

Recreation in the Sierra

ABSTRACT

Recreation is a significant activity in the Sierra Nevada, which serves as a center for a wide range of recreational activities. The Sierra contains some of the world's outstanding natural features, and they attract visitors from throughout the country and the world. Lake Tahoe, Yosemite Valley, Mono Lake, and the Sequoia Big Trees attract millions of visitors each year. Recreational activities on public lands alone account for between 50 and 60 million recreational visitor days (RVDs) per year, with nearly three-fifths to two-thirds of those RVDs occurring on lands administered by the U.S. Forest Service. The California Department of Parks and Recreation has the second greatest number of RVDs, followed by the U.S. Bureau of Reclamation, the National Park Service, and the U.S. Bureau of Land Management. Additional recreational activities on private lands account for millions more RVDs that are currently not accounted for by any agency in a consistent or reliable format that would allow direct comparisons with public land recreational use data. Inconsistency in the data classification and collection methodologies of the various public agencies also limits the usefulness of the recreational activity data that are available. This report brings the available data together into a common digital format and makes it available for analysis. The role of state and federal agencies in providing recreational opportunities in the Sierra Nevada is summarized, and more specific data provided about the types of recreational activities pursued under each agency's jurisdiction. There is significant variation by subregion and recreational activity class, moreover, which makes some agencies more important than others for specific types of recreation in specific areas. These differences by subregion and recreational activity class must be accounted for in any assessment of policy scenarios for the Sierra Nevada that might affect the availability of future opportunities for recreation. A more detailed assessment of recreational activities in the eastern Sierra subregion is also described to illustrate how subregional assessments can provide critical information on user characteristics and activities at a finer level of disaggregation.

INTRODUCTION

The Sierra Nevada region is a popular destination for recreationists. Year-round local residents and California residents and nonresidents pursue a wide variety of recreational activities. These pursuits occur throughout the entire region, from the bottom of steep river canyons to the top of the highest mountain peaks. The mountain range is the natural infrastructure that supports wilderness backpackers, skiers, fishing enthusiasts, off-road vehicle users, naturalists, and many others. All individuals who pursue outdoor activities within the Sierra Nevada rely upon the natural world for an enjoyable experience. The ecological conditions of the Sierra Nevada are therefore important factors influencing patterns of recreational activity. The frequency, duration, timing, and spatial pattern of recreational activities will in turn affect those ecological conditions.

Ecological, social, and economic conditions for many Sierra Nevada communities and residents are closely intertwined in the recreation sector. Tourism activity in the region, of which recreation constitutes a significant part, is also dependent in part upon the condition of Sierra Nevada ecosystems. The assessment in this chapter focuses exclusively on recreational activities on the public lands and public waters in the Sierra Nevada. This recreational activity may be either local in origin or involve tourism, which is in turn a subset of all activity related to the travel industry. Tourism that does not involve recreational activities utilizing the natural resources of the Sierra Nevada are not addressed in this report. Tourism throughout the Sierra Nevada is nevertheless conducted against the backdrop of the Sierra Nevada's recreational opportunities, so the two are closely intertwined and include most of the economic activity described by Stewart (1996) in the tourism and developed recreation sectors.

Unfortunately, there is very limited quantitative information linking specific levels and types of recreational activity to specific levels of tourism for the Sierra Nevada as a whole. The potential impact of changing ecological conditions on recreational activity and specific levels of tourism is therefore poorly understood. This is true despite several decades of work on the topic (Knight and Gutzwiller 1995), including several studies that were specifically focused on conditions in the Sierra Nevada (Parmeter 1976; Foin 1977). We therefore do not attempt to infer specific responses by the recreation sector to alternative management actions or changes in ecological conditions. Recreational activity is a function of many factors, and for most types of recreation ecological conditions are not necessarily the dominant factor. The availability of developed facilities and a wide range of behavioral considerations, including cultural factors, are probably equally important. The institutional arrangements for the provision of recreational opportunities (e.g., whether they are public or private and whether or not there is a fee for the activity) also influence recreational activity. Finally, aesthetic considerations are important for many types of outdoor recreation in the Sierra Nevada. Aesthetic appeal is not necessarily consistent with ecological well-being, however, so ecological well-being is not necessary to support many types of recreational activities that are dominated by aesthetic considerations.

This report has several significant deficiencies: (1) it has no reliable information about recreational activities on private lands; (2) it does not address the qualitative dimensions of different types of recreational experiences or activities; (3) it does not address the impact of recreation on ecological conditions; (4) it does not address the impact of public land policies and alternative institutional arrangements upon future recreational opportunities; (5) it does not discuss the vast literature on recreation or recreation's important historical role in determining the institutional arrangements for land and resource management in the Sierra Nevada. Limited resources required us to focus on available data in a common format, which touches on only one dimension of recreation in the Sierra Nevada. Each of these other dimensions is also important, but we were unable to address them within the framework of this assessment.

Significant recreational resources in the Sierra Nevada are located on private lands, however, and a significant level of recreational activity occurs on those lands. Much of the shoreline of the lakes and rivers of the Sierra Nevada is on private land, and recreational activities in the region are often focused around water resources. The high Sierra resort communities of Truckee and Donner Lake, much of Lake Tahoe, Lee Vining, and the town of Mammoth Lakes are all situated on private land. Access to the Sierra Nevada's spectacular national parks is primarily through the western gateway communities of Groveland, El Portal, Oakhurst, and Three Rivers. Other communities, such as Lone Pine and Bishop in the Owens Valley, are important centers for recreation on nearby public lands.

There is also a significant level of locally based recreational activity occurring within the Sierra Nevada. Finally, indoor recreation by both Sierra Nevada residents and visitors occurs largely on private lands. Our estimates of recreational activity in the Sierra Nevada are therefore conservative: overall social, economic, and ecological importance of recreation and tourism is much greater than indicated by the activity figures reported here. The impact of recreation on social and ecological well-being remains largely unexplored in the Sierra Nevada. These linkages are now being explored by local groups and recreation providers in recreation-dependent communities, however, such as the Tahoe Coalition of Recreation Providers (TCORP) and the Coalition for Unified Recreation in the Eastern Sierra (CURES).

KEY QUESTIONS

This assessment has attempted to answer five basic questions about recreation in the Sierra Nevada. The answers may help policymakers, citizens, agencies, and others to evaluate how various future policy alternatives (or other trends) may affect recreational activities in the region:

1. What are the current levels and types of recreational activities in the Sierra Nevada?
2. What is the spatial and temporal distribution of those recreational activities?
3. Who participates in these recreational activities (e.g., age, gender, residence)?
4. Who provides the opportunities for these recreational activities (e.g., agency)?
5. What changes are likely to occur in the future in recreational activities and users?

We are also interested in how the answers to these questions have changed over time, although we have not attempted to complete a comprehensive historical analysis of recreation in the Sierra Nevada; our focus has been on the recent past and its implications for the future. David Beesley (1996) discusses some of the more important historical events regarding recreation in the Sierra Nevada, including the designation of several national parks. These events continue to affect land and resource management in the region, so it is clear that recreation has played an important role in determining the present social, economic, ecological, and institutional context for management of the Sierra Nevada. This role is widely recognized by both the public and government officials at the federal, state, and local levels. It is most apparent when considering differences between the various federal land and resource management agencies. Nearly every agency is involved

with or affected by recreation within its jurisdiction, so this assessment has relevance throughout the Sierra Nevada. Nearly every human community within the Sierra Nevada is also affected by recreational activity in some way. This assessment's primary challenge is therefore to clarify the current state of our knowledge regarding recreational activities across multiple jurisdictions. As noted, however, this report addresses only a few of the dimensions of that knowledge and is therefore not a comprehensive treatment of the subject.

BACKGROUND

We have not generated any new information through primary research. All of the information that we present here has already been publicly available, but it has generally been inaccessible to anyone interested in an overview of recreation in the Sierra Nevada. Before this research, it was well known that recreation was significant throughout the range. It was also well known that recreational activities within the Sierra Nevada included a wide range of users, jurisdictions, and activities. Although local residents participate in those recreational activities, it was also clear that most recreational activity in the Sierra Nevada has been by nonresidents. Those nonresidents were known to be primarily Californians but included both other Americans and foreign visitors. The non-Californians were believed to be drawn primarily to the "world-class" recreational resources of the Sierra Nevada, such as Yosemite Valley. It was unknown to what degree other parts of the Sierra Nevada were visited by non-Californians.

What we didn't know was how to answer the five questions we raised. Estimates of different types of recreational activity varied by agency and interest group, with no common basis for discussion of the relative importance of and conflicts surrounding different types of recreational activities. Due to limitations in available information, some of that remains highly uncertain. There is very little accounting consistency between recreational providers, and not all public land management agencies keep records. Private landholders also have very few incentives to maintain records on recreational use of their lands, and the records they do keep are generally unavailable. We have nevertheless helped to close some of the gaps and to identify where the remaining gaps may be. This assessment should therefore much improve our understanding of those aspects of recreation in the Sierra Nevada for which we have detailed records that are generally comparable. Considerably more research is necessary to develop a comprehensive understanding of recreational activity in the region.

