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National Forests of Wisconsin

Demographics and Recreation Participation

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Abstract

The primary benefit of this research was to lay a foundation for examining and predicting future participation in recreation on a specific national forest. We explain some of the obstacles involved in site-specific projections and note that this is an area in need of additional research. This study used data from the 1990 U.S. Census to examine changes in the human population surrounding the Chequamegon and Nicolet National Forests in Wisconsin. A methodology was then developed to project future participation in recreation on those national forests based solely on demographics. This research highlights the difficulties inherent in making point-in-time estimates or forecasts of recreation participation for a specific location, such as a national forest. This research also demonstrates how demographic variables can be used to describe general trends in recreation participation and plan for future recreation resource needs. Expected changes in the size, age, and race and ethnicity of the U.S. population are compared with expected population changes in the areas surrounding the Nicolet and Chequamegon National Forests. Although other studies have shown that population age will likely have the most pronounced effect on future recreation participation at the national level, a decomposition analysis for the Nicolet National Forest shows that population size will likely have the greatest effect at the local level.

Keywords: Demographics, recreation, national forests

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Demographics and Recreation Participation

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Introduction

Forest resources contribute to our well being in a variety of ways, including providing for human leisure and recreation. Opportunities exist in the U.S. national forests to hike, backpack, camp, picnic, view wildlife, and canoe, just to name a few. To provide the optimal recreation opportunities, national forest planners need to have an understanding of who their customers are and how changes in the population can affect future participation in recreation.

At the national level, population in the United States is expected to increase from 262 to 338×10^6 by 2025 (Day 1993). Further, the U.S. population is expected to become older and more diverse. Demographic changes such as these can have a significant effect on the demand for recreation. National population projections have been used to project recreation participation at the national level (Clawson 1985, Dwyer 1994, Kelly 1987, Loomis and Ditton 1988, Murdock and others 1991). State-level work along these lines also exists (Dwyer, in press; Murdock and others 1990, 1992). Typically, such studies have multiplied the anticipated population in an area, often segmented by age, sex, race, and ethnicity, by similarly segmented participation rates to obtain a demographic forecast of future participation in an activity. The majority of work in this general area has used national or state-wide participation rates obtained from representative sample surveys of participation and national population projections to derive nationwide forecasts of participation. Such use is straightforward and presents no conceptual difficulties as long as the participation rates by demographic groups are correct for the given level of analysis and the demographic projections are reliable. However, problems emerge when applying this methodology to subnational recreational areas such as individual national forests.

This research tested a potential method to estimate future recreation participation on individual national forests. This method involved using age-specific demographic variables coupled with age-specific participation rates to determine future participation in selected recreational activities. The results and explanation of difficulties involved in conducting these analyses are documented. Expected demographic changes over the next two decades are examined, and a decomposition analysis is used to provide information on the general trends in future recreation participation.

Methodology

This study tested a new methodology for projecting future participation in recreation on the national forests in Wisconsin based solely on demographics. This methodology involved using a finite distance from the forests such that the population contained within a circle defined by a radius equal to that finite distance might reasonably estimate actual current use when multiplied by appropriate participation rates. If the population so defined does yield a reasonable estimate of actual current use when multiplied by appropriate participation rates, then changes in the demographic characteristics of the population can be used to determine changes in future recreation participation. The methodology involved the following four steps:

1. Obtain estimates of actual current use.

2. Determine appropriate population base.

3. Obtain appropriate recreation participation rates for the national forests in Wisconsin.

4. Multiply population by participation rates and compare with actual use estimates.

Current Use Estimate

Recreation activities on the national forests in Wisconsin include camping, swimming, picnicking, boating, fishing, hiking, biking, cross-country skiing, snowmobiling, canoeing, and horseback riding (Masberg and Hronek [n.d.]). It is difficult to determine the number of recreation visitor days or visitors for each of these activities because numerous points of entry are available into the forest. Many of these activities are considered dispersed, and no survey card or other means of tracking participation in the various activities is currently available. The exception is developed camping. To camp at a developed campsite in a national forest, you must pay a fee, thus the camping experience is recorded. Because use data for camping are the most reliable, we used camping as the recreational activity of analysis throughout this report.

Estimates of current use of Federal lands by activity typically contain estimates of recreation visitor days (RVDs), but not the number of recreation visits or visitors. For purposes of this study, we wanted the number of recreation visitors rather than the RVDs. One RVD is equal to 12 h. This could mean one person recreating for 12 h or three persons recreating for 4 h each. To obtain an estimate of the number of visitors for camping on each forest, we converted the number of RVDs, as recorded by each national forest, to hours and divided that number by the average length of stay in hours as shown in the following calculation:

	Chequamegon	Nicolet
Total RVDs for camping	207,300	239,600
× 12 (hours in 1 RVD)	12	12
Equals total recreation visitor hours	2,487,600	2,875,200
Divided by average length (hours) of stay (1 person)	8	72
Equals annual visitors	30,711	39,933

Total RVDs for camping in the Nicolet and Chequamegon were obtained from national forest data (Robert Bodine 1993–1994, personal correspondence). For the Chequamegon, the average length of stay was determined from a survey of visitors to the Chequamegon National Forest in 1990 (Cordell and others 1991). For the Nicolet, the average length of stay was determined from a customer report card for the Lakewood District, Bagley Rapids campground (Robert Bodine 1993–1994, personal correspondence). Although the average length of stay for the entire Nicolet National Forest may not coincide with the average length of stay on the Bagley Rapids campground, these were the only data available for our use. Therefore, we determined that the annual number of visitors is the number of total visitor hours divided by the average length of stay. For the Chequamegon, the estimated number of visitors was 30,711 and for the Nicolet, 39,933 (Table 1).

Table 1—Current use estimate for camping and population within a 125-mile radius of each forest

National forest	Annual visitors[a]	Population[b] ($\times 10^6$)
Nicolet	39,933	1.68
Chequamegon	30,711	2.38

[a]Information based on national forest data.
[b]Source: Census of Population 1990.

Population and Distance

After determining that our estimates of current participation in camping in both the Nicolet and Chequamegon National Forests were reasonable, the next step was to determine the appropriate population by age that would best represent current participation. The approach in this step of the research began by acknowledging that participation in an activity at a specific site generally decreases for persons who live farther away from that site, and areas with large populations contribute more to participation than do areas with small populations regardless of distance. This can be represented as

$$PR_D \approx P_D^{b_1} / D^{b_2}$$

where
PR_D = participation rate at distance D from the site
P_D = population residing at distance D from the site
D = distance from the site
b_1 and b_2 = empirically determined parameters that describe the slope of the exponential decay

The decrease is steep for those recreational activities that require people to generally travel only short distances to take part in (e.g., picnic) and shallow for activities where people are willing to travel longer distances for (e.g., camp). But, in general, the observation holds that participation is high for those who live near a recreational site and low for those who live far from the site. This presented a problem. We knew of no survey (with a sufficiently large sample and detailed content) that would permit the determination of participation rates that are jointly specific to site, distance from site, and recreational activity, as well as by age (and perhaps by other useful demographics such as gender and race).

