,445	222,447	28,489	36,840	42,379
Massachusetts	7,468	140,467	635,211	50,121	41,583	51,597
Michigan	50,071	375,366	713,537	30,127	34,960	51,091
Minnesota	25,084	766,616	649,960	29,826	46,974	54,775
Missouri	5,690	280,620	394,241	24,214	26,887	45,015
New Hampshire	17,235	111,285	114,965	36,671	40,350	51,600
New Jersey	1,035	174,792	839,838	45,007	38,340	59,690
New York	28,954	342,066	995,661	31,000	35,221	49,361
Ohio	14,424	531,005	1,167,389	23,530	32,229	47,213
Pennsylvania	20,550	986,426	1,349,183	24,699	32,565	50,262
Rhode Island	--	--	53,259	--	--	39,775
Vermont	--	77,768	65,434	--	34,064	50,685
West Virginia	25,790	245,596	28,123	21,968	29,762	38,897
Wisconsin	26,611	816,305	1,949,581	27,434	31,520	54,143
North total	344,419	6,704,460	12,041,480	29,367	34,523	51,219
U.S. total	2,502,632	19,278,736	24,825,898	34,691	34,667	52,999
North as a percent of U.S. total	14	35	49	85	100	97

[a]*The paper category includes manufacturers of converted paper products such as packaging and stationery.*

[b]*Not disclosed.*

Data from 2003 to 2007 show declines in recordable injury rates in the U.S. forestry and logging, wood products, and pulp and paper manufacturing industries (Fig. 51). Nevertheless, the injury rate for wood product manufacturing was higher than the mean rate for other U.S. manufacturing industries. In contrast, injury rates in the forestry and logging and the pulp and paper manufacturing industries tend to be lower than the overall manufacturing averages in the United States.

From 2003 to 2008, 131 job-related fatalities occurred in the North forestry and logging, wood products, and pulp and paper manufacturing industries, or about 14 percent of the national total. Given that 40 percent of the total national workforce for these industries is employed in Northern States, this fatality rate is relatively low, suggesting that working conditions are safer in the North than in other parts of the country. Fatalities were most common in forestry and logging, accounting for 79 percent of total forest industry fatalities and exceeding the national average of 66 percent. The fatality rate for the northern forestry and logging sector was high considering that only 12,000 workers (out of 441,000 total workers in all northern forest industries) were in that sector. However, Tables 16 and 18 show that region's proportion of the nationwide forestry and logging fatalities (17 percent) is consistent with the region's proportion of nationwide forestry and logging jobs (16 percent). The Northern States employed 35 percent of the national wood products workforce with only 10 percent of that industry sector's fatalities reported nationally and 49 percent of the national pulp and paper workforce with only 6 percent of the fatalities reported nationally. These relatively low incidences may suggest safer working conditions for northern workers in these industries compared to the rest of the country (Table 18).

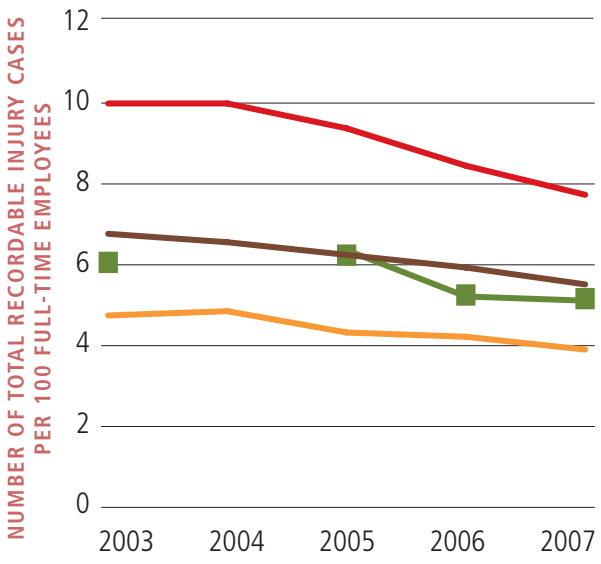


FIGURE 51

National total recordable injury cases in the forestry and logging industry, wood products manufacturing, pulp and paper industries; and total U.S. manufacturing (U.S. Bureau of Labor Statistics 2009).

Table 18—Total fatalities reported, 2003 to 2008, in the Northern States by forest products industry (U.S. Bureau of Labor Statistics 2007a).

Industry category	Northern States fatalities	National fatalities	Northern States proportion
	(number)	(number)	(percent)
Forestry and logging (NAICS 113)	103	617	17
Wood products (NAICS 321)	22	229	10
Pulp and paper (NAICS 322)	6	95	6
Total	131	941	14

Recreation and tourism

The forest land that covers 42 percent of the North offers vast opportunities for forest-based recreation. About 85 percent of the total 172 million acres of forest land in the region is available for recreation, but open access to the public varies by ownership group. Nearly all the 44 million acres of public forest land is open to the public for various forms of recreation. In contrast, only about 18 percent of the 100 million acres of nonindustrial private forest land is open for public recreation. Nevertheless, more than 90 percent of that private land is used for recreation by owners, their families, associates, or lessees. The remaining owner group, private corporations, own 28 million acres of forest land, of which roughly 40 percent is available for forest recreation (USDA FS 2011e, Cordell 2004).

Compared to other regions of the United States, the North has a small portion of Federal forest land (6 percent of the U.S. total), and little wilderness (1.5 percent of the U.S. total). However, Northern States have 7,300 miles in the National Recreation Trail System, more than other comparably sized regions of the U.S. Moreover, designated trail mileage in the Northern States increased by 77 percent from 2004 to 2009 (Cordell et al. in press).

