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Criterion 6, Indicator 36: Employment in the Forest Sector

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Abstract

The lack of data about employment in a number of categories indicates that we do not have full understanding of employment associated with forestry. But for some categories, employment has been declining—especially for wood furniture manufacturing, and to a lesser degree for the pulp and paper industries. This is due in part to lower competitiveness with respect to production and import of products from other countries. There has been a decline in jobs in the U.S. Department of Agriculture, Forest Service, but jobs in state forestry agencies are steady to increasing. Increasing participation in forest-based recreation suggests increases in forest-based recreation jobs. It would appear that in the recent past there has been a shift in the types of jobs that forests support.

Keywords: employment, forestry, forest industry, forest recreation

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Criterion 6, Indicator 36: Employment in the Forest Sector

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Indicator Background

The purpose of this report is to provide information on the rationale and data provided for Indicator 36 for the *U.S. National Report on Sustainable Forests—2010*. Information on the rationale for the Indicator and recommended data to be developed are taken from the report of the Technical Advisory Committee (TAC) of the Montreal Process (MP).

Verbatim Montreal Process Technical Advisory Committee Notes

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

Measurement—The measure desired is the total employment across all relevant economic activities that rely on forests. Attempts should be made to report direct employment for all the activities for which production and investment data were reported for other Criterion 6 indicators. Examples of forest-based employment include

- employment in the forest, as well as
- industries processing wood and non-wood forest products.

Forest-related employment includes employment such as

- forest-related research and education, and
- support activities for recreation and tourism.

Additional employment associated with that direct employment, sometimes referred to as indirect and/or induced employment, should also be reported, if available.

Depending on national circumstances, employment in the production and marketing of environmental services may be

included. Official government reports are likely to be the best source of comprehensive data on employment in many countries. Forest industry associations may also have data on employment from their member companies.

Comments and Clarifications

Additions and Clarifications to Rationale (opportunity to provide comment on relevance and nature of indicator)

Additions and Clarifications to Measurement (opportunity to provide comment on feasibility and applicability of TAC recommendations)

Indicator Development

Data Used to Address Indicator

To meet the intent of the indicator suggested by the TAC, we provide the following data.

Information on Direct Employment

Category 1—Forest management and protection

- Employees in state forestry agencies by Resources Planning Act (RPA) Region, 2002 (Table 1)
- U.S. Department of Agriculture, Forest Service permanent employees by location, 1992–2006 Employees on National Forests, Washington Office, and Northern Area State and Private Forestry (Tables 2, 3, Fig. 1)
- Employees in the U.S. Department of the Interior, Bureau of Indian Affairs, Bureau of Land Management, National Park Service (Table 4)
- Number of employees fighting forest wildfires during fire season, nationwide, in a typical year in recent years (Table 5)

Table 1—State forestry agency employees by region, 1998–2004 (million \$2005)

Year	North	South	Rocky	Pacific	Total
			Mountains	Coast	
Total					
1998	5,042	7,427	1,496	8,304	22,269
2002	6,250	7,327	1,388	8,455	23,420
2004	7,111	6,535	1,632	9,230	24,507
Permanent					
1998	3,142	5,889	975	5,830	15,836
2002	2,579	6,042	859	5,648	15,128
2004	2,791	5,492	1,051	6,121	15,455
Seasonal/temporary					
1998	1,900	1,538	521	2,474	6,433
2002	3,671	1,285	529	2,807	8,292
2004	4,320	1,043	581	3,109	9,052

Source: Association of State Foresters 2008. State data missing: 2002—PA, NV; 2004—OH, NE, IL, AR.

- Employment related to Indian forest lands (Table 5)

Category 2—Wood and paper products industries

- Employees for North American Industry Classification System (NAICS) industries 113, 321, and wood part of 322, 1997–2006 (Tables 6 to 10, Figs. 2, 3)

Category 3—Non-wood forest products industries

- Employment in Oregon and Washington for gathering floral and Christmas greens, and for production of lumber and wood products, and paper and allied products, selected years 1950–1994 (Table 11)
- Employees in hunting and trapping establishments (Table 12)

- Discussion on employment in non-wood forest products (Appendix)

Category 4—Forest sector research and education

- U.S. Department of Agriculture, Forest Service, employees at research stations, 1992–2006 (Table 2)
- Forestry related research employees in colleges and universities; the U.S. Department of Agriculture, Forest Service, and in the forest industry (full-time equivalents) (Table 13)

Category 5—Recreation and tourism

- Direct and indirect jobs associated with and supported by national forest-based recreation (Tables 13, 14)

Analysis Techniques

General Description

Data on employment in Federal agencies were taken directly from Federal publications or databases. Data on employment in state agencies were obtained from the Association of State Foresters (2008). Data on employment in forest products industries were obtained from the Bureau of the Census, census of manufacturing, and survey of county business patterns. Data on employment in non-wood forest products industries were taken partly from the survey of county business patterns and occasional scientific studies.