So the question was, Can you take a general participation rate for an activity and find some distance from a specific recreational site that permits the demographic estimation of use? Stated differently, Is there some average distance from a

site such that an average participation rate applied to the population within that average distance yields a reasonable estimate of use? Implicit in this question is acknowledgment that not everyone who lives inside the distance radius participates in recreation at the site and, similarly, that some people who live long distances beyond the radius do participate.[1] The success of the methodology depends on the validity of using averages.

Fortunately, a recent survey provided information giving a frequency distribution of participation in various activities by distance traveled to the Chequamegon National Forest (Cordell and others 1991). This information provided a means of directly deriving an average distance of travel by participants. The average distance traveled by campers to the Chequamegon National Forest was approximately 140 miles (1 mile = 1.6 km). Because we did not have an estimate specific to the Nicolet National Forest, 140 miles was also used for the Nicolet.

Participation Rate

A participation rate is the number of people in a given population that participate in an activity, expressed as a percentage of the total population. Participation rates are often given for various age groups. Because specific forests (e.g., Nicolet and Chequamegon located in the Wisconsin northwoods) are sought for recreational pursuits by a national and international population, it was deemed appropriate to use national participation rates for camping in a national forest. However, national level participation rates for camping specific to national forests do not exist. Rather, age-specific participation rates for an activity such as camping at the national level are all-inclusive, representing the percentage of the national population that camp at a national forest, national park, state park, county park, or private campground.

Participation rates do exist for Wisconsin residents who have camped in a national forest. The problem with using these participation rates is that they reflect participation in any national forest, not just those in Wisconsin. Furthermore, the rates are specific only to Wisconsin residents, and we know that people who camp in the Chequamegon and Nicolet also come from areas outside Wisconsin.

To derive a national estimate of camping rates specific to national forests, we assumed that the ratio of Wisconsin residents who camp in a national forest to Wisconsin residents who camp in all locations is proportionate to the ratio of the national population who camp in a national forest to the national population who camp in all locations.

Data on camping in a national forest and camping in all locations by Wisconsin residents were obtained from the Wisconsin Statewide Comprehensive Outdoor Recreation Plan (Wisconsin Department of Natural Resources 1991, personal communication). Data on camping by U.S. residents in all locations were obtained from Dwyer (1994). Although this still did not provide us with an age-specific participation rate specific to a particular national forest, it did provide us with an age-specific national participation rate for camping specific to national forests (Table 2).

The validation test, then, became one of comparing the outcome of multiplying the estimated vector of national participation rates, by age, with camping in a national forest by the age vector of the population residing within 140 miles of each of the two national forests. Because the target use figures and the national participation rates were referenced to the early 1990s, it seemed suitable to use population data, by age, from the Census of Population (1990), which includes Minnesota, Wisconsin, and Michigan. Profiles of the population from the counties of these states falling within the specified radius were created.

Results

For both the Nicolet and Chequamegon National Forests, this methodology yielded estimates of actual use that were too high. Our initial experimentation had used a radius of 140 miles; therefore, we reduced this to a 125-mile radius to see if this might validate the methodology, but again the estimates were too high. Using a radius of 125 miles, our estimate was that 43,775 people used the Nicolet National Forest for camping annually. This estimate is 9.5 percent

Table 2—Estimated participation rate for camping in a national forest[a]

Age group (years)	Population (%)
15 to 24	4.42
25 to 34	4.95
35 to 44	4.43
45 to 54	3.49
55 to 64	1.88
65+	0.36

[a]Data obtained by multiplying national participation rates for camping by an adjusted ratio (DNR 1991, personal communication; Dwyer 1994).

[1] For example, we know that many visitors to the Nicolet National Forest come from Chicago, Illinois, and metropolitan areas in southeastern Wisconsin, even though these areas are outside the 125-mile radius chosen for this study. In this instance, the large populations in these areas overcome the "distance effect." That is, large populations participating at low rates still yield a relatively large number of visitors.

greater than the estimate of the actual number of participants of 39,993 based on national forest data. For the Chequamegon National Forest, we estimated that 63,547 people would use the forest for camping, but actual use was estimated to be only 30,711, a difference of 106.9 percent. Several factors may have contributed to our results.

First, we suspect that state borders constitute barriers to use for some campers. According to a survey, more people are aware or have visited the Chequamegon and Nicolet from Milwaukee than from Minneapolis and St. Paul (Dwyer and others 1992). Milwaukee is both smaller and farther away from the forests than are Minneapolis and St. Paul, providing evidence that the border between the two states, presumably coupled with other recreation opportunities in Minnesota, reduces visitor awareness and use by Minnesota residents of the Nicolet and Chequamegon National Forests.

Second, our analysis found that, although the number of visitors to the Chequamegon National Forest for camping was less than the number of visitors to the Nicolet National Forest according to national forest data, the number of people living within the 125-mile radius of the Chequamegon is greater than that for the Nicolet (Table 1). The greater population surrounding the Chequamegon is due to the inclusion of a large metropolitan county in Minnesota that lies within the 125-mile radius. The greater participation in camping in the Nicolet National Forest may be due to the location of the Nicolet in Northeastern Wisconsin where an abundance of lakes and water resources are available. Because the Nicolet and Chequamegon can act as substitutes for each other, future studies might analyze the population in the market areas of the two forests together. Further, other substitute sites should be considered, such as state parks, state forests, and private campgrounds that have more developed facilities than do typical national forest campgrounds.

A third reason for our results is that populations are distributed in nonuniform patterns. If the populations distributed in the three states were uniformly distributed, a method based on averages would work. This suggests that a distance circle defined by the average camper does not work in estimating the actual participation in camping in a specific national forest, at least under the conditions of widely disparate population densities.

Fourth, our results were based on use data provided by the national forests. Although better for camping than for most other activities, these use data are somewhat unreliable. National forest personnel have improved their use of surveys in the past few years, and efforts should continue to further improve data collection. To obtain good estimates of future participation, reliable estimates of current participation are needed. Such information is currently unavailable.

Finally, our results were based up national age-specific participation rates of camping in a national forest derived from age-specific ratios for Wisconsin of camping in a national forest to camping in general. Because Wisconsin residents have greater participation rates for camping in all locations than nationally, we suspect that Wisconsin residents also have greater participation rates for camping in national forests. If the presence of two popular national forests in the state tend to increase the latter rates, then our estimates of national participation in camping in a national forest may be high because they are based on Wisconsin data.