METHODOLOGY

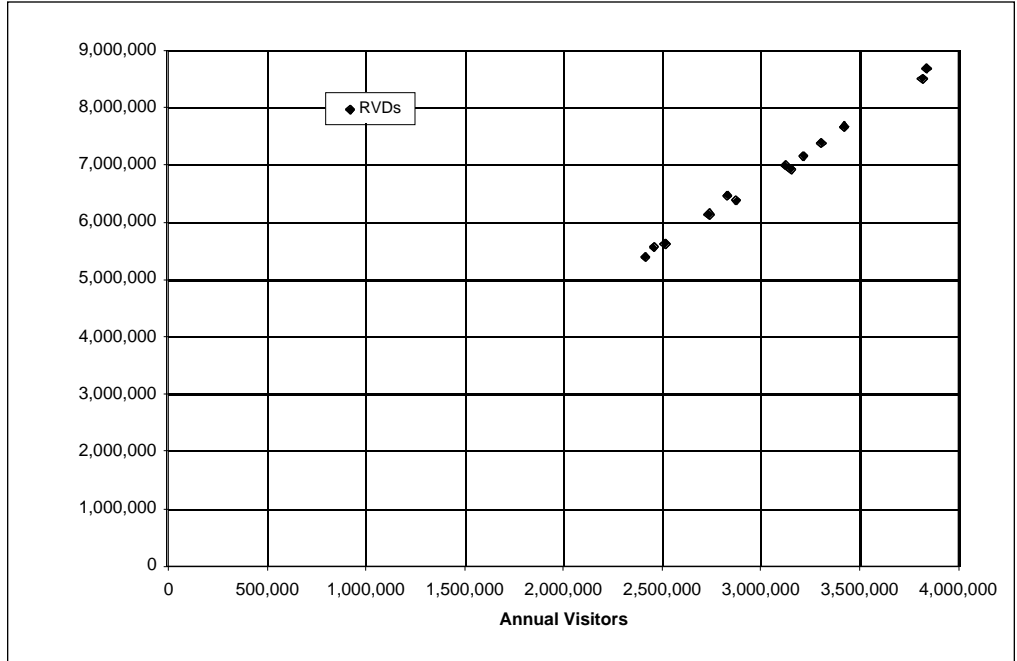
Recreation providers within the SNEP study area maintain use records of variable quality, consistency, and reliability. For this assessment, existing recreational use information was collected from all agencies that would provide it and manually entered into spreadsheet files. These agencies were contacted from June 1994 to December 1994 for information about current and historical recreation activity. Data were then compiled and analyzed for each recreation provider within the study area. Interagency data analysis was generally limited due to inconsistent data collection methodologies, varying units of measurement, and data gaps. Whenever possible, however, recreational use information was converted to recreational visitor days (RVD), a measurement unit employed by the U.S. Forest Service (USFS). One RVD equals one twelve-hour visit to a site or twelve hours of an activity. Four hours of an activity would equal, therefore, one-third of an RVD; participating in an activity for two hours per week for six weeks would equal one RVD. We have attempted to use RVDs as a standard measure here in order to allow comparisons across multiple jurisdictions and data sources. It is difficult to convert USFS estimates from RVDs into comparable units for comparison with other agency measures, but we have been able to convert most other agency measures into RVDs.

We did not have RVD data from the California Department of Parks and Recreation (CDPR), which reported numbers of visitors rather than the length of time those visitors spent on specific recreational activities. Visitation data from Yosemite National Park for 1981–91 shows that visitation is strongly correlated with RVDs ($R = 0.998$). Figure 19.1 shows this relationship. The average visitor generated 2.24 RVDs, ranging from a low of 2.20 to a high of 2.29. We have therefore converted visitor figures to RVD figures using a ratio of 2.24 wherever necessary. Yosemite National Park is clearly not a "typical" recreational destination in the Sierra Nevada, however, for it receives a higher level of day visitors than most areas. We nevertheless believe it is an appropriate proxy for visitation at other sites where developed recreation is the dominant use (as a fraction of overall visitation). These areas also have a higher level of day visitors than many USFS areas. Use of the Yosemite ratio will tend to result in conservative estimates of overall recreational activity at most other sites. Both Sequoia and Kings Canyon National Parks had higher RVDs per visitor than Yosemite, while Lassen Volcanic National Park (LVNP) had a much lower RVD per visitor ratio (1.03). Figure 19.2 shows annual RVD per visitor ratios for all four national parks from 1981 to 1993. Because the LVNP ratio is so much lower than the Yosemite ratio, we estimated RVDs for the CDPR and USBOR using both conversion factors.

The RVD accounting methodology itself has several significant weaknesses, however, which include (1) variable and inconsistent accounting practices between administrative

FIGURE 19.1

Recreational visitor days (RVDs) versus visitors for Yosemite National Park, 1981–93.

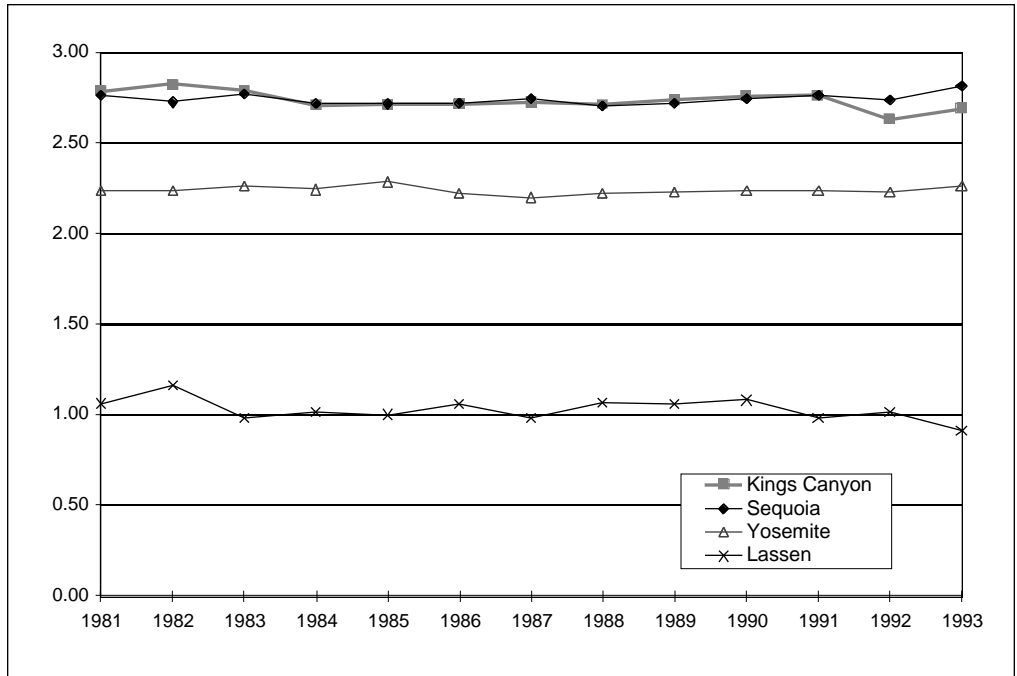


units (e.g., the National Park Service and the U.S. Forest Service; different national forests; different ranger districts within a single national forest) and over time due to changes in personnel and/or methods; (2) poorly defined RVD accounting classifications, resulting in inconsistent classification of some activities (especially new recreational activities as they first

emerge); and (3) highly subjective accounting procedures that exacerbate problems of both classification and accounting. Systematic sampling procedures are generally poorly defined and rarely applied consistently enough to generate a statistically reliable basis for analysis. Together these flaws result in inconsistent data both within individual agency units (e.g., a

FIGURE 19.2

RVDS per visitor for all national parks, 1981–93.



single national forest) and across agency units and agencies. Even direct quantitative comparisons are therefore uncertain.

Perhaps the most significant limitation of RVD accounting practices, however, is that the information generated is not detailed enough to guide recreational site planning and resource management activities within various subregions of a given agency or administrative unit. It is therefore often necessary to collect additional site-specific information about recreational activities and visitor preferences in order to evaluate land and resource management alternatives (Duane and Knauer 1996). This additional information can then complement the existing RVD information to assist land and resource managers and the public as they consider management alternatives. In particular, this additional information can address the quality of the visitors' recreational experiences rather than merely the number of hours spent on an activity. Likely visitor responses to management alternatives can then be assessed through a variety of methods, including focus group sessions, key informant interviews, and field surveys of recreational users. An example of this type of more detailed analysis is included for the Inyo National Forest at the conclusion of the subregional study of the eastern Sierra later in the chapter.

RECREATION ON PRIVATE LANDS

The availability of accessible recreational opportunities on both public and private lands appears to be an important factor for many residents of the Sierra Nevada in choosing where to live. The direct and indirect social and economic effects of locally based recreation can therefore be significant. Community capacity (Kusel 1996) may be both enhanced by and reflected in community recreational activities, for example, while residential location decisions based upon access to recreational opportunities may bring both construction employment and income from retirees or commuters into the local economy. Further work is needed to assess the relative importance of this access, but a survey of El Dorado County residents (J. Moore Methods 1992) found that 41% listed the recreational opportunities as a major reason they've chosen to live in the county. Another 23% listed it as a moderate reason, while 34% listed it as a minor reason (2% expressed no opinion). It can probably be assumed that those listing it as a major or moderate reason for living in the county participate in recreational activities at least fairly regularly.

If we assume that a similar proportion of Sierra Nevada residents participate in recreational activities throughout the Sierra Nevada, we can derive an approximate estimate of the number of RVDs associated with locally based recreation that is not likely to be recorded in our records here. If 41% of the region's 700,000 residents¹ recreate locally for an average of three hours per week during the year and 23% recreate lo-

cally for an average of one hour per week, this activity alone accounts for 4.4 million RVDs. This figure is likely to be conservative, yet it is nevertheless greater than the combined RVDs for Yosemite, Sequoia, and Kings Canyon National Parks in 1993 (which had a total of 3,352,667 RVDs). Assuming just one hour of recreational activity per week for all Sierra Nevada residents yields more than 3 million RVDs per year. Based on informal review of local recreation plans (for seven counties in the Sierra Nevada: Nevada, Placer, El Dorado, Amador, Calaveras, Mono, and Inyo), this is probably a conservative assumption. Total RVDs for locally based recreation, although it is widely dispersed, is therefore probably significant in the Sierra Nevada. Some of that activity is likely to be accounted for in other agencies' recreational use data (e.g., hiking or fishing on USFS land), but any of it that occurs on private land is not recorded in the results that we report.