Estimates of employment associated with all forest-based recreation were made for the 2003 National Sustainability Report for 2001 using methods described in that report. Estimates of employment associated with recreation on national forests for 2004 were made with methods described below.

Table 2—U.S. Department of Agriculture, Forest Service permanent employees by branch, 1992–2006

Year ^a	National forests	Research stations	Northern area of state and private forestry	Washington office	Washington office detached	Washington office total	Total
1991 ^b	30,632	2,469	138	845	310	1,155	34,394
1992 ^b	31,065	2,628	158	899	335	1,234	35,085
1993 ^b	30,180	2,622	155	896	337	1,233	34,190
1994 ^b	27,240	2,393	153	835	400	1,235	31,021
1995 ^b	25,740	2,304	152	753	1,825	2,578	30,774
1996 ^b	25,531	2,100	149	683	1,863	2,546	30,326
1997 ^b	24,847	2,039	146	651	1,875	2,526	29,558
1998 ^b	23,555	2,040	145	665	1,940	2,605	28,345
1999 ^b	23,247	2,051	153	694	1,972	2,666	28,117
2000 ^c	24,605	1,708	152	—	—	2,834	29,299
2001 ^c	24,605	1,708	152	—	—	2,937	29,402
2002 ^d	25,683	1,921	154	—	—	2,276	30,963
2003 ^d	26,188	1,941	154	—	—	2,257	31,505
2004 ^d	25,894	1,941	159	—	—	2,257	31,211
2005 ^d	23,772	1,784	157	—	—	3,028	29,640
2006 ^d	22,867	1,760	156	—	—	3,402	29,034

^aNumber of employees are shown for October 1 or near October 1 each year.

^b(USDA FS 2002a).

^c(USDA FS 2002b).

^d(USDA FS 2008a,b).

Table 3—U.S. Department of Agriculture, Forest Service permanent and non-permanent employees, 1975–2006

Year	Permanent	Non-permanent
1975	31,701	18,076
1976	—	—
1977	33,719	20,480
1978	—	—
1979	34,690	25,450
1980	37,236	14,594
1981	36,869	19,053
1982	37,174	15,624
1983	36,077	14,899
1984	33,995	15,225
1985	32,924	14,014
1986	30,436	14,121
1987	30,301	15,785
1988	30,899	14,519
1989	32,924	14,524
1990	33,781	13,011
1991	34,861	13,821
1992	35,425	15,151
1993	34,588	15,363
1994	30,978	14,592
1995	30,676	13,009
1996	30,347	11,075
1997	29,558	10,215
1998	28,170	12,491
1999	28,117	—
2000	29,299	—
2001	29,402	—
2002	31,046	—
2003	31,556	—
2004	31,224	—
2005	30,306	—
2006	29,034	—

Source: 1997–2000 (USDA FS report of the Forest Service, annual); 2001–2006 (USDA FS 2008a,b).

Table 4—Employees in selected Department of Interior agencies with forest management responsibilities, in September of 1998, 2003–2007

Year	Bureau of Indian Affairs	Bureau of Land Management	National Park Service	Total
1998	11,156	10,641	22,206	44,003
1999	—	—	—	—
2000	—	—	—	—
2001	—	—	—	—
2002	—	—	—	—
2003	10,786	12,466	23,986	47,238
2004	10,804	12,217	23,587	46,608
2005	10,635	11,842	23,701	46,178
2006	9,986	11,386	22,053	43,425
2007	9,432	11,344	22,309	43,085

Source: US OPM 2008.