Our analysis found that using an average distance traveled and based only on demographics, it is difficult to obtain accurate point-in-time estimates or forecasts of participation in recreation. However, our analysis does reveal that the population contained within the radius that represents the average distance traveled to the forest for recreation actually matches well with the demographic characteristics revealed in user surveys conducted in the Chequamegon (Cordell and others 1991). For example, our estimates of participation by age indicate that 56 percent of those participating in camping would be between the ages of 25 and 44 and 19 percent would be between the ages of 45 and 64. These findings are similar to those from the Chequamegon Customer Survey (Cordell and others 1991) that indicated that 60 percent of campers in the Chequamegon are between the ages of 25 and 44 and 21 percent are between the ages of 45 and 64.

This finding results from the fact that our point-in-time estimates of participation were highly dependent on having chosen a market area of the appropriate population size. A comparison of the characteristics of the population in terms of age, race, education, and income with actual user surveys is less dependent on population size. The population within a 125-mile radius of each of the Wisconsin national forests then seems appropriate for further analysis, because we know most users have characteristics similar to these populations. The next section of this report explains the demographic characteristics of the populations within the 125-mile radius of both the Chequamegon and Nicolet National Forests.

Demographic Characteristics

The demographic variables of population size, growth rate, age, and race/ethnicity were examined at the national and forest level and the results are given in Tables 2–6. (Additional demographic illustrations for the Chequamegon and Nicolet National Forests are given in the Appendix.) National level population projections were obtained from the U.S. Bureau of the Census (Day 1993). At the forest level, population data by age were obtained from the Census of Population (1990) for Minnesota, Wisconsin, and Michigan. Profiles of the population from only those counties falling within the specified radius were obtained.

Table 3—Projected population size for the United States and within a 125-mile radius of each national forest[a]

Year	Population ($\times 10^6$)		
	United States	Chequamegon	Nicolet
1990	249	2.38	1.68
2000	276	2.54	1.78
2010	300	2.64	1.81
2020	326	2.70	1.82

[a]Day 1993; Census of Population 1990.

Table 4—Projected population growth rates for the United States and within a 125-mile radius of each national forest[a]

Year	Population growth rate (%)		
	United States	Chequamegon	Nicolet
1990–2000	1.0	0.66	0.57
2000–2010	0.84	0.38	0.2
2010–2020	0.82	0.27	0.05

[a]Day 1993; Census of Population 1990.

Table 5—Projected median age for the United States and within a 125-mile radius of each national forest[a]

Year	Median age		
	United States	Chequamegon	Nicolet
1990	32.8	32.9	33.6
2000	35.7	36.3	37.2
2010	37.4	38.8	40.1
2020	38	40.6	41.8

[a]Day 1993; Census of Population 1990.

The population projections are based on Census of Population (1990) results and employ a standard cohort-component projection methodology (Irwin 1977). This methodology uses age-specific rates of mortality, fertility, and net migration to separately account for the three components of population change. In particular, for net migration, an assumption is first made regarding the future net migration in the state. This volume of net migration is then allocated to counties

Table 6—Race and Hispanic origin of the United States and within a 125-mile radius of each national forest[a]

	Total population (%)		
	United States	Chequamegon	Nicolet
White non-Hispanic	83.9	95.3	97.1
African American	12.3	1.3	0.3
Asian/Pacific Islander	3	1.7	0.8
Native American	0.8	1.4	1.5
Other	NA	0.4	0.2
Hispanic	9	1	0.6

[a]Day 1993; Census of Population 1990.

based on prior and anticipated trends. Finally, the number of projected net migrants for counties is allocated to age groups based on the particular county-specific age pattern of net migration observed in the past decade. For the three states involved, population projections were obtained from the demographic units in the three state governmental executive agencies (McMurray and Gillaspy 1993, Wisconsin Department of Administration 1993, Michigan Office of the Budget 1993, personal communication).

Population Size and Growth

National population projections (Day 1993) indicate that although the U.S. population is expected to increase, it will grow more slowly than in the past (Tables 3, 4). During the 1990s, the population is expected to grow at an annual rate of 1.03 percent, from 249×10^6 in 1990 to 276×10^6 in 2000. The annual growth rate is expected to decrease to 0.84 percent by 2010, with a population of 300×10^6, and to 0.82 percent per year by 2020 with a population of 326×10^6.

At the forest level, more than 2.4×10^6 people from counties in Minnesota, Wisconsin, and northern Michigan lived within a 125-mile radius of the Chequamegon National Forest in 1990, and more than 1.68×10^6 people from counties in Wisconsin and northern Michigan lived within a 125-mile radius of the Nicolet National Forest. Counties included in this analysis are shown in Figure 1.

As shown in Table 3, the population within the 125-mile radius of the Chequamegon National Forest is expected to increase 13.6 percent, from 2.4×10^6 in 1990 to 2.7×10^6 in 2020, and the population within the 125-mile radius of the Nicolet National Forest is expected to increase 8.4 percent, from 1.68×10^6 in 1990 to 1.82×10^6 in 2020. Faster growth in the Chequamegon National Forest region is due to