It is also important to note that the relatively low density of human settlement in the Sierra Nevada is accompanied by large areas of open space that are privately owned. Much of this land is fenced and posted against trespass, but other land remains generally accessible for informal public recreational activities of a dispersed, low-intensity nature. These activities include running, walking, mountain biking, cross-country skiing, snowmobiling, and nature study. Similar activities occur on large private land holdings at higher elevations, especially those that are interspersed with public lands. Recreational users often cross between public and private lands on a single trail, for example, without even knowing whether they are on federal, state, local, or private land at a given time. Recreational use estimates for the public agencies described in this chapter record only those activities that occur on those lands or resources within the management jurisdiction of those public agencies. Additional recreational activities occur on private lands, and the potential for conflicts over trespass are highest at the public-private land interface. Moreover, reductions in informal public access to privately owned open space are also likely as human settlement increases parcelization and population density on large blocks of private land. The implications for trends in human settlement and public lands management for recreation are discussed in more detail later.

SOURCES

We contacted the following sources and evaluated recreational activity and visitor information (when available). In many cases, these organizations either had no data or their data duplicated other data provided by public land and resource management agencies. Detailed data sets and records of our data collection are available from the California Environmental Resource Evaluation System (CERES) project of the Re-

sources Agency of the State of California (<http://ceres.ca.gov/snep>), and the Alexandria Project at the University of California, Santa Barbara (<http://alexandria.sdc.ucsb.edu/>).

- Federal agencies: Forest Service, National Park Service, Bureau of Reclamation, Bureau of Land Management, Army Corps of Engineers
- State agencies: Department of Parks and Recreation, Department of Fish and Game, Department of Water Resources, State Lands Commission
- Public utilities: East Bay Municipal Utility District, Hetch Hetchy Water and Power, Los Angeles Water and Power, Sacramento Municipal Utility District, Placer County Water Agency, El Dorado Irrigation District, Nevada Irrigation District
- Utility companies: Pacific Gas and Electric Company, Southern California Edison Company, Sierra Pacific Power Company
- Local government: twenty-one county parks and recreation departments, several special/community service districts
- Nongovernmental organizations: Ducks Unlimited, Friends of the River, Sierra Club, Nature Conservancy, Trust for Public Land
- Private camps: American Campground Association, Christian camps and camping centers, twenty-one county health departments
- Miscellaneous: two wildland skill schools, Recreational Equipment, Inc., other recreation researchers

Our reported results for public agencies are biased toward those agencies that have kept reliable records and reported them to us. These include the Forest Service, the National Park Service, the California Department of Parks and Recreation, the Bureau of Reclamation, the California Department of Fish and Game, Pacific Gas and Electric Company, the East Bay Municipal Utility District, and El Dorado County. It is therefore not a random sample of recreational activities in the Sierra Nevada. This list covers all of the major land and resource management agencies in the region, however, so it should be an accurate approximation of the degree and types of recreational activities on public lands and waters in the Sierra Nevada. Recreational activities are most underrepresented in our data and analysis for foothill-area water sports and local parks.

Development of a common framework for sampling, recording, reporting, and analyzing recreational activity information for public agencies would assist future efforts at analysis. The State of California's Outdoor Recreation Plan (SCORP) is the only effort currently directed toward systematic evaluation of recreational activities for the entire Sierra Nevada region.

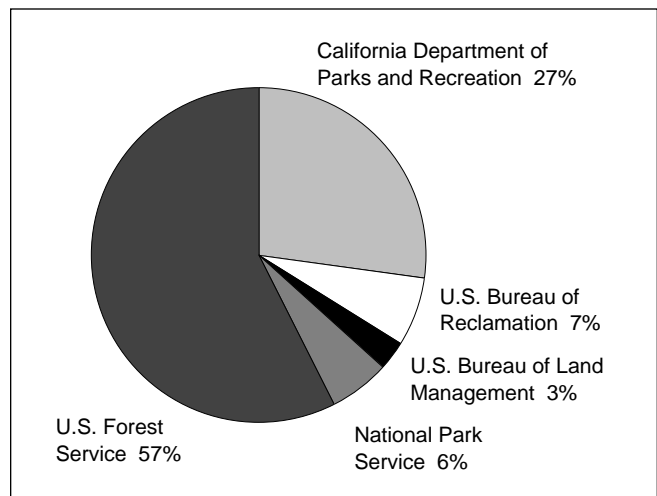
RESULTS

Results will be described here for each of the individual data sources and agency providers of recreational opportunities. Potential problems with data and preliminary interpretations of the data are described here, although the primary product of this assessment is the integrated provision of the data itself in digital form. Considerably more analysis of individual data sets will offer additional insights into specific policy questions. All of the data sources are available in Excel 5.0 for Windows spreadsheets from the California Environmental Resource Evaluation System (CERES) project of the Resources Agency of the State of California (<http://ceres.ca.gov/snep>), and the Alexandria Project at the University of California, Santa Barbara (<http://alexandria.sdc.ucsb.edu/>).

Recreation is a significant activity in the Sierra Nevada, which serves as a center for a wide range of recreational activities. The Sierra contains some of the world's outstanding natural features, and they attract visitors from throughout the country and the world. Lake Tahoe, Yosemite Valley, Mono Lake, and the Sequoia Big Trees attract millions of visitors each year. Recreational activities on public lands alone account for between 50 and 60 million recreational visitor days (RVDs) per year, with nearly three-fifths to two-thirds of those RVDs occurring on lands administered by the U.S. Forest Service (USFS). The California Department of Parks and Recreation (CDPR) has the second greatest number of RVDs, followed by the U.S. Bureau of Reclamation, the National Park Service, and the U.S. Bureau of Land Management. Our range of estimates for total RVDs is a function of the RVD per visitor ratio we assumed for the California Department of Parks and Recreation, for which only visitor data are available. Figure 19.3

FIGURE 19.3

Agency shares of RVDs (assuming CDPR = 2.24 RVD ratio).



and table 19.1 show that the USFS contributes 57% and the CDPR contributes 27% of all public RVDs in the Sierra Nevada if the Yosemite National Park ratio of 2.24 RVDs per visitor is assumed.

Figure 19.4 and table 19.2 show that the CDPR contribution drops considerably, to less than 15%, if the Lassen Volcanic National Park ratio of 1.03 RVDs per visitor is assumed. This increases the USFS share to nearly 67% of all public RVDs in the Sierra Nevada. It also decreases the total number of RVDs from nearly 59 million to about 50 million per year.

These alternative sets of assumptions do not alter either the rank order or magnitude of RVDs for other public recreation providers in our database. They do affect their relative shares of total RVDs, however, with each of the other agencies holding a higher share of the smaller total under the Lassen RVD assumption of 1.03 RVDs per visitor for CDPR visitors. The U.S. Bureau of Reclamation has about 3.9 million RVDs per year, the National Park Service has about 3.4 million RVDs per year, and the Bureau of Land Management has about 1.7 million RVDs per year. Recreational activity on reservoirs and lands of the East Bay Municipal Utility District, and Pacific Gas and Electric Company and commercial rafting through private land on the South Fork of the American River totals about 0.5 million RVDs per year. We will now describe the results for each of these agencies in greater detail.

FEDERAL AGENCIES

United States Forest Service

The USFS is the largest land manager in the Sierra Nevada and accounts for the majority of total RVDs on public lands in the region. Nine national forests or USFS administrative units are located within the SNEP study area (figure 19.5): Eldorado, Inyo, Plumas, Sequoia, Sierra, Stanislaus, Tahoe,

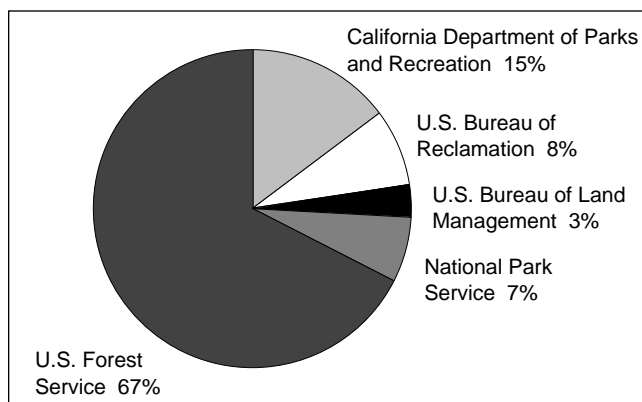


FIGURE 19.4

Agency shares of RVDs (assuming CDPR = 1.03 RVD ratio).

Toiyabe, and the Lake Tahoe Basin Management Unit (LTBMU). All of these except the Toiyabe National Forest are part of Region 5 of the USFS (headquartered in San Francisco) and have common procedures and accounting systems for collecting recreational use data. We acquired data for each of these forests from the regional office in San Francisco. Toiyabe National Forest is headquartered in Sparks, Nevada, and is part of Region 4 (headquartered in Ogden, Utah). Only the Carson and Bridgeport Ranger Districts of the Toiyabe National Forest are within the Sierra Nevada, and data for the Toiyabe were reported in a different format and for a different period than those for Region 5. We have therefore estimated mean annual RVDs for the USFS units in Region 5 based on 1987–93 data and mean annual RVDs for the Sierra Nevada portion of the Toiyabe National Forest based on 1987–91 data. The data are otherwise aggregated into the same recreational activity classes.

We have aggregated historical data from 1966 to 1993 for all national forest units in Region 5, but these are not disag-

TABLE 19.1

Agency shares of Sierra Nevada RVDs if CDPR = Yosemite (2.24 RVDs per visitor).