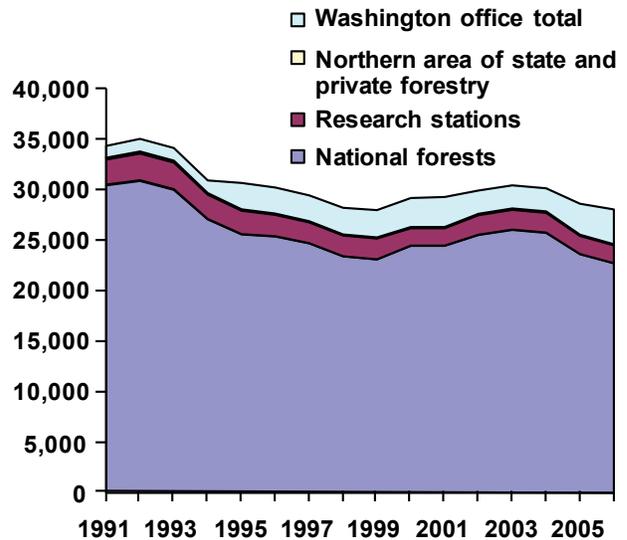


Figure 1. U.S. Department of Agriculture, Forest Service permanent employees by branch, 1992–2006. Source: Table 2.

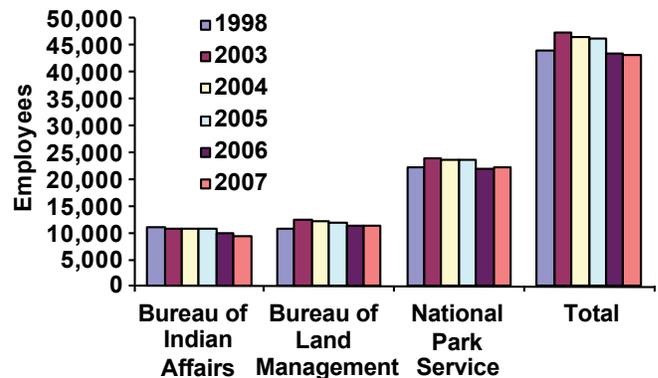


Figure 2. Employees in selected Department of Interior agencies with forest management responsibilities, in September of 1998, 2003–2007. Source: Table 4.

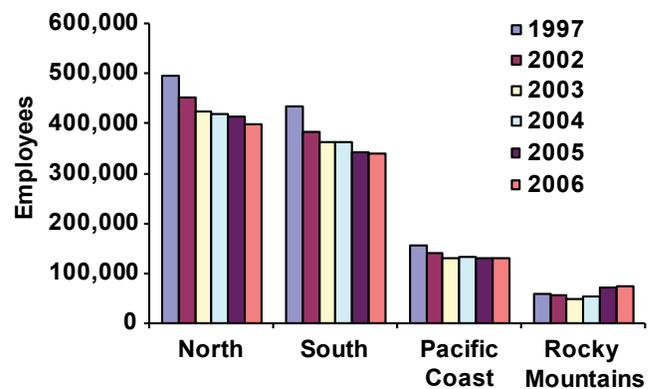


Figure 3. Employees in wood and paper products industries (NAICS 321, 322) by region, 1997, 2002–2006. Source: Table 9.

Table 5—Other forest-related direct employment

Staffing in support of timber production for Indian lands ^a	827
Natural resource professionals working in Indian forestry ^a	45
Permanent employees in the USDI Bureau of Land Management (March 2002) ^b	9,455
Permanent employees in the USDI National Park Service (March 2002) ^b	16,241
Forestry-related research employees in U.S. colleges and universities (full-time equivalents) ^c	1,361
Forestry-related research employees in the USDA Forest Service (full-time equivalents)	701
Forestry-related research employees in forest industry (full-time equivalents) ^c	124
Firefighting and support jobs, nationwide during fire season (recent) ^d	12,000–15,000 (typical year)

^aIFMAT 1993 p. V-27, 28.^bUS OPM 2003.^cNRC (2002) p. 56.^dInteragency Fire Center 2002.**Table 6—Number of employees in forest products industries, 1998–2006**

Year	Forestry and logging products (NAICS 113)	Wood products (NAICS 321)	Paper products (NAICS 322)	Wood furniture ^a	Total
				(parts of NAICS 337)	
1998 ^b	84,177	577,900	572,371	293,119	1,527,560
1999 ^b	83,833	588,609	560,662	296,361	1,529,465
2000 ^c	83,143	586,473	548,293	308,099	1,526,008
2001 ^c	77,984	555,900	530,245	293,979	1,458,108
2002 ^c	75,822	540,102	491,832	303,064	1,410,820
2003 ^d	75,818	511,684	461,233	284,843	1,333,578
2004 ^d	75,966	534,005	439,868	292,700	1,342,539
2005 ^d	69,541	538,890	426,748	277,133	1,312,312
2006 ^d	66,304	536,094	414,049	273,666	1,290,113