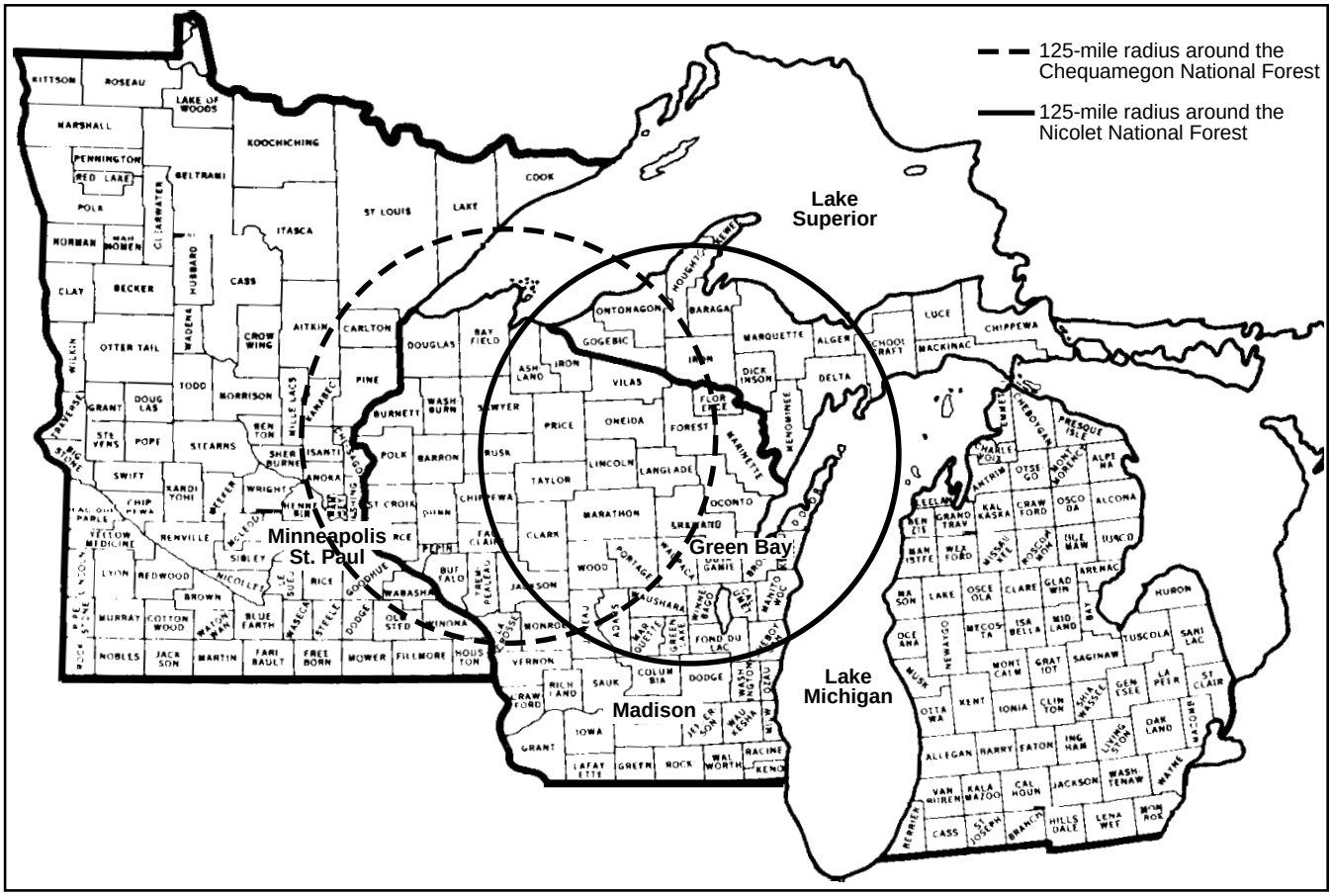

Figure 1—Map showing counties in Minnesota, Wisconsin, and northern Michigan within a 125-mile radius of the Chequamegon and the Nicolet National Forests.

the increased rates of growth in the suburban and exurban counties to the east of Minneapolis and St. Paul. Similar to the nation's population, the growth rate for the market population of both forests is expected to decrease, as shown in Table 4. From 1990 to 2000, the population surrounding the Chequamegon National Forest is expected to grow at a rate of 0.66 percent per year, and the population surrounding the Nicolet National Forest is expected to grow at a rate of 0.57 percent per year. By 2010, the growth rate for the Chequamegon National Forest is expected to slow to 0.27 percent per year, and for the Nicolet, the growth rate is expected to slow to 0.05 percent per year.

Population Age

Baby Boomers and Baby Busters

Understanding the U.S. population and sublevel populations requires an understanding of the "Baby Boom" and the "Baby Bust" generations. The Baby Boom took place between 1946 and 1964, two decades when more births took place than at any other time in U.S. history. Not only were women having more children, but more women were having children (Bouvier 1980). In the peak year of the Baby Boom, 1957, more than 4.3×10^6 births took place. The Baby Bust took place in the decade following 1964, when the number of recorded births again decreased. By the mid-1970s, births had decreased to just over 3×10^6, slightly greater than the number recorded in the early 1940s.

The implication for the future age distribution of the U.S. population is significant. The Baby Boomers will be in the age range 26–44 in 1990, 36–54 in 2000, 46–64 in 2010, and 56–74 in 2020. The population will age with the Baby Boomers, affecting the median age of the population and the age distribution.

Median Age

In the presence of relatively low fertility rates, the median age is driven primarily by the aging of the population. Because the Baby Boom generation is currently passing through the age marked by the median, the increase in the median is especially fast (Table 5). The estimated median age of the U.S. population in 1990 was 32.8 years. Census Bureau projections suggest that the median age will increase to 35.7 by 2000 and to 38.0 by 2020 (Day 1993).

The median age of the population living within the 125-mile radius of the Chequamegon in 1990 was 32.9, almost exactly the median age for the nation as a whole. Projections indicate that the median age should increase to 36.3 by 2000, and to 40.6 by 2020 (Table 4). The median age of the population within the 125-mile radius of the Nicolet National Forest was 33.6 in 1990, slightly greater than the median age for the nation as a whole. Projections indicate that the median age should increase to 37.2 by 2000, and to 41.8 by 2020 (Table 5).

Age Distribution

For the U.S. population, the age group with the largest expected increase in number between now and the year 2000 is expected to be persons 45–54 years old. This group numbered 25.2×10^6 people in 1991 and is expected to number 36.2×10^6 by 2000, an increase of 44 percent. As the Baby Boomers move into retirement, around 2010, the average annual rate of growth for persons 65 and older will increase from 1.3 percent between 1991 and 2010 to 2.8 percent between 2010 and 2030.

Such changes affect the age distribution of the population. As illustrated in Figure 2, the percentage of the total population in the age groups under 45 was 68.9 percent in 1990. This number is projected to decrease to 58.8 percent by 2020.

At the forest level, between 1990 and 2020, the number of people in all age groups under 45 is projected to decrease. For the population surrounding the Chequamegon National Forest, the age group 0–14 is projected to decrease more than 10 percent, from 543×10^3 in 1990 to 486×10^3 in 2020. The age group 15–24 is projected to decrease by 4 percent during the projection period, the number of 25–34 year olds will decrease nearly 14 percent, and the number of people age 35–44 is expected to decrease by about 3 percent.

For the population surrounding the Nicolet National Forest, similar decreases are projected. The age group 0–14 is projected to decrease 14 percent, from 376×10^3 in 1990 to 324×10^3 in 2020. The age group 15–24 is projected to decrease nearly 8 percent; the number of 25–34 year olds will decrease more than 19 percent; and the number of 35–44 year olds is expected to decrease more than 8 percent.

The number of people in every age group over 45 increases throughout the projection period for the population surrounding both forests. For the Chequamegon National Forest from 1990 to 2000, the 45–54 age class is projected to increase by 36 percent, from 235×10^3 in 1990 to 319×10^3 in 2020. During the same period, the number of people age 55–64 nearly doubles (increases by 95 percent). The number of people over age 65 also increases substantially—more than 60 percent; as life expectancy improves, the number of

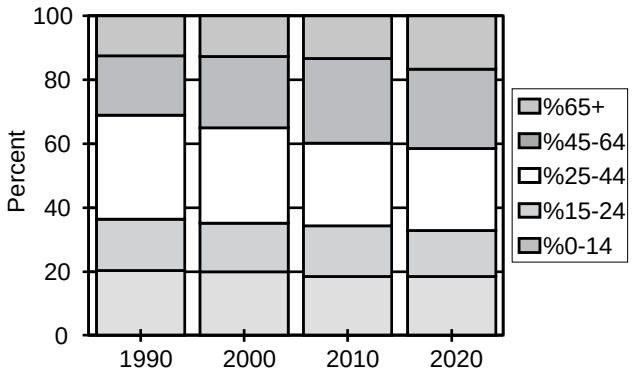

Figure 2—Age distribution of the U.S. population. Source: Day 1993.