Agency	Annual RVDs	Percentage of Total
Pacific Gas and Electric Company	97,292	0.17
South Fork of the American River	118,000	0.20
East Bay Municipal Utilities District	306,106	0.52
California Department of Parks and Recreation	15,868,723	26.99
U.S. Bureau of Reclamation	3,881,000	6.60
U.S. Bureau of Land Management	1,660,033	2.82
U.S. National Park Service	3,352,607	5.70
U.S. Forest Service	33,500,739	56.99
Total	58,784,500	100.00
Public	58,569,208	99.63

TABLE 19.2

Agency shares of Sierra Nevada RVDs if CDPR = Lassen (1.03 RVDs per visitor).

Agency	Annual RVDs	Percentage of Total
Pacific Gas and Electric Company	97,292	0.19
South Fork of the American River	118,000	0.24
East Bay Municipal Utilities District	306,106	0.61
California Department of Parks and Recreation	7,296,779	14.53
U.S. Bureau of Reclamation	3,881,000	7.73
U.S. Bureau of Land Management	1,660,033	3.31
U.S. National Park Service	3,352,607	6.68
U.S. Forest Service	33,500,739	66.72
Total	50,212,566	100.00
Public	49,997,264	99.57

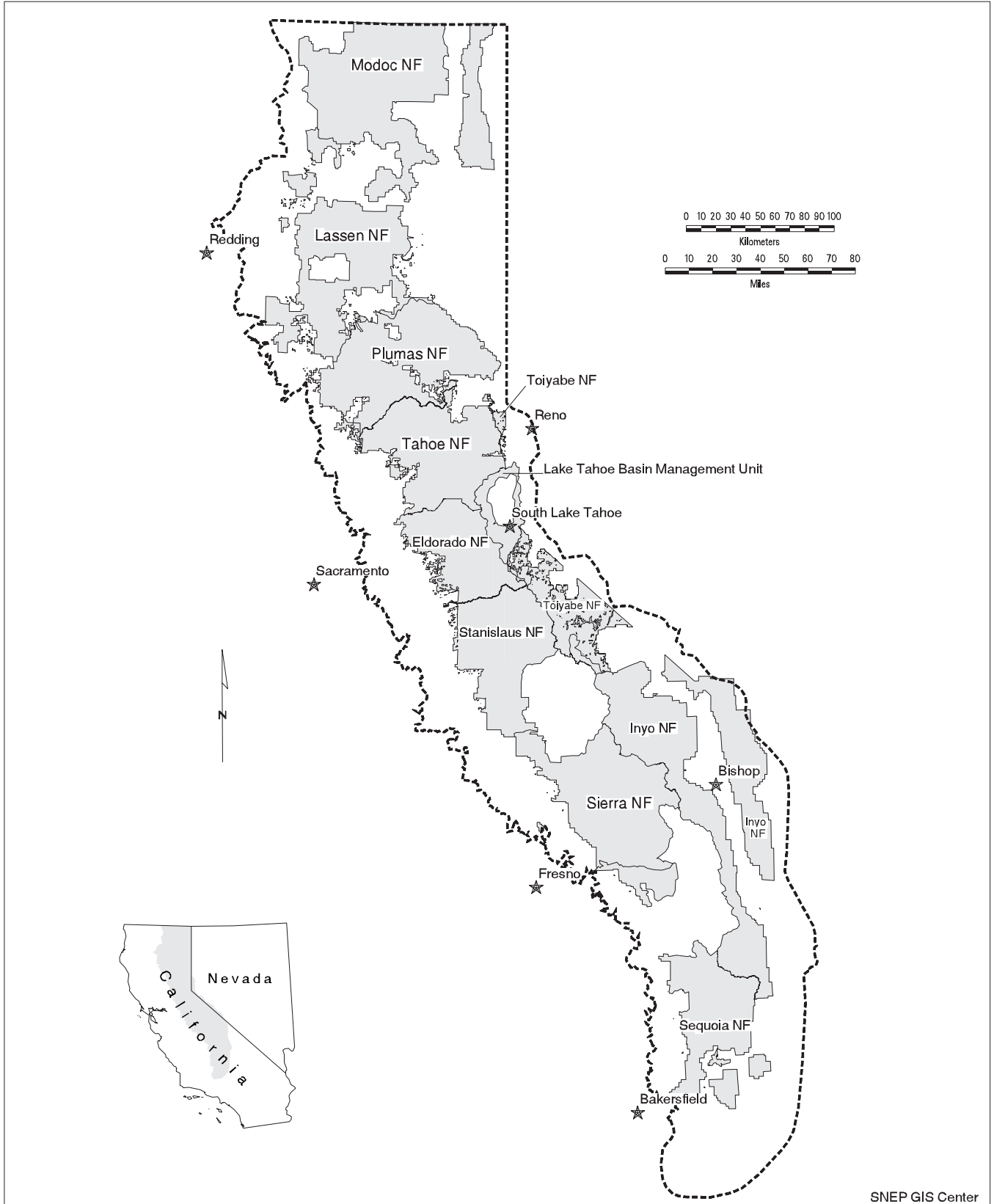


FIGURE 19.5

National Forests within study area.

gregated by individual USFS unit. Time-series analysis of that data shows that most activities were basically flat during that period, however, with the exception of three major categories: auto travel, sightseeing, and miscellaneous. All three of these categories began to grow rapidly in the mid-1980s, around the same time that the national forests in the Sierra Nevada completed their land and resource management plans under the National Forest Management Act of 1976. It is unclear what could have accounted for this increase. Because of this shift, our USFS data from 1987–93 is higher than the historical data from 1966–86. Most of that increase is in these unspecified and difficult-to-count categories, however, so the estimates may be inflated for the 1987–93 mean RVDs.

Recreational activity on the national forests in Region 5 totalled 31.9 million RVDs in 1993. The Toiyabe National Forest averaged over 1.6 million RVDs per year in the Sierra Nevada from 1987 to 1991. Total USFS RVDs are therefore more than two-and-one-half times the total RVDs for California state parks within the Sierra Nevada, ten times the total RVDs for the national parks within the Sierra Nevada, a dozen times the total RVDs for the Bureau of Reclamation, and two-dozen times the total RVDs for the BLM. Overall, the 33.6 million RVDs on USFS lands accounted for 57% of the 58.6 million RVDs reported here by public agencies for the 1987–93 period. These totals for the Sierra Nevada do not include RVDs for the Lake Tahoe State Park in Nevada, parks and/or reservoirs operated by local and regional agencies, or recreational activities on private lands in the region. They nevertheless illustrate the importance of the USFS as a provider of recreational opportunities. Many of the RVDs that occur on private lands in the Sierra Nevada are also associated with activities on the public lands, however, when recreationists

spend the night on private lands but recreate during the day on public lands. The RVDs on public lands are therefore likely to be tied to total recreation-related activities and expenditures in the region.

The two largest national forests are the Inyo and the Sierra (figure 19.6). The four national forests with the highest proportion of their land base designated as wilderness are the Sierra, the Inyo, the Sequoia, and the Lake Tahoe Basin Management Unit (figure 19.7). This distribution of designated wilderness has important implications for the spatial distribution of specific recreational activities across the USFS land base in the Sierra Nevada. The southern Sierra Nevada is the only place in the contiguous forty-eight states where one can draw a straight line on a map for more than 150 miles and not cross a road, which occurs near the John Muir Trail between Tuolumne Meadows in Yosemite National Park and Monache Meadows just south of the Golden Trout Wilderness. The area between these two points includes portions of Yosemite National Park, the Ansel Adams Wilderness, the John Muir Wilderness, Kings Canyon National Park, Sequoia National Park, and the Golden Trout Wilderness. A comparison of total acreage to wilderness acreage indicates that the Sierra, Inyo, and Sequoia National Forests (all located in the southern Sierra Nevada and adjacent to national parks) proportionally contain the most wilderness within their boundaries (table 19.3).

Time-series RVD data were available for the national forests from 1966 to 1993, but uncertainty about changes in RVD accounting practices led us to focus on more recent data for consistency. We used the 1987–93 period to derive mean RVD figures for each of the USFS units on Region 5. This also allowed comparisons with other agency data, which were generally available in detail only for the more recent period. As