In Northern States the most common nature-based recreation activities are walking, participating in family gatherings, gardening or landscaping, and viewing or photographing nature. The fastest growing nature-based recreation activities in the North from 1999 to 2009 were, visiting a farm or agricultural setting, gathering wild-grown edibles, off-road driving, viewing or photographing wildlife or natural environments, warm-water fishing, and day hiking (Table 19). For many forest recreation activities in the United States the majority of participation occurs on public lands and much takes place on urban forest land. Urban and community forests comprise relatively few acres compared to rural forests (see subsequent sections), but are heavily used because of their proximity to people.

Table 19—Participation in nature-based activities from 2005 to 2009 in the North for activities with greater than 10 million participants age 16 and older, and corresponding change in participation 1999 to 2009 (Cordell at al. in press)

Activity	Mean portion of population participating 2005-2009	Participation change 1999-2009
	(percent)	
Walk for pleasure	85	6
Family gathering	75	7
Gardening or landscaping	67	3
View/photograph natural scenery	64	12
Visit outdoor nature center/zoo	57	5
Picnicking	55	1
View/photograph other wildlife	51	21
View/photograph flowers, etc.	51	23
Sightseeing	51	5
Driving for pleasure	50	4
Visit a beach	45	15
Visit historic sites	44	0
Swimming in lakes, ponds, etc.	44	8
Swimming in an outdoor pool	43	11
Bicycling	37	4
View or photograph birds	38	18
Gather mushrooms, berries, etc.	36	26
Visited farm or agricultural setting	36	28
Day hiking	33	15
Visit a wilderness	31	11
View or photograph fish	25	13
Warmwater fishing	25	17
Motorboating	24	5
Visit waterside besides beach	24	2
Sledding	21	5
Developed camping	21	-10
Mountain biking	20	-6
Boat tours or excursions	19	-2
Visit prehistoric sites	19	3
Drive off-road	18	25
Canoeing	12	8
Primitive camping	12	-3

Walking for pleasure and viewing or photographing nature are among the most common forest recreation activities, in rural as well as urban forests

Ash Cave, Hocking Hills Region, Ohio

The population density is higher in the North than other regions, so the total number of nature-based recreation activity days is greater than elsewhere and concentrated on the relatively few forested acres per capita. However the recent rate of population increase in the Northern States has been slower than for other quadrants of the United States and shows considerable variation among age classes. Population increases in the North have been concentrated in age groups between 45 and 64 years with net population decreases for age cohorts greater than 64 years old, 25 to 34 years old, and less than 6 years old. Thus, recreation choices by members of the current 45-to-64-years-old age cohort will strongly influence nature-based recreation trends in the coming decade (Cordell et al. in press).

The North's large proportion of private forest land, combined with its large population, results in a strong recreation and tourism industry. About half the Nation's 1,600 privately operated campgrounds and recreational vehicle parks are in the North, as are the majority of privately operated downhill skiing facilities and forest-based nature parks. Forest-based sightseeing and transportation businesses are also concentrated in the eastern United States. (Cordell 2004). Seasonal homes are another significant part of the recreation and tourism industry. The States with the highest proportions of seasonal homes nationally were Maine (16 percent seasonal homes), Vermont (15 percent), and New Hampshire (10 percent); Wisconsin ranked eighth with 6 percent (U.S. Census Bureau 2000). These seasonal homes—common across the northern forests in New England, the Adirondacks, the upper Great Lakes, Missouri Ozarks, and other mainly nonmetropolitan places with forests, lakes, rivers, and mountains—function as family housing for vacations, providing ready access to outdoor recreation and informal workplaces for long weekends. Later in life, seasonal homes may become the retirement home (Stewart and Johnson 2006, Stynes et al. 1997).

The importance of forests to people

Many people value and appreciate the forest environment itself; the importance of forests extends beyond what can be extracted from them to what they are, whether they are used or not. The directly experienced features and qualities of the forest environment are one aspect of their importance to society. Aesthetic experiences in outdoor settings are often among the most important experiences in people's lives. Sometimes the experiences that people have in natural environments are strongly felt, but hard to put into words. Emotional experiences of this kind may carry a sense of awe, wonder, joy, and deep meaning; and may directly influence quality of life. Positive experiences in natural environments serve as significant sources of meaning and happiness, often leading people to form strong emotional attachments that can in turn influence second-home development and vacation choices. This can become a source of controversy in natural resource management if management actions threaten to change the character of places where people have formed strong attachments. It is critical for resource managers and planners to recognize the importance of sense of place, to understand why people consider certain places to be special, and to consider how such places may be affected by land management and development policies.

Criterion 7:

LEGAL, INSTITUTIONAL, AND ECONOMIC FRAMEWORK FOR FOREST CONSERVATION AND SUSTAINABLE MANAGEMENT

Montréal Process Criterion 7 (Montréal Process Working Group 2010); Northern Area Forest Sustainability Indicators 15.3–15.5, 17.1, 17.2, 18.1-18.6 (USDA FS 2010d)

The importance of legal, institutional, and economic frameworks for forest conservation and sustainable management

This criterion focuses on the social context of forests—the laws, policies, administrative rules, and social and economic institutions—that governs forest resource management and use. What society permits or restricts, encourages or discourages all influence the sustainability of forest resources. Criterion 7 captures this by turning attention to all the different social institutions that create and enforce rules about resource management and use.

Many of the criteria included in this assessment provide baseline measures, analyzing current conditions and providing a starting point for projecting future conditions (among others, how much land is forested and how many species are at risk). This criterion is different in that it addresses the likely characteristics of change. Forest sustainability is less likely where there are no rules or guidelines protecting resources or where laws and regulations are not enforced; more likely where society has developed social institutions to guide forest management.