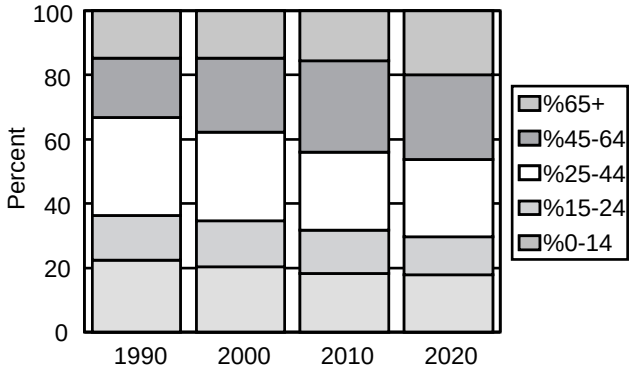

Figure 3—Age distribution within a 125-mile radius of the Chequamegon National Forest. Source: Census of Population 1990.

people in the age group 75 and over also increases—more than 44 percent. As shown in Figure 3, the portion of the population surrounding the Chequamegon National Forest in the age groups over 45 increases, and the portion of the total population in the younger age groups decreases.

For the Nicolet National Forest from 1990 to 2000, the number of people age 45–54 increases 28 percent, from 163×10^3 in 1990 to 209×10^3 in 2020. During the same period, the number of people age 55–64 increases by 83 percent. The number of people over age 65 also increases substantially—more than 47 percent; as life expectancy improves, the number of people in the age group 75 and over also increases—more than 32 percent from 1990 to 2020. As illustrated in Figure 4, the portion of the population in the age groups over 45 increases, and the portion of the total population in the younger age groups decreases.

Race and Hispanic Distribution

The U.S. population is expected to become more ethnically diverse in coming years, as illustrated in Figure 5. In 1980, 85.9 percent of the population was white non-Hispanic. By

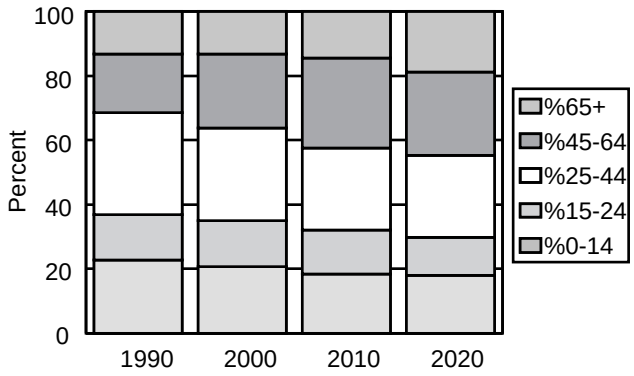

Figure 4—Age distribution within a 125-mile radius of the Nicolet National Forest. Source: Census of Population 1990.

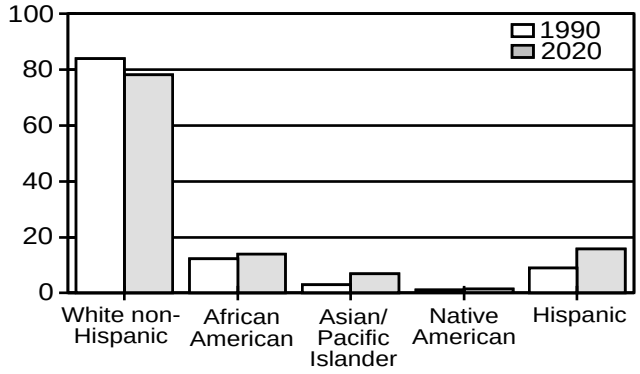

Figure 5—Race/Hispanic origin of total U.S. population. Source: Day 1993.

1990, that percentage had decreased to 83.9 percent and is expected to decrease further to 78.2 percent by 2020. The African American population is expected to increase from 12.3 percent of the total population in 1990 to 13.9 percent in 2020. Asian/Pacific Islanders are expected to have the greatest growth rate, possibly exceeding 4 percent annually in the 1990s. As a percentage of the total population, the Asian/Pacific Islander group is expected to increase from 3 percent in 1990 to 7 percent in 2020. The percentage of the total population that is Native American is also expected to increase from 0.8 percent in 1990 to 0.9 percent in 2020. Finally, those of Hispanic origin will represent 15.7 percent by 2020, up from 9.0 percent in 1990. Thus, racial and ethnic groups other than white non-Hispanic are increasing in numbers, and this trend is expected to continue.[2]

[2] Persons of Hispanic origin are a separate category used by the Census Bureau. Each person included in the census answers a question on race (e.g., white non-Hispanic, African American, Asian/Pacific Islanders, Native American) and a separate question on Hispanic origin.

The populations surrounding the Chequamegon and Nicolet National Forests are not as diverse as the U.S. population. Both populations consist primarily of white non-Hispanic residents. As shown in Table 6, only 4.7 percent of the population within the 125-mile radius of the Chequamegon National Forest are African American, Asian/Pacific Islander, Native American, or other race; only 2.87 percent of the population within the 125-mile radius of the Nicolet National Forest are minorities. Those who indicated that they were of Hispanic origin were approximately 1.0 percent of the population surrounding the Chequamegon National Forest, and less than 1.0 percent for the Nicolet National Forest. Population projections by race were not available at the county level for Michigan, Minnesota, or Wisconsin. Therefore, apart from indicating that the populations at the forest level are not as diverse as the national population and are not likely to be, little can be said about the future ethnic diversity of the forests.

Implications for Recreation Participation

At the national level, outdoor recreation customers for many activities are likely to increase in numbers at a slower rate than in the past, will be increasingly older, and from racial/ethnic minority groups (Dwyer 1994). If participation rates for recreation on the Chequamegon and Nicolet National Forests remain constant over time, projected demographic changes are likely to result in changes in recreation participation patterns. Based upon the demographic changes projected for the populations within the 125-mile radius of the two forests, recreation customers for the Chequamegon and Nicolet will also increase in numbers at a slower rate than in the past and will be increasingly older. Although the populations surrounding the forests are likely to become more diverse, the race/ethnicity mix of the population will probably change more slowly than the projected changes at the national level. The following discusses possible changes in recreation participation that can be partially attributed to age distribution, population size, and ethnic diversity.