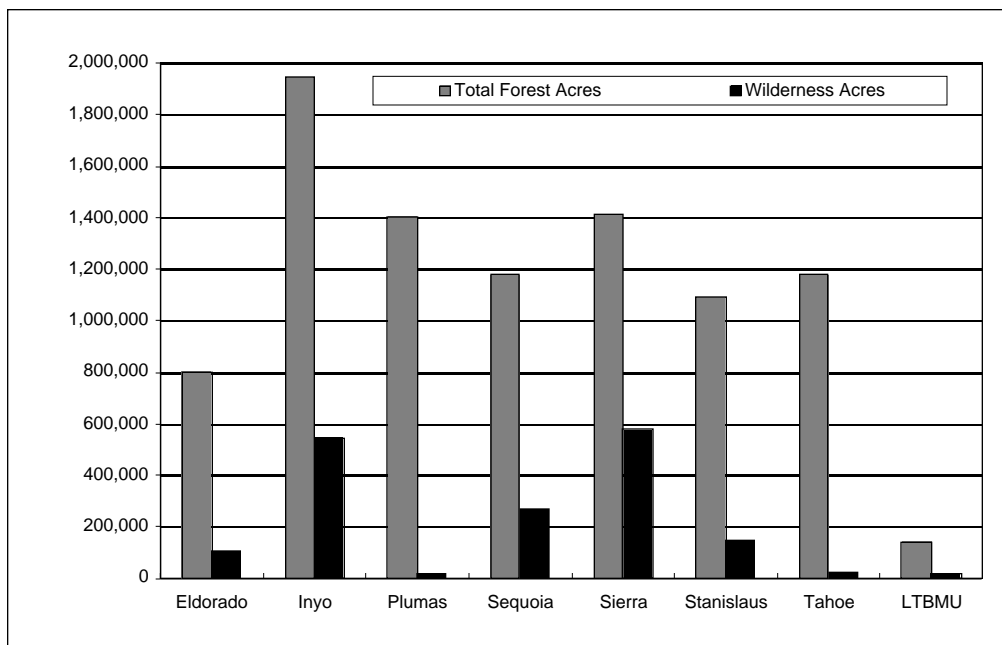
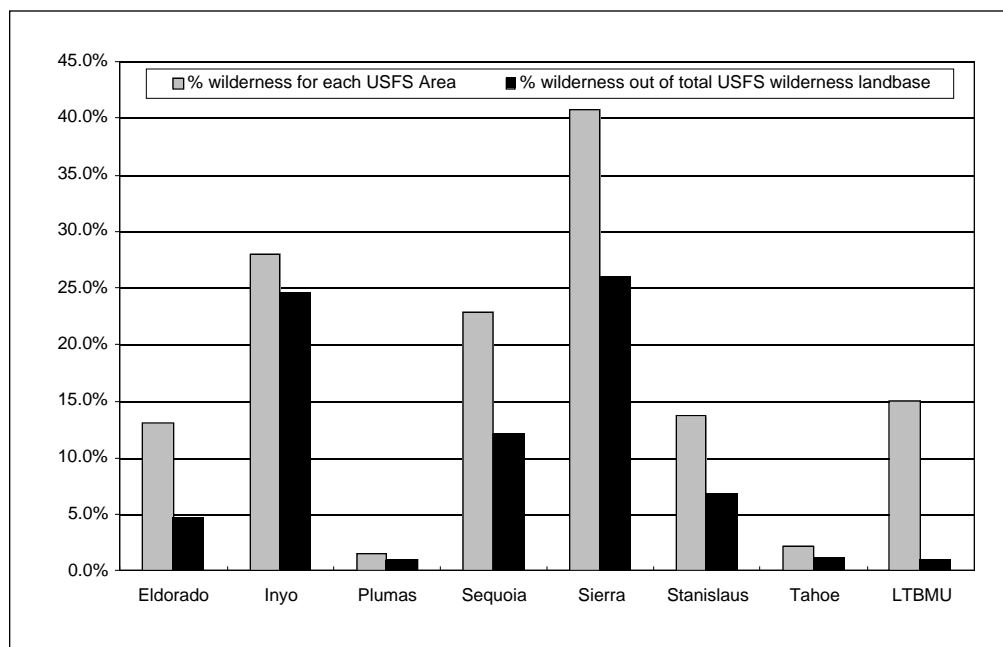


FIGURE 19.6

Size attributes of individual national forests.

FIGURE 19.7

Wilderness share of national forests.



noted earlier, we used 1987–91 data for the Toiyabe National Forest. The more detailed breakdown of RVDs for the entire 1966–93 period is available from the California Environmental Resource Evaluation System (CERES) project of the Resources Agency of the State of California (<http://ceres.ca.gov/snep>), and the Alexandria Project at the University of California, Santa Barbara (<http://alexandria.sdc.ucsb.edu/>). Mean annual RVD data were therefore compiled for each national forest in the Sierra Nevada and then aggregated across the region to determine the relative contribution of each USFS unit to overall USFS RVDs in the region. Each USFS unit’s total mean annual RVD estimate was then disaggregated by activity class to determine the relative importance of different recreational activities in different parts of the Sierra Nevada. Each of these is reported in detail, and a pie chart is included showing each USFS unit’s RVD allocation by recreational activity class.

The Inyo National Forest is the dominant provider of RVDs, accounting for 23% of overall mean annual RVDs on land

managed by the USFS in the Sierra Nevada. The Tahoe National Forest provided 16%, followed by the Sierra National Forest (13%). All of the other national forests each accounted for less than 10% of the total USFS RVDs in the Sierra Nevada (figure 19.8).

Each USFS unit estimates its total number of wilderness RVDs based upon the number of wilderness permits issued. The Inyo National Forest accounted for 36% of the total wilderness RVDs among Sierra Nevada national forests, followed by the Sequoia (17%) and the LTBMU (12%) (figure 19.9). These estimates do not include day users, however, who do not need a wilderness permit. Some wilderness users are also likely to use the wilderness areas without obtaining a permit. The estimates reported here therefore underestimate actual wilderness RVDs. This undercounting is most likely to be a problem for those wilderness areas that are generally accessible to a large population of residents or visitors who make frequent and extensive casual use of the wilderness (e.g., Desolation Wilderness within the Lake Tahoe Basin, which is accessible to day hikers from the Sacramento metropolitan area, the Lake Tahoe Basin, and the western foothills of the Sierra Nevada). We have no reliable basis for estimating the degree of undercounting of day users, who should still be recorded in the overall RVD estimates.

The Forest Service classifies its nonwilderness recreational activities using the following activity classes (1) camping; (2) picnicking, swimming; (3) travel; (4) hiking, horseback riding, water travel; (5) winter sports; (6) resorts; (7) hunting; (8) fishing; and (9) other activities. For the purposes of this analysis, the category “other activities” was further disaggregated to separate another category, (10) “nature study/interpretive activities.” (This particular subcategory might be important

TABLE 19.3

Sierra Nevada national forests with the highest proportion of wilderness.

National Forest Service Area	Total Acreage	Wilderness Acreage	Percentage Designated Wilderness
Sierra National Forest	1,417,355	577,654	41
Inyo National Forest	1,944,710	544,667	28
Sequoia National Forest	1,179,193	269,790	23

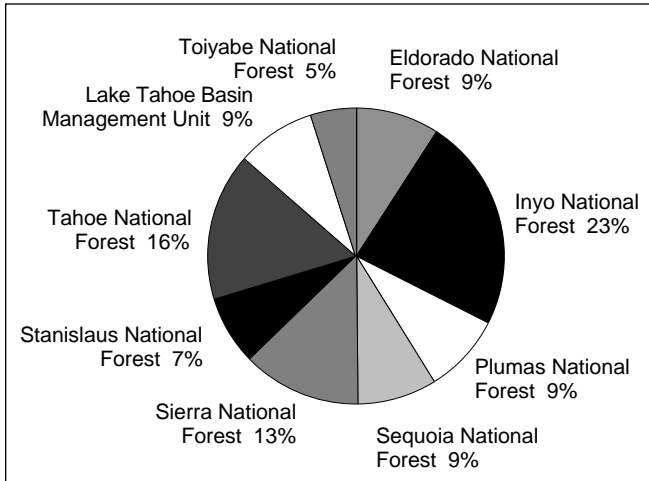


FIGURE 19.8
Distribution of mean total annual RVDs for USFS units, 1987-93.

for more detailed assessment of the policy scenarios.) Using variable methodologies, Forest Service personnel annually estimate the number of recreational visitor days (RVDs) for each activity class by ranger district. More detailed analysis of data at the ranger district level was possible only for the Inyo National Forest and is reported in a section on the eastern Sierra Nevada later in the chapter. Note that some of the activity classes include seemingly unrelated activities, while some related activities (e.g., swimming, water travel, and fishing) are recorded across multiple activity classes. This makes it difficult to disaggregate recreational activities on USFS lands based upon physical characteristics (e.g., access to water). This in turn limits our capacity to analyze the impact of various policy scenarios on recreation. Figure 19.10 shows historical patterns in wilderness and primitive area use under USFS jurisdiction from 1964 to 1993 as reported by the administering USFS units.

Mean annual RVDs were calculated for each activity class by individual Forest Service unit and across all Sierra Nevada national forests. The most popular recreational activities, as measured by RVDs, within each of the nine Forest Service areas were the two activity classes of "automobile travel" (32%) and "camping, picnicking, and swimming" (29%) (figure 19.11). Together with resorts (11%), these three general classes of recreational activity accounted for nearly three-quarters (72%) of all RVDs on USFS units in the Sierra Nevada.

Approximately 18% of the total number of RVDs for the activity class "camping, picnicking, and swimming" were attributed to the Inyo National Forest, followed by the Sierra (15%), Sequoia (13%), and Tahoe (12%) National Forests (figure 19.12). The Inyo National Forest also accounted for 28% of the Sierra Nevada RVDs in USFS units in activities related to the "travel" activity class, while the Tahoe National Forest provided 21% (figure 19.13). The Inyo and Sierra National

Forests each accounted for one-fourth of the "hiking, horse-back riding, and water travel" activity class on USFS lands (figure 19.14).

Tahoe National Forest received the most RVDs (36%) for the category "winter sports," with the Inyo National Forest comprising 26% of the total for that activity class. The LTBMU accounted for another 16% and the Eldorado National Forest provided 11% of the "winter sports" RVDs (figure 19.15). The figures for the greater Lake Tahoe area (totaling 63% of all winter sports RVDs in the Sierra Nevada) reflected activity at a number of major ski resorts, while the Inyo National Forest RVDs were almost exclusively due to the presence of a single large ski area, Mammoth Mountain and nearby June Mountain.

One-fifth (19%) each of the total number of RVDs in activities in the "resorts" class occurred on the Inyo National Forest and the Sierra National Forest. Another 16% of "resort" activity occurred on the Stanislaus National Forest and 14% on the Eldorado National Forest (figure 19.16). Hunting was also most popular on the Eldorado National Forest, which accounted for 25% of total hunting activity on USFS lands in the Sierra Nevada. Other USFS units with more than a 10% share of total hunting RVDs were the Inyo National Forest (16%), the Sierra National Forest (15%), the Plumas National Forest (14%) and the Tahoe National Forest (12%). The LTBMU reported no RVDs for this class (figure 19.17). The Inyo National Forest received the most fishing RVDs (20% of the total for the Sierra Nevada on USFS lands), while the Plumas National Forest had the second highest (15%). Sierra National Forest provided 14% of all fishing RVDs and the Eldorado and Sequoia National Forests provided 10% and 11%, respectively (figure 19.18). Nearly two-thirds (65%) of the total num-

FIGURE 19.9
Distribution of mean total annual wilderness RVDs for USFS units, 1987-93.