^aWood furniture includes Kitchen Cabinet and Counter Top (337110), Non-upholstered Wood Household furniture (337122), Wood Office furniture (337211), and Custom Architectural Woodwork and Millwork (337212).^b(USDC BOC 2002a).^c(USDC BOC 2002b, 2003, 2004).^d(USDC BOC 2008).**Table 7—Employees in paper products industries (NAICS 322) by region**

Year	North	South	Pacific	Rocky	Not	Total
			Coast	Mountains	specified	
1997	300,327	198,402	57,333	17,158	1,054	574,274
1998	—	—	—	—	—	572,371
1999	—	—	—	—	—	560,662
2000	—	—	—	—	—	548,293
2001	—	—	—	—	—	530,245
2002	252,577	172,192	48,978	16,701	1,384	491,832
2003	235,295	163,269	44,759	14,171	3,739	461,233
2004	222,942	156,410	43,118	13,925	3,473	439,868
2005	217,179	133,914	41,560	30,602	3,493	426,748
2006	206,558	131,189	40,896	30,181	5,225	414,049

Source: Table 9.

Table 8—Employees in wood products industries (NAICS 321) by region

Year	North	South	Pacific	Rocky	Not	Total
			Coast	Mountains	specified	
1997	194,747	235,118	99,109	40,585	475	570,034
1998	—	—	—	—	—	577,900
1999	—	—	—	—	—	588,609
2000	—	—	—	—	—	586,473
2001	—	—	—	—	—	491,832
2002	198,636	210,899	91,279	39,571	–283	540,102
2003	188,281	200,421	85,506	34,823	2,653	511,684
2004	196,286	205,896	89,606	39,649	2,568	534,005
2005	197,041	208,101	89,395	41,923	2,430	538,890
2006	193,051	209,368	88,642	42,692	2,341	536,094

Source: Table 9.

Table 9—Employees in wood and paper products industries (NAICS 321, 322) by region

Year	North	South	Pacific	Rocky	Not	Total
			Coast	Mountains	specified	
1997	495,074	433,520	156,442	57,743	1,529	1,144,308
1998	—	—	—	—	—	1,150,271
1999	—	—	—	—	—	1,149,271
2000	—	—	—	—	—	1,134,766
2001	—	—	—	—	—	1,022,077
2002	451,213	383,091	140,257	56,272	1,101	1,031,934
2003	423,576	363,690	130,265	48,994	6,392	972,917
2004	419,228	362,306	132,724	53,574	6,041	973,873
2005	414,220	342,015	130,955	72,525	5,923	965,638
2006	399,609	340,557	129,538	72,873	7,566	950,143

Specific Steps Taken

Estimates of jobs associated with recreation on national forests were made by multiplying the estimated expenditures made by visitors to national forests by estimates of the number of direct jobs (and indirect jobs) supported per dollar of expenditures.

The estimation procedure began with expenditures per party of people visiting national forests from the National Visitor Use Monitoring (NVUM) Survey for the years 2000, 2001, 2002, and 2003, as provided by Stynes and White (2005).

Table 10—Employees in wood furniture industries, 1997–2006^a

Year	Wood kitchen cabinet and counter top (337110)	Non-upholstered wood household furniture (337122)	Wood office furniture (337211) ^b	Custom architectural woodwork and millwork (337212)	Total
1997	99,266	127,703	30,106	24,390	281,465
1998	104,932	132,404	30,535	25,248	293,119
1999	106,635	134,169	30,115	25,442	296,361
2000	115,348	133,884	32,121	26,746	308,099
2001	115,803	122,774	30,823	24,579	293,979
2002	126,626	111,984	30,338	34,116	303,064
2003	128,113	95,502	28,859	32,369	284,843
2004	136,790	95,337	27,432	33,141	292,700
2005	139,258	81,016	25,142	31,717	277,133
2006	145,013	71,544	25,076	32,033	273,666

^aTable 9.

^b337211 is estimated based on the trend in 33721 after 2001.

Table 11—Employment in Oregon and Washington for gathering flora and Christmas greens and for production of lumber and wood products and paper and allied products, selected years 1950–1994^a

Year	Lumber and wood products	Paper and allied products	Floral and Christmas greens
1950	Not calculated	Not calculated	2,000 ^b
1953	134,400 ^a	2,100	NA
1989	109,300 ^a	26,500	10,300 ^c
1990	103,600 ^d	27,200	NA
1994	91,100	26,300	5,800 ^e

^aAlexander and others 2002.