Age Distribution and Population Size

Murdock and others (1991) and Dwyer (1993) found a general trend that increasing age will have a depressing effect on overall participation in recreation, because most recreation activities are associated with high participation rates in younger age groups. Thus, in the United States, the number of participants in activities such as camping that are popular with younger participants will decline in the future (Murdock and others 1991). Murdock and others developed a cohort-component projection model using national population projections by age and race/ethnicity, coupled with national participation rates for specific recreation activities. The activities

studied were backpacking, bird watching, camping, day hiking, hunting, picnicking, and walking. Assuming constant participation rates, Murdock and others conducted a decomposition analysis as developed by Das Gupta (1978) and found that age will have the most significant effect on change in future recreation participation in the activities studied, at the national level. Furthermore, Murdock and others also examined the effect of changes in the number of participants in recreation activities that could be attributed to population growth (called the rate effect). They found, as expected, that population growth enhances the level of participation in recreation for all activities studied.

For our research, a decomposition analysis was conducted to determine the effect that the individual components of age and size will have on future participation in camping on the Nicolet National Forest, holding current participation rates constant. Based on techniques developed by Das Gupta (1978), the decomposition analysis was used to determine how much of the expected change in future participation in an activity is directly attributable to age, holding size constant, and how much is attributable to size, holding age constant.

We used the following formula to conduct the analysis:

$$(e. - E.) = \sum T_i [(n_i/n. \times N.) - (N_i/N. \times N.)] + \sum T_i [(N_i/N. \times n.) - (N_i/N. \times N.)] + I \quad (1)$$

where

- e. = number of campers expected in 2020
- E. = number of campers estimated in 1990
- T_i = participation rate for age group i
- N_i = 1990 population for age group i
- $N. = \sum N_i$
- n_i = 2020 population for age group i
- $n. = \sum n_i$
- I = the interaction term

The difference between the estimated number of participants in camping on the Nicolet National Forest in 1990 and those projected for 2020[3], represented by the left-hand side of Equation (1), is

$$(e. - E.) = 43802.56 - 43774.79 = 27.77 \quad (2)$$

Thus, given our estimates of current and future use, the estimated change in the number of people participating in camping on the Nicolet National Forest will be 27.77, a difference of 0.06 percent. However, is this realistic? Given the average distance traveled for camping is 125 miles, the age distribution, and expected change in size of the population, we believe that the difference of 0.06 percent is realistic. The following calculates the age effect, the portion of Equation (1) that tells us how much we can expect participation to change based on changing age distribution, holding size and participation rates constant:

$$\sum T_i [(n_i/n. \times N.) - (N_i/N. \times N.)] = -5649.87 \quad (3)$$

The result of Equation (3) indicates that because the population within the 125-mile radius of the Nicolet National Forest is expected to have more people in older age groups in the year 2020, given no change in the size of the population, there would be a decrease of 13 percent in the number of people participating in camping. However, this decrease is expected to be offset by the increase in population size. The following calculates the size effect, the portion of Equation (1) that tells us how much we can expect participation to change based on increasing population size, holding age distribution of the population constant:

$$\sum T_i [(N_i/N. \times n.) - (N_i/N. \times N.)] = 6519.03 \quad (4)$$

The result of Equation (4) indicates that because the population within the 125-mile radius of the Nicolet National Forest is expected to increase, the number of people participating in camping would increase by 15 percent.

The interaction term, I, from Equations (1) to (4) is $27.77 - (-5649.87) - (6519.03) = -841.39$. The interaction term is the effect of simultaneously changing population size and age composition.

This decomposition analysis reveals the effect that the individual components of age and size will have on future participation in recreation, holding constant current participation rates. Our analysis of the area within a 125-mile radius of the Nicolet National Forest indicates that population size will have a more pronounced effect on future participation in camping than will age. We believe this is because the population within these 125 miles of the Nicolet is already heavily distributed toward the older age groups, thus aging will not have as large an effect on participation in recreation by this population as it does for the national population.

Ethnic Diversity

Murdock and others (1991) also examined the effect of changes in the number of participants in recreation activities that could be attributed to changes in race. At the national level, population projections indicate that the proportion of the population that is white non-Hispanic will decrease from 83.9 percent of the total population to 78.2 percent of the total population. In general, increasing minority populations will result in slowing the rate of participation for the activities studied (Murdock and others 1991).

[3] We conducted the decomposition analysis only for the Nicolet National Forest because the results of our previous analysis were more accurate for the Nicolet.

Dwyer (1994) examined several recreation activities in addition to the activities examined by Murdock and others (1991). Dwyer (1994) found that for some activities, Hispanic and other population groups had comparable or even greater participation rates than white non-Hispanic, depending on the activity. Thus, for some activities increasing minority populations could result in an increase in the rate of participation. Such activities include freshwater fishing.

An examination of the populations within a 125-mile radius of the Chequamegon and Nicolet National Forests shows that the proportion of the minority population is less than 4 percent in each case. Although these population groups are likely to become more diverse, they are unlikely to experience the magnitude of change in diversity that is projected at the national level. Thus, ethnic diversity will likely play a less significant role in the change in recreation participation on these national forests than it will at the national level. To the extent that the minority population increases in the areas surrounding these national forests, the number of participants in a given recreation activity may increase or decrease, depending on the activity.

Key Findings

This study furthers research in projecting participation in recreation for a specific site, such as a national forest. Because planners and recreation managers often have limited budgets and time, we attempted to develop a relatively simple method of estimating future participation in recreation based only on demographics. Similar methods have been used at national and state levels, but problems occur when attempting to make such projections at the level at which resource use actually occurs.

Our first obstacle was obtaining reliable recreation use estimates. Data were most reliable for camping, thus our study was limited to estimating participation in camping. A second obstacle was that the national forests do not have reliable information on where visitors are from and how many come from a particular location. Thus, based upon previous studies, we used a 125-mile radius as a conservative estimate of the average distance traveled to the national forest for camping. The third obstacle was that participation rates for camping in a national forest do not exist. We derived such participation rates based on data of Wisconsin residents.

We multiplied the population within a 125-mile radius of each national forest in Wisconsin by the derived participation rates to obtain estimates of camping in each national forest in Wisconsin. Results gave us estimates of use that were high compared with national forest data on actual use. We cited several reasons for our results and suggested ways to improve projections in future studies. Nevertheless, characteristics of the local population are important to understand. Planners and managers are usually aware of national population shifts, but are unaware of what changes to expect in the local population structure. Thus, we provided information about the current population and expected demographic changes for the population within a 125-mile radius of the Chequamegon and Nicolet National Forests. We then compared these to expected national population changes.

The U.S. population is expected to increase at a slower rate than in the past, become increasingly older, and more ethnically diverse. Populations in the market areas of the Chequamegon and Nicolet National Forests are also expected to grow but at a slower rate than in the past. Further, these populations are projected to age faster than the nation as a whole. In 1990, these areas were primarily white non-Hispanic. Population projections by race and ethnicity are not available for these areas, but it is unlikely that these areas will experience the same increase in minority populations that is projected for the U.S. population.