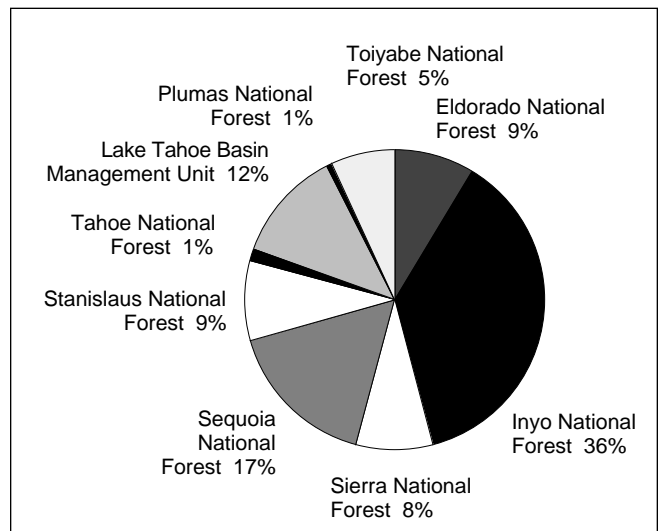
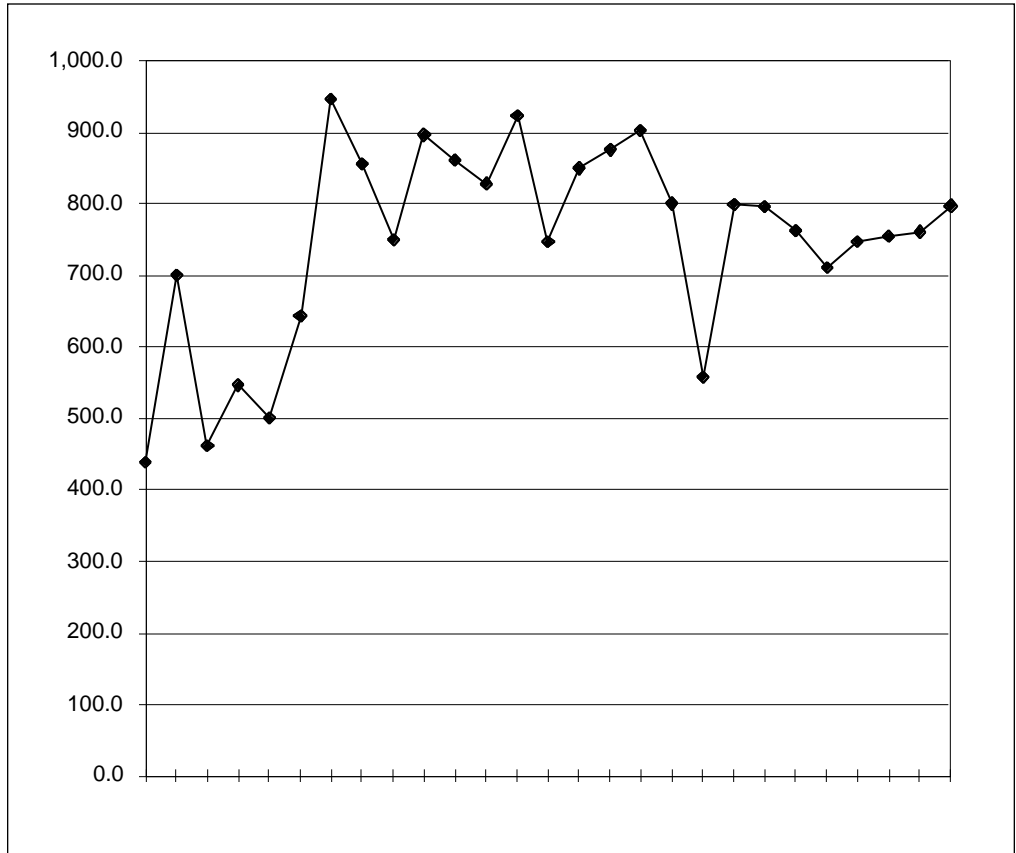


FIGURE 19.10

USFS wilderness and primitive area use by RVD, 1965–91.



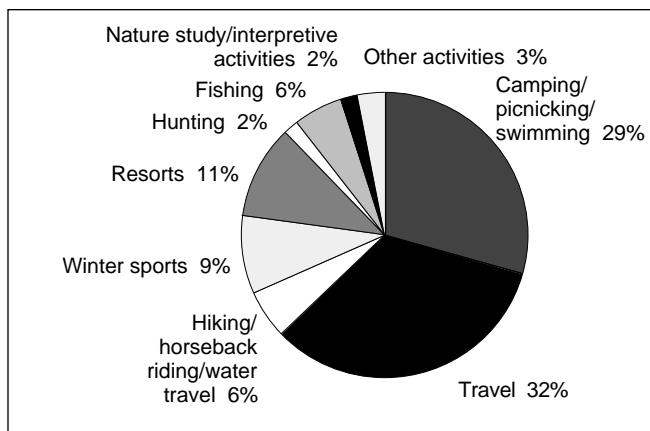
ber of hours spent on nature study or interpretive activities occurred on the Inyo National Forest, which stands out in comparison to the other USFS units in the Sierra Nevada within that activity class (figure 19.19). The Toiyabe National Forest reported no RVDs for this activity class.

Time-series trends from 1966 to 1993 for several aggregated recreational activity classes are shown in figure 19.20 for all

USFS units in the Sierra Nevada (except Toiyabe National Forest). Note that two major classes, “travel/sightseeing” and “miscellaneous,” account for most of the growth in USFS RVD estimates. Winter sports RVDs increased significantly in the late 1970s but have been relatively flat since the early 1980s. Camping RVDs have also been flat since the late 1970s, when they dropped after climbing quickly from 1968 to 1974. Hunting and fishing RVDs have also been relatively flat since the early 1980s after a significant decline. RVDs for the “hotels, resorts, cabins and camps” class have also remained flat after a decline from 1966 to 1972. Shares of total USFS RVDs in the Sierra Nevada are shown for each of these classes in figure 19.21. Note that “travel/sightseeing” now accounts for as many RVDs as camping, which is a significant change over the time series. “Miscellaneous” now exceeds all other activity classes.

FIGURE 19.11

Distribution of activity in mean annual RVDs by class throughout the USFS, 1987–93.



Trends for the components of the “miscellaneous” class are broken down in figure 19.22. The class as a whole has been climbing steadily since 1968, but there has been a significant jump in the “miscellaneous” class within our “miscellaneous” aggregation since 1986. Figure 19.23 shows that this jump has resulted in declining or steady shares of this aggregated class for other activities. These include “hiking, biking, and horses,” “other water sports,” “off-highway vehicles,” and “picnicking.” The “miscellaneous” component of the “miscellaneous” RVD class is not defined with any specificity by the USFS.

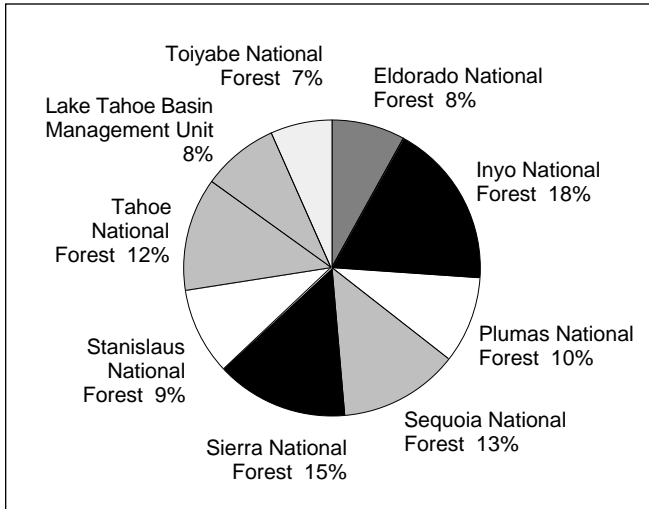


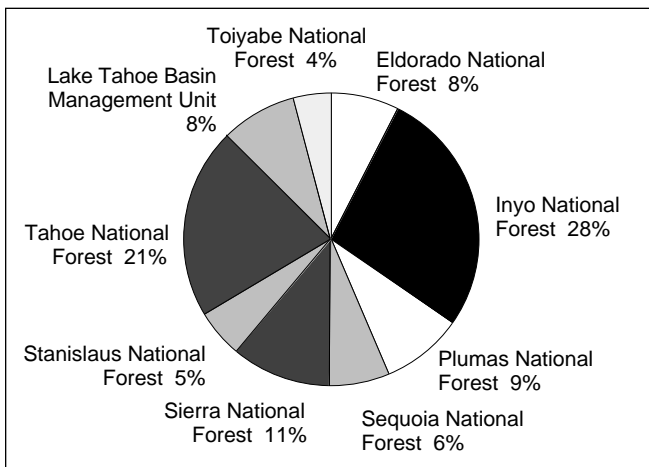
FIGURE 19.12

Distribution of the "camping, picnicking, and swimming" class in mean annual RVDs throughout the USFS, 1987-93.

The increase in RVDs for the "travel/sightseeing" and "miscellaneous" classes since 1986 has dramatically increased the total RVD estimates for USFS lands in the Sierra Nevada. The increase alone in "miscellaneous" RVDs since 1986 totals nearly as many RVDs (3.1 million) as occur annually in the combined areas of Yosemite, Sequoia, and Kings Canyon National Parks (3.4 million RVDs per year). Total "travel/sightseeing" RVDs on USFS lands are estimated to be around 8 million RVDs per year, which approaches the combined total of all park service, BLM, and Bureau of Reclamation RVDs (8.9 million RVDs per year). "Travel" now accounts for 23%

FIGURE 19.13

Distribution of the "traveling" class in mean annual RVDs throughout the USFS, 1987-93.