^bHeckman 1951.

^cSchlosser and others 1991.

^dWarren 1996.

^eEstimated from Blatner and Schlosser (1997); includes WA, OR, ID, and MT.

These data were converted to average expenditures per person per visit, with the average party size being 2.09 persons. Expenditures per person per visit were assumed constant across regions, as indicated by Stynes and White (2005). National total expenditures were estimated by multiplying average expenditures per person per visit by the number of recreation person visits to national forests estimated from NVUM data for the years 2000, 2001, 2002, and 2003 (USDA FS 2004).

To estimate direct, indirect, and induced employment at the national level, total national forest recreation expenditures were entered into the IMPLAN (MIG, Inc., Hudson, Wisconsin) economic input-output model and converted to 2006 dollars to match the IMPLAN data (Minnesota IMPLAN Group 2006). Estimated total national forest-based

Table 12—Number of hunting and trapping establishments, payroll, and total number of full- and part-time employees for selected years

Year ^a	Number of establishments	Payroll (million current dollars)	Number of employees
1992 ^b	179	—	—
1997 ^b	295	48.9	1,886
1998 ^b	345	58.6	2,107
1999	360	68.9	2,375
2000 ^c	363	75.8	2,511
2001 ^c	384	82.4	2,604
2002 ^c	469	82.8	2,707
2003 ^d	432	85.5	2,711
2004 ^d	395	85.0	2,664
2005 ^d	368	50.1	1,730
2006 ^d	348	55.2	1,875

^a1992–1997 data are for SIC 0971; 1998–2006 data are for NAICS 1142.

^bUSDC BOC 2002 a.

^cUSDC BOC 2002b.

^dUSDC BOC 2008.

recreation employment (201,343 direct and indirect jobs for 2006) was disaggregated to Forest Service regions by multiplying total employment by the percentage of total visits that occur within each region (Table 14). Regional visitor data were obtained from the NVUM survey data for 2005 (Stynes and White 2005). The national totals for direct, indirect, and induced jobs are 97,579, 41,796, and 61,948, respectively.

Another method was used to make a rough “order of magnitude” estimate of the number of direct jobs associated with recreation on all forests in the United States. First, data on employment in 2006 were collected for NAICS codes that included outdoor recreation industries from the Bureau of Economic Analysis (USDC BEA 2006). Because these codes include many industries unrelated to outdoor recreation, an estimate of the proportion of outdoor recreation firms was needed. To estimate this proportion, we first obtained the number of records in a business mailing list for Standard Industrial Classification (SIC) Code 79—the amusement and recreation services industry—from Mari-gold Technologies (2008) (Fig. 5). This mailing list contains 64,284 records. Next, using professional judgment, we determined which sub-industries identified by SIC Code are predominately involved with outdoor recreation. The number of records in these outdoor recreation sub-industries is 15,166. By dividing 15,166 by 64,284, we estimate that approximately 24% of firms in the U.S. recreation and leisure industry are outdoor recreation firms. However, not all outdoor recreation activities are forest-based recreation activities. Thus, a weight was needed to estimate the relative proportion of outdoor recreation that was forest recreation.

Table 13—Other forest-related direct employment

Staffing in support of timber production for Indian lands ^a	827
Natural resource professionals working in Indian forestry ^a	45
Permanent employees in the USDI Bureau of Land Management (March 2002) ^b	9,455
Permanent employees in the USDI National Park Service (March 2002) ^b	16,241
Forestry-related research employees in U.S. colleges and universities (full-time equivalents) ^c	1,361
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Forestry-related research employees in forest industry (full-time equivalents) ^c	124
Firefighting and support jobs, nationwide during fire season (recent) ^d	12,000–15,000 (typical year)

^aIFMAT 1993 p. V-27, 28.

^bU.S. OPM 2003.

^cNRC (2002) p. 56.

^dInteragency Fire Center (2002).

Table 14—Employees associated with recreation on national forests, 2005

Forest Service region	RPA region*	Direct	Indirect	Induced	Total	RPA region*	Total
Region 1	Rocky Mountain	—	—	—	12,976	North	22,118
Region 2	Rocky Mountain	—	—	—	31,948	South	30,474
Region 3	Rocky Mountain	—	—	—	20,152	Rocky Mountains	87,981
Region 4	Rocky Mountain	—	—	—	22,905	Pacific Coast	57,900
Region 5	Pacific Coast	—	—	—	30,179	Alaska	2,851
Region 6	Pacific Coast	—	—	—	27,721	—	—
Region 8	South	—	—	—	30,474	—	—
Region 9	North	—	—	—	22,118	—	—
Region 10	Alaska	—	—	—	2,851	—	—
Total	—	97,579	41,796	61,948	201,324	—	201,324

*Note: The Rocky Mountain region contains ND, NE, and KS, which are usually in the North region.