The final section of this report discusses a decomposition analysis for expected changes in participation in camping in the Nicolet National Forest. The analysis showed that, although age will have the most pronounced effect on future participation in recreation at the national level, population size will have the greatest effect at the local level (within the 125-mile radius of the Nicolet). Thus, future participation in camping will increase overall, but is not expected to change significantly (less than 1 percent).

The primary benefit of this research was to lay a foundation for examining and predicting future participation in recreation on a specific national forest. We have explained some of the obstacles involved in site-specific projections and note that this is an area that is in need of additional research.

Future Research

This study investigated a simple methodology to estimate recreational use of specific national forests based only on demographics. The task now is to begin refining this methodology to overcome problems inherent in the use of simple averages, circle distances, and the consideration of forests as single points when their areas actually stretch for 100 miles or more.

Some suggestions for future research were received from reviewers of our study. One suggestion was to use procedures similar to those used in market area analysis, such as concentric zones in which the probability of participation in an activity is inversely related to the distance from the site to the service area. Another suggestion was to develop a distance minimization model, including alternative or substitute sites. Similarly, a travel cost-based model could be developed that is useful for predicting site use, but does not reveal how

use will change with changing demographics, other than a possible shift in population across origins. Those shifts can only be examined using county-level population projections.

Future research should also consider that many retirees have second homes in northern Wisconsin but are considered nonresidents. Because U.S. Census data do not account for these nonresidents, some other means of accounting for them should be considered. Finally, the Nicolet National Forest has developed the use of "Customer Report Cards" in the past few years. Data from these report cards were not available at the time we developed our procedures. and data available at the time of our study were not considered statistically valid. Since then, the Nicolet has improved data collection and tabulation, and this information should be considered in subsequent research.

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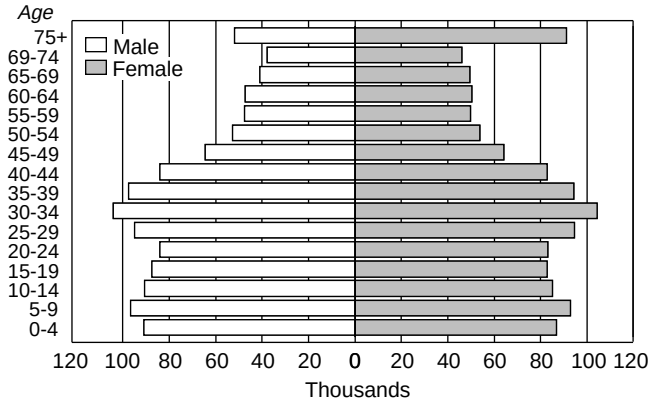
Appendix—Demographic Information

This Appendix contains demographic illustrations for the Chequamegon and Nicolet National Forests. Within a 125-mile radius of each forest, current and predicted data are given for the following:

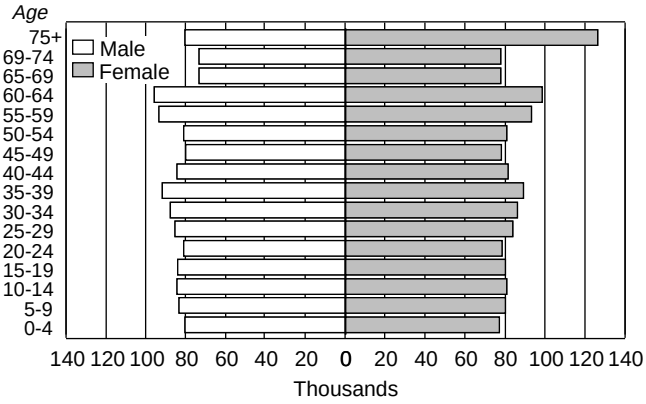
- Total population by age
- Rural and urban population
- Educational attainment of those 18 years and older
- Occupation of those 16 years and older
- Employment status of those 16 years and older
- Household income

Total population, Chequamegon National Forest, 1990



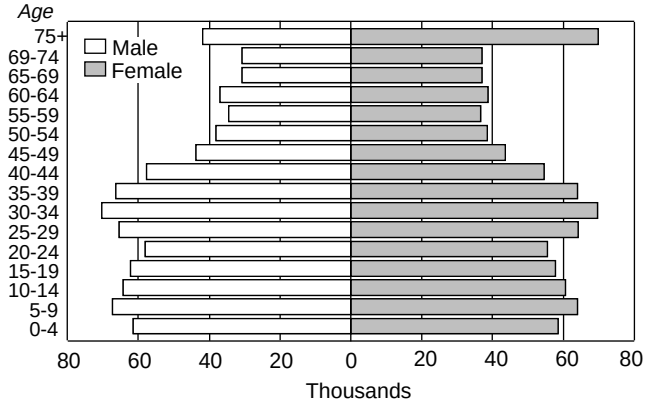
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Chequamegon National Forest

Total population, Chequamegon National Forest, 2020



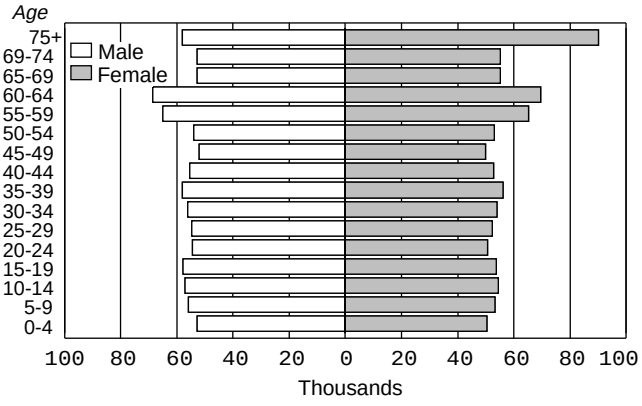
Source: State demographic units in MI, WI.
Population that resides within 125 miles of the Chequamegon National Forest

Total population, Nicolet National Forest, 1990



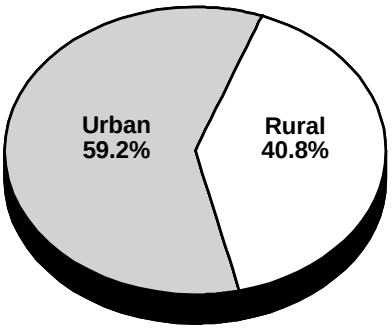
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Nicolet National Forest

Total population, Nicolet National Forest, 2020



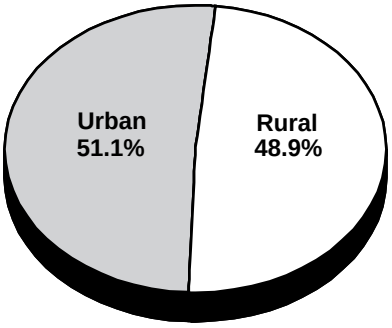
Source: State demographic units in MI, WI.
Population that resides within 125 miles of the Nicolet National Forest