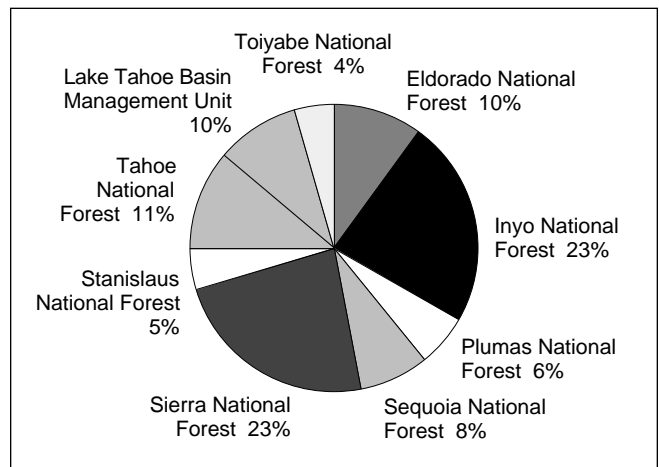
of all USFS RVDs. This figure seems to be exceptionally high, and there is no clear reason for USFS "travel/sightseeing" RVDs to have increased so dramatically from 1986 to 1993. The "miscellaneous" category can be explained in part by the recent popularity of new forms of recreation, such as mountain biking and snowboarding. We nevertheless suspect that the USFS data probably overstates the total RVDs due to unsubstantiated "travel/sightseeing" RVDs.

The time-series data for 1966-93 show that recreational activity varies substantially from year to year, so we have averaged seven years of data (1987-93) to reduce the likelihood of significant errors due to selection of an unusual year for analysis. These averages then serve as the basis for our estimates of total USFS RVDs and the share of those totals attributable to specific recreational activity classes or administrative units. Figures 19.24-19.32 summarize the proportion of RVDs by activity class for each Forest Service administrative unit. These pie charts show the fraction of total RVDs within each unit, whereas the figures reported earlier compare total RVDs by activity class across units.

Downhill ski area RVD information is accounted for within the Eldorado, Inyo, Sequoia, Sierra, Stanislaus, and Tahoe National Forests and the LTBMU. Between 1967 and 1991, total mean annual ski area RVDs increased by 79%, with an increase of more than 200% between 1967 and 1986 and a 46% decrease between 1986 and 1991 during the drought (figure 19.33). Figures 19.34-19.40 detail the total ski area RVDs for each Forest Service area. Between 1967 and 1991, only two areas showed a consistent increase in annual ski area RVDs, the Tahoe National Forest and the LTBMU. Ski resorts within these two USFS units, together with ski areas within the Inyo National Forest, have made significant investments in both snow-making equipment and new high-speed, detachable quad chairlifts during the past decade. Much of the increase

FIGURE 19.14

Distribution of the "hiking, horseback riding, and water travel" class in mean annual RVDs throughout the USFS, 1987-93.



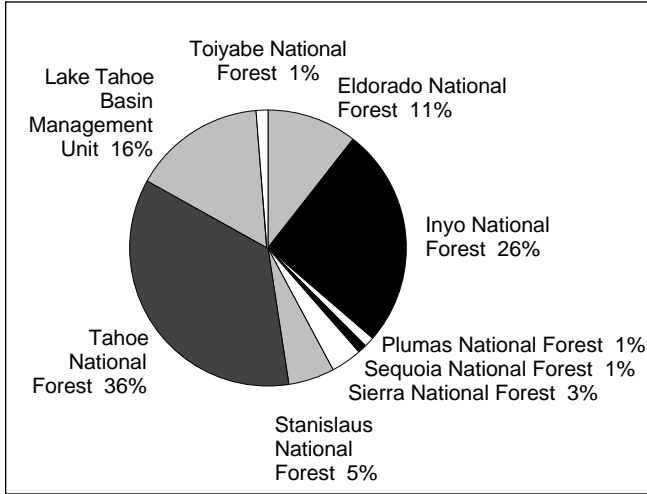


FIGURE 19.15

Distribution of the “winter sports” class in mean annual RVDs throughout the USFS, 1987–93.

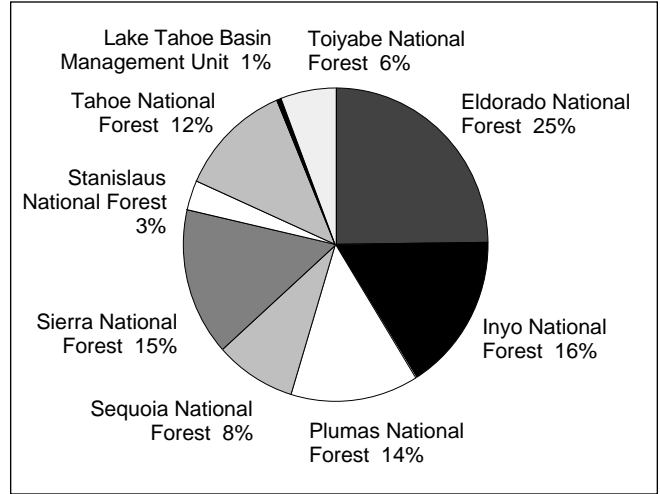


FIGURE 19.17

Distribution of the “hunting” class in mean annual RVDs throughout the USFS, 1987–93.

is therefore attributable to more efficient management of skiers at these ski areas. There has also been some limited expansion of ski runs (e.g., at Northstar, Sugar Bowl, and Diamond Peak). Ski areas in the western Sierra Nevada south of the greater Lake Tahoe area have not expanded their capacity or visitation levels. Continued population growth in the southern San Joaquin valley could create growing demand for additional skiing opportunities in this region in the future. There was no information available to indicate where skiers from that area now ski in the Sierra Nevada. Ski resorts in the Lake Tahoe area currently dominate the market

for skiing among residents of the San Francisco Bay Area and the Sacramento metropolitan area, while Mammoth Mountain dominates the market for southern California skiers. Competition from out-of-state ski areas has also been intense recently, with low-cost air fares and inexpensive package trips to resorts in Utah, Colorado, Idaho, and British Columbia. The ski resorts in the Sierra Nevada appear to rely primarily on California skiers and are not “destination” resorts relying primarily on out-of-state skiers.

The USFS data offer a clear picture of the spatial distribution of RVDs by activity class at the coarse scale of the na-

FIGURE 19.16

Distribution of the “resorts” class in mean annual RVDs throughout the USFS, 1987–93.

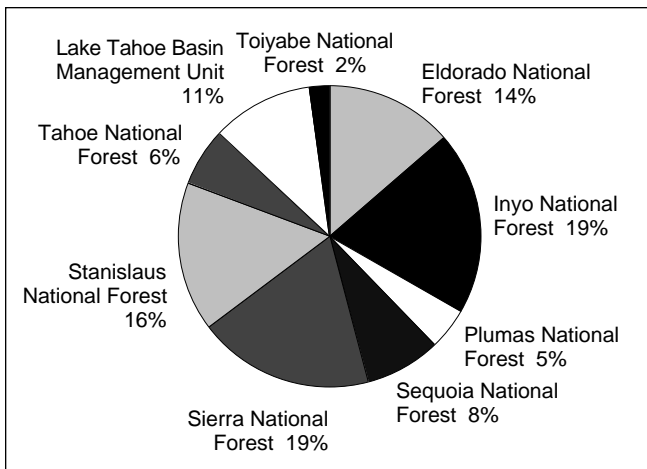
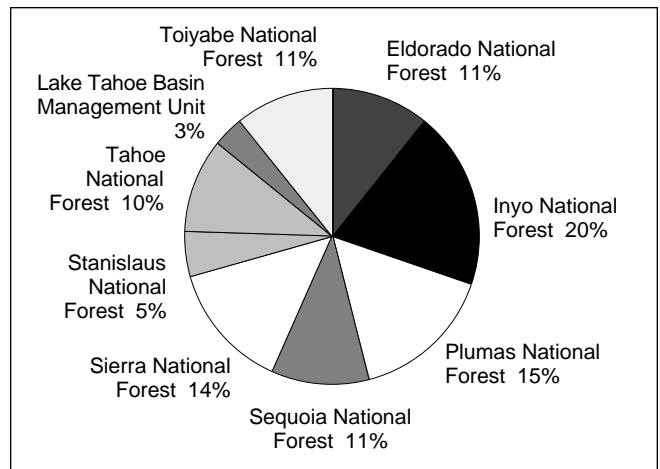


FIGURE 19.18

Distribution of the “fishing” class in mean annual RVDs throughout the USFS, 1987–93.