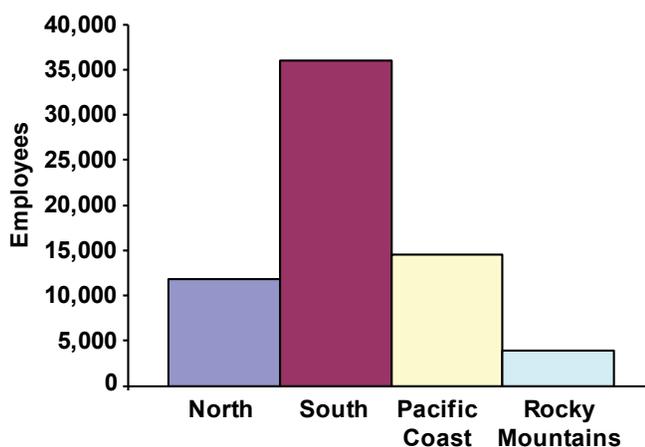


Figure 4. Employees in forestry and logging industries (NAICS 113) by region, 2006. Source: Table 6.

Since the employment dataset from the Bureau of Economic Analysis (BEA) was at the state level, the percentage of total land in each U.S. state covered by forest was used to create this weight. The percentages of forest cover in each U.S. state were obtained from U.S. Department of Agriculture, National Agricultural Statistics Service (NASS) datasets, provided by the USDA Economic Research Service (USDA ERS 2002). By multiplying 24% by the percentage of forest cover in each state by direct employment in the outdoor recreation and leisure industry obtained from the BEA data, we estimated direct employment supported by forest-based recreation on all public and private sites by state. These state estimates were then used to calculate national and regional estimates.

At the national level, it is estimated that approximately 551,360 jobs are directly supported by forest-based recreation to all public and private sites (Table 15). Approximations for employment by NFS region were estimated

Table 15—Rough estimates of direct employees associated with recreation on all forests in the U.S., 2006

Forest Service region	RPA region*	Direct employees	RPA region*	Total
Region 1	Rocky Mountain	1,919	North	251,270
Region 2	Rocky Mountain	14,484	South	175,754
Region 3	Rocky Mountain	7,759	Rocky Mountains	29,569
Region 4	Rocky Mountain	5,407	Pacific Coast	94,767
Region 5	Pacific Coast	70,252	—	—
Region 6	Pacific Coast	24,515	—	—
Region 8	South	175,754	—	—
Region 9	North	251,270	—	—
Total	—	551,360	—	551,360

*Note: The Rocky Mountain region contains ND, NE, and KS which are usually in the North region.

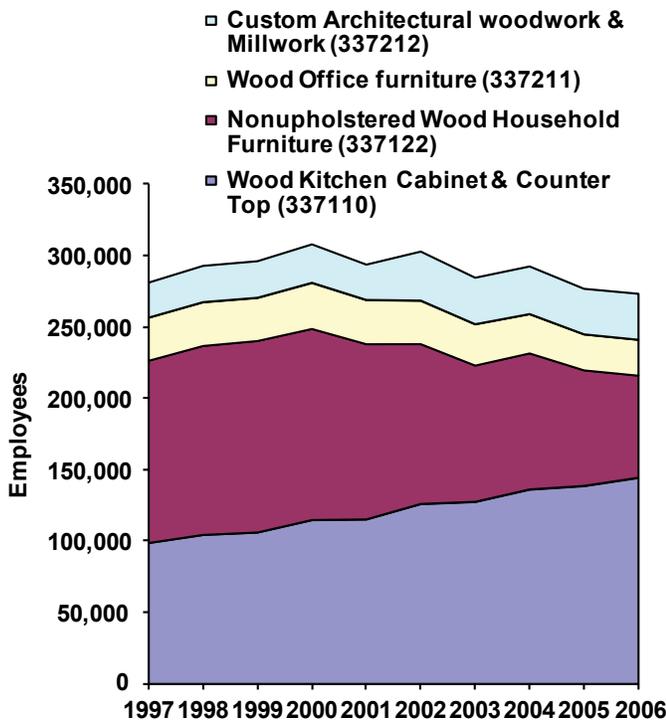


Figure 5. Employees in wood furniture industries by sub-industry, 1997–2006. Source: Table 10.

somewhat roughly, as these regions do not perfectly overlay with states in Region 1, 2, and 4. However, since this only occurs in three states—Idaho, Wyoming, and South Dakota—these overlaps were ignored and the region that appeared to encompass the majority of each of these states was assumed to be the region for the entire state. This limitation

could easily be improved upon with access to a boundary file for national forest regions.