Rural and urban population,
Chequamegon National Forest, 1990



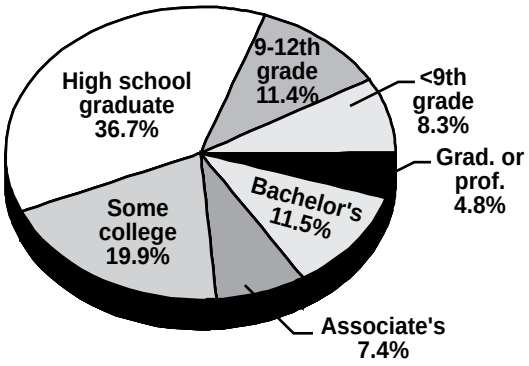
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Chequamegon National Forest

Rural and urban population,
Nicolet National Forest, 1990



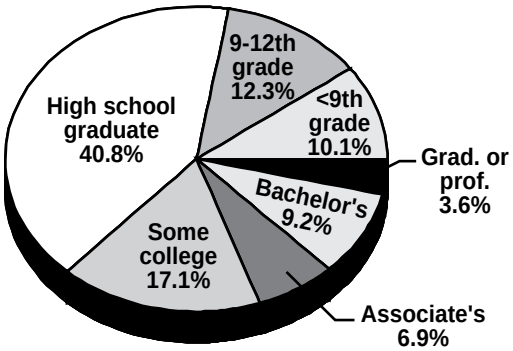
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Nicolet National Forest

Educational attainment,
Chequamegon National Forest, 1990
Universe: Persons 18 years and over



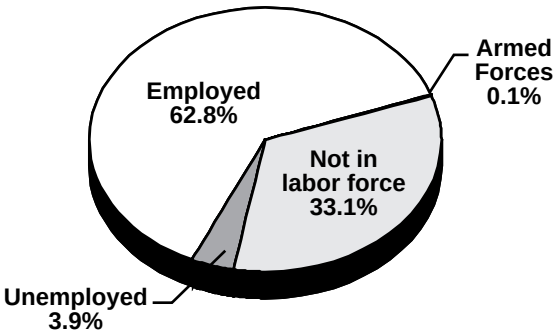
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Chequamegon National Forest

Educational attainment,
Nicolet National Forest, 1990
Universe: Persons 18 years and over



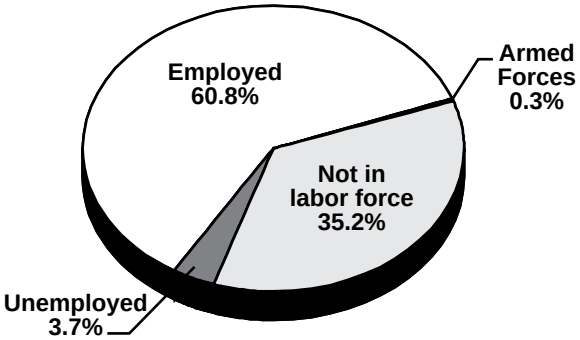
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Nicolet National Forest

Employment status,
Chequamegon National Forest, 1990
Universe: Persons 16 years and over



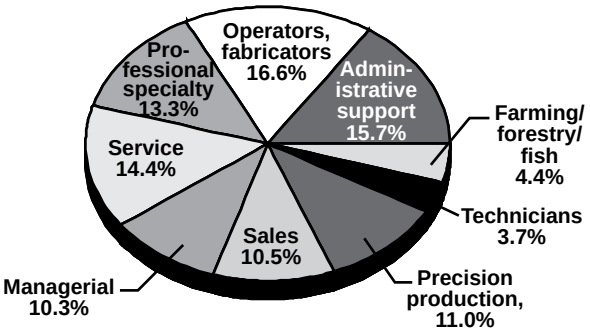
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Chequamegon National Forest

Employment status,
Nicolet National Forest, 1990
Universe: Persons 16 years and over



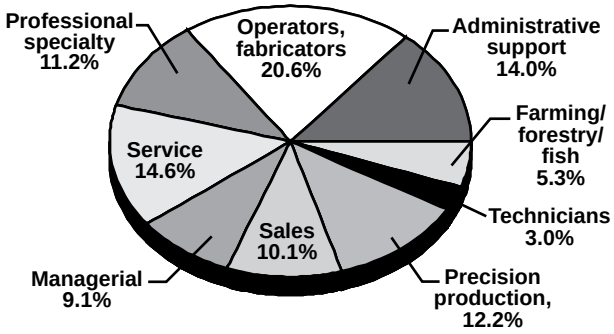
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Nicolet National Forest

Occupation, Chequamegon National Forest, 1990
Universe: employed persons 16 years and over



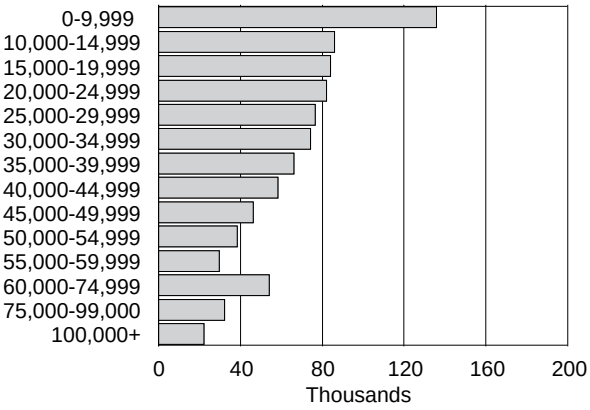
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Chequamegon National Forest

Occupation, Nicolet National Forest, 1990
Universe: employed persons 16 years and over



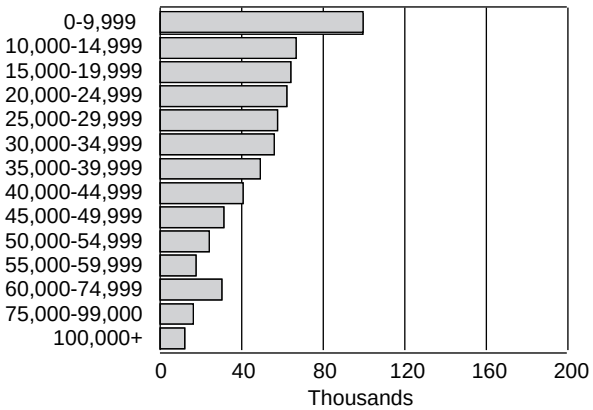
Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Nicolet National Forest

Household income, Chequamegon National Forest, 1990



Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Chequamegon National Forest

Household income, Nicolet National Forest, 1990



Based on 1990 Census: [STF 3A Machine Readable Database]
Population that resides within 125 miles of the Nicolet National Forest