Data Issues (Replicability, Availability, Precision, and Potential Bias)

In the future, we expect data to be available and accurate on the number of employees for forest products industries, Federal agencies engaged in forest management, and state forestry agencies. Data are not routinely available (special studies are needed) for non-wood forest products businesses, forest-based recreation firms, and for environmental services.

Indicator Interpretation and Discussion

Indicator Results

What Does the Indicator Show?

Jobs in forest management and protection include

- permanent employees in state forestry agencies, the number of which has been about constant between 1998 (15,836) and 2004 (15,455); (Table 1)
- total state agency employees that have increased by about 2,000 after including temporary employees—from 22,269 in 1998 to 24,507 in 2004; (Table 1)
- permanent U.S. Department of Agriculture, Forest Service, National Forest System jobs, which have declined from 30,632 in 1991, to 24,605 in 2000, and 22,867 in 2006; (Fig. 1, Table 2).
- employees in Department of Interior agencies that manage forests, which, after increasing by several thousand between 1998 and 2003, is about the same level in 2007 (43,085) as in 1998 (44,003); (Table 4, Fig. 2), 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 been 12,000 to 15,000 (Table 13).

Jobs in forest products industries decreased about 15% between 1997 and 2006, from 1.51 to 1.29 million. Declines include 21% for forestry and logging, 6% for solidwood products, 28% for pulp and paper, and 3% for wood furniture. Within the furniture category, non-upholstered wood furniture decreased 44% from 127,703 to 71,544, and architectural woodwork and millwork increased 31% from 24,390 to 32,033 (Tables 6 to 10). Forestry and logging jobs had been relatively constant between 1986 and 1996.

In 2006, 74% of forest industry jobs noted above were in the wood products and paper products industries (535,094 and 414,049, respectively). Combined, they were 0.6% of all U.S. jobs and 7.3% of manufacturing jobs. This is down

from 824,000 and 485,000 in 1950 when combined they were 2.5% of all jobs and 8.6% of manufacturing jobs.

The number of jobs associated with forest-based recreation is uncertain. For the *2003 Report on Sustainable Forests*, we estimated about 1.1 million direct forest-based recreation jobs or 0.8% of all U.S. jobs (USDA FS 2003). An increase may be inferred by the increase in participation in U.S. forest recreation. For 2006, direct jobs associated with recreation on national forests are estimated to be 97,600. When indirect and induced jobs are added, the total is 201,300, with the largest totals associated with national forest recreation in the Rocky Mountain region (87,981) followed by the Pacific Coast (57,900), South (30,474), and North (22,118) (Table 15).

Jobs in producing non-wood 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 are informal businesses whose characteristics are not recorded in Bureau of Census surveys. There are 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. Such jobs have decreased from 2,702 in 2002 (Table 12, Appendix).

Jobs in forest-related education and research include those at colleges and universities, and research jobs include those in the U.S. Department of Agriculture, Forest Service. For the *2003 Report on Sustainable Forests*, we estimated 1,361 jobs in forest-related education and research for 2001 (USDA FS 2003). This estimate has not been updated. 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. (Table 2). For the *2003 Report on Sustainable Forests*, we estimated 124 industry research jobs for 2001 (Table 13). 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% of all U.S. employment. This does not include indirect jobs generated by expenditures of government agencies, businesses, or others.

How Has It Changed Since 2003?

Jobs in forest products industries have declined notably by 120,707 or 12% between 2001 and 2006 (Table 6).

Regional Variation and Associated Issues

In 2006, forest products industry employment (excluding wood furniture) was highest in the North (about 400,000), followed by the South (366,000), Pacific Coast (140,000), and Rocky Mountains (75,000). Between 2001 and 2006,

these jobs decreased in the North, South, and Pacific Coast but increased in the Rocky Mountain region (Fig. 3, Tables 8, 9).

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) (Fig. 4).

In 2004, total employment in state forestry agencies was highest in the Pacific Coast (6,121 permanent; 3,109 temporary) followed by the North (2,791 permanent; 4,320 temporary), the South (5,492 permanent; 1,043 temporary), and Rocky Mountains (1,051 permanent and 581 temporary). Between 1998 and 2004, state forestry agency seasonal/temporary jobs increased for the North (more than doubled), and for the Pacific Coast and Rocky Mountains, but declined for the South (Table 1).

Assessment of Ability to Measure Underlying Concern

General Assessment

Data are currently insufficient for accurately estimating recreation employment not associated with recreation trips to U.S. national forests. In particular, data are not available for estimating recreation trips to private forest lands and expenditures associated with these trips.

Little data are available on those jobs producing non-wood forest products, as many businesses are very small and part of the “informal economy,” which reflects casual hiring and non-reported income.

Data are not available on jobs related specifically for providing environmental services such as carbon storage, biodiversity, or water supply. But a number of jobs counted in the Forest Service and state agencies help provide environmental services.

Updated data are not available on forest-related education and research jobs at colleges and universities.

Data are not available on forest-related jobs in county and municipal governments, private land management organizations, private consultants, and private forest resource related organizations.

Data are not available on indirect and induced jobs generated by direct jobs.

Congruence of U.S. Results with TAC Recommendations

Data that are provided on employment match the data requested by the TAC recommendations, but data are not available for many categories of workers.

Suggested Steps for Improvement

Special surveys and studies would be needed to provide data on employment for a number of categories of forest

management, non-wood products production, education and research, and environmental services.

Cross-Cutting Issues and Relation to Other Indicators

The levels of employment are a factor in the resilience of forest-based communities (Indicator 38) and a factor in the importance of forests to people (Indicator 44). The level of employment is influenced by the levels of capital investment (Indicator 34) and by the levels of education and research (Indicator 35). The level of employment in forest products industries is also 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 32).

Concluding Remarks

What does the information on employment suggest about sustainable forestry and sustaining benefits of forest-based employment? The lack of data about employment in a number of categories indicates that we do not have full understanding of employment associated with forestry. But it is clear that for some categories employment has been declining—especially for wood furniture manufacturing, and to a lesser degree for the pulp and paper industries. This is due in part to lower competitiveness with respect to production and import of products from other countries (see Indicator 32). There has been a decline in jobs in the U.S. Department of Agriculture, Forest Service, but jobs in state forestry agencies are steady to increasing. Increasing participation in forest-based recreation (Indicator 42) suggests increases in forest-based recreation jobs. It would appear that in the recent past there has been a shift in the types of jobs that forests support.

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Appendix—Non-Wood Forest Products Employment

Businesses in the non-timber forest products (NTFP) industry are generally small, employing few people. There are exceptions, but most businesses are what are referred to as very small enterprises, employing less than 10 people. In 2006, the U.S. Census Bureau's County Business Patterns data reported 2,098 employees and 231 businesses in the industry code 1132, Forest Nurseries and Gathering of Forest Products. About 75% of these businesses employed less than 10 people.

According to McLain and others (2008), "informal economy is one of many terms used to describe diverse economic activities that are omitted from or only partially accounted for in macroeconomic analysis." Very small enterprises are relevant to informality for two important reasons. First, because of their low visibility, ease of displacement, and other small business/low capital investment characteristics, they provide the most appropriate setting for casual hiring, non-reported income, and other informal practices. The second point is that it is easier to operate a very small enterprise as a totally underground business. Fully informal small enterprises escape government record keeping. It is important to note that not all very small enterprises engage in informal practices (Alexander and others 2002). McLain and others (2008) state that "much of the economic activity in the NTFP sector has historically taken place outside or on the edges of the formal economy."

In 1994, the most recent year for which both formal and informal non-timber forest products employment data are available, there were 5,800 floral and Christmas greens workers and 120,400 wood and paper products workers in Oregon and Washington. If this is indicative of the ratio of non-wood forest products workers to wood and paper workers in other regions, then the year 2006 level of wood and paper products workers of 950,100 (Table 9) could suggest that the number of non-wood forest products workers would be at least in the multiple tens of thousands nationwide.

Employment by businesses large enough to be recognized as hunting and trapping establishments decreased from a recent high of 2,707 in 2002 to 1,875 in 2006. (Table 10).

Workers in the informal economy tend to have very specific characteristics that can be referred to as downgraded labor. Many receive fewer benefits or lower wages, or experience worse working conditions than they would in the formal economy. Many work in the informal economy because they must.