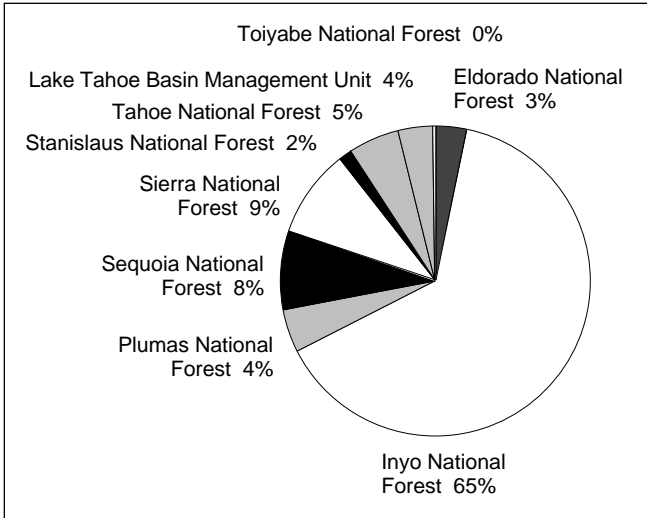


FIGURE 19.19

Distribution of the “nature study and interpretive activities” class in mean annual RVDs throughout the USFS, 1987–93.

tional forest, but these data are limited by the high level of aggregation both spatially and by activity class. It is difficult to evaluate RVDs for individual watersheds, for example, or by county. This limits our ability to relate these coarse-scale data to ecological, social, and economic conditions. It also limits our ability to evaluate policy scenarios in terms of their impacts on RVDs. There are further limitations in these data

due to the ambiguity (and consequent uncertainty) associated with some specific activity classes. Approximately 11.2 million of the 33.5 million mean annual overall RVDs (33%) for the USFS in the Region 5 national forests of the Sierra Nevada, for example, are in the “travel” class. Without these “travel” RVDs, the USFS would account for only 22.3 million of the 38.8–47.4 million RVDs (57% and 47%, respectively) reported in our data here for the entire Sierra Nevada. Other agencies (e.g., BLM) also report “travel” RVDs, but the USFS “travel” class seems to be disproportionately high. It is unclear whether these figures may include some visitors who are simply traveling through the national forests on their way to other destinations (e.g., on Interstate 80, U.S. 50, and U.S. 395). Recreation planners with each USFS unit estimate these RVDs from a variety of sources, but there is little empirical support for allocating a specified fraction of overall travel through USFS lands to the “travel” RVD class. Though this travel certainly does constitute an important activity on national forest lands (with a variety of impacts), it is arguable whether it should all be counted as “recreational” activity and included in the RVD estimates. We were unable to determine with any consistency how the “travel” class is counted by the USFS, so it is unclear at this time whether there are problems with the “travel” RVD estimates.

National Park Service

There are three national parks within the SNEP core area: Sequoia, Kings Canyon, and Yosemite (figure 19.41). The National Park Service (NPS) also operates the Devils Postpile

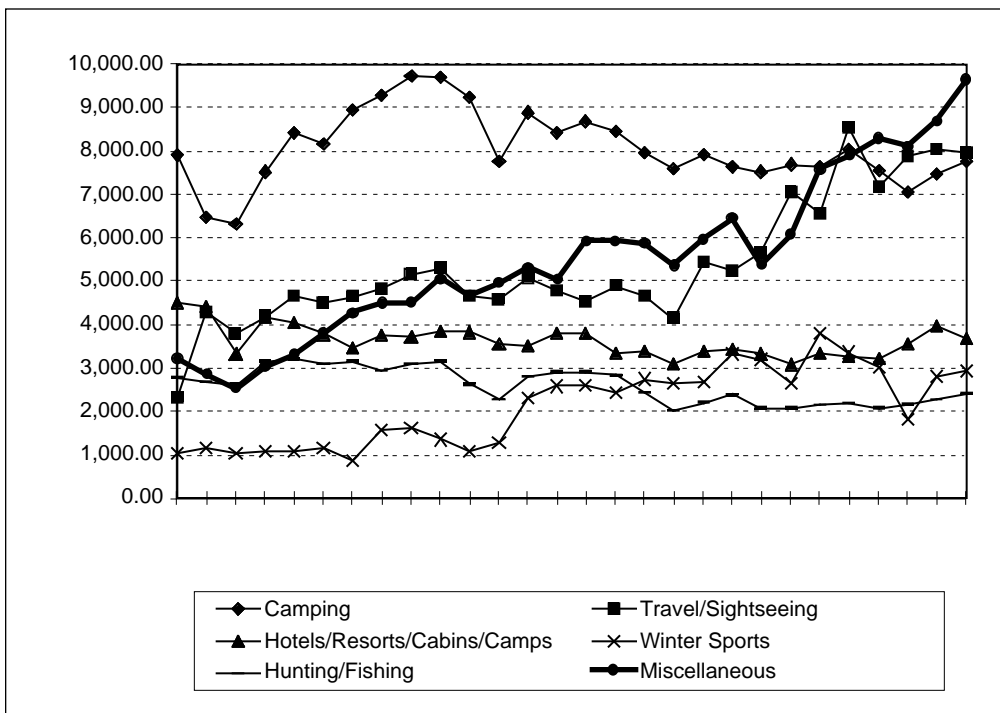
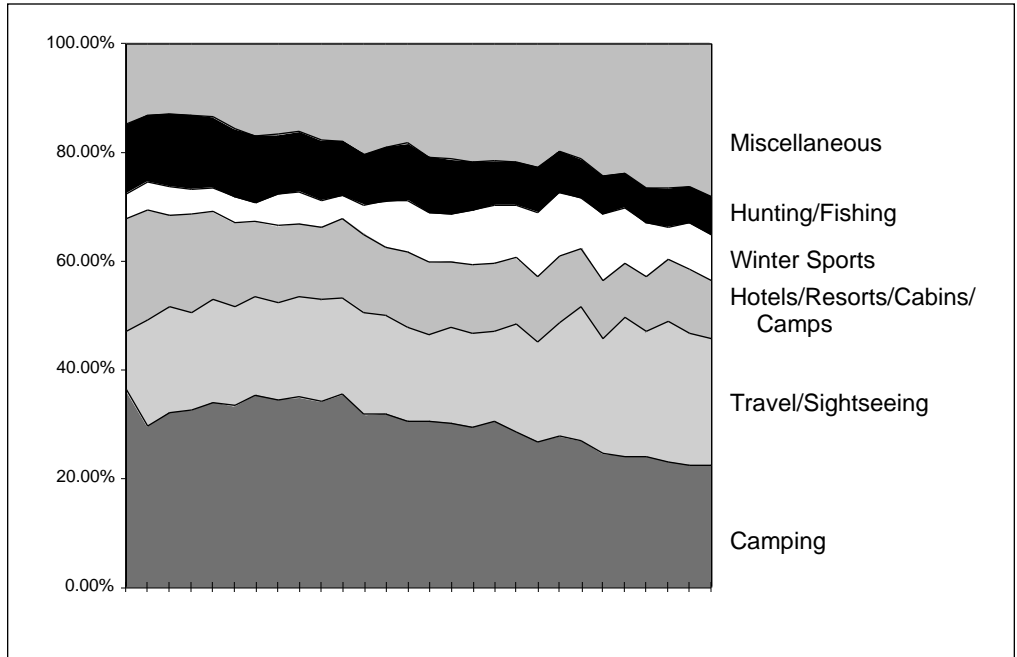


FIGURE 19.20

RVD trends for all USFS units (except Toiyabe), 1966–93.

FIGURE 19.21

RVD activity class shares of all USFS RVDs (except Toiyabe National Forest), 1966–93.

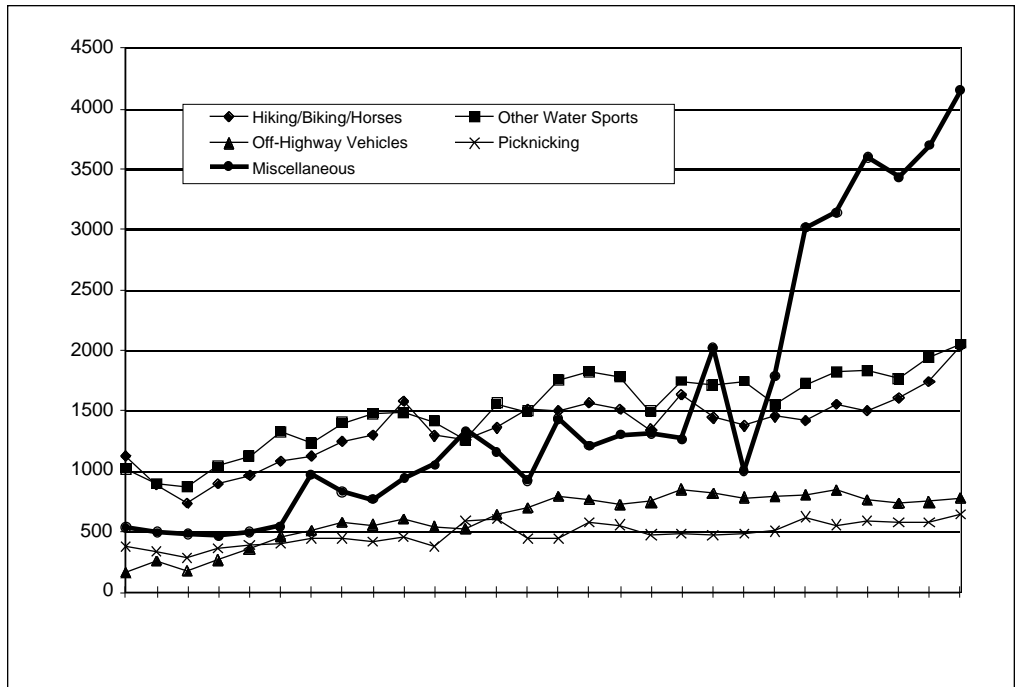


National Monument, whose visitation figures are reported by the administration of Sequoia–Kings Canyon National Parks. Lassen Volcanic National Park is located just north of the Sierra Nevada in the Cascade Range, but figures for Lassen were not included in our analysis.² The NPS has visitation records for 1971–93 (figure 19.42) but RVD estimates only from 1981 to 1993. Between 1981 and 1993, the total annual RVDs increased by 24% at NPS units for the region, from 2,697,634 to

3,352,607 (figure 19.43). Sequoia and Kings Canyon National Parks maintained very similar mean annual RVD rates during the twelve-year period, despite a significant decrease in RVDs for Kings Canyon between 1991 and 1993 (figures 19.44 and 19.45). During the twelve-year period, Yosemite National Park maintained the highest rate of visitation of the three national parks, averaging more than double the mean annual RVDs for either Sequoia or Kings Canyon alone. The com-

FIGURE 19.22

USFS RVDs trends within the “miscellaneous” RVD activity class, 1966–93 (Toiyabe National Forest not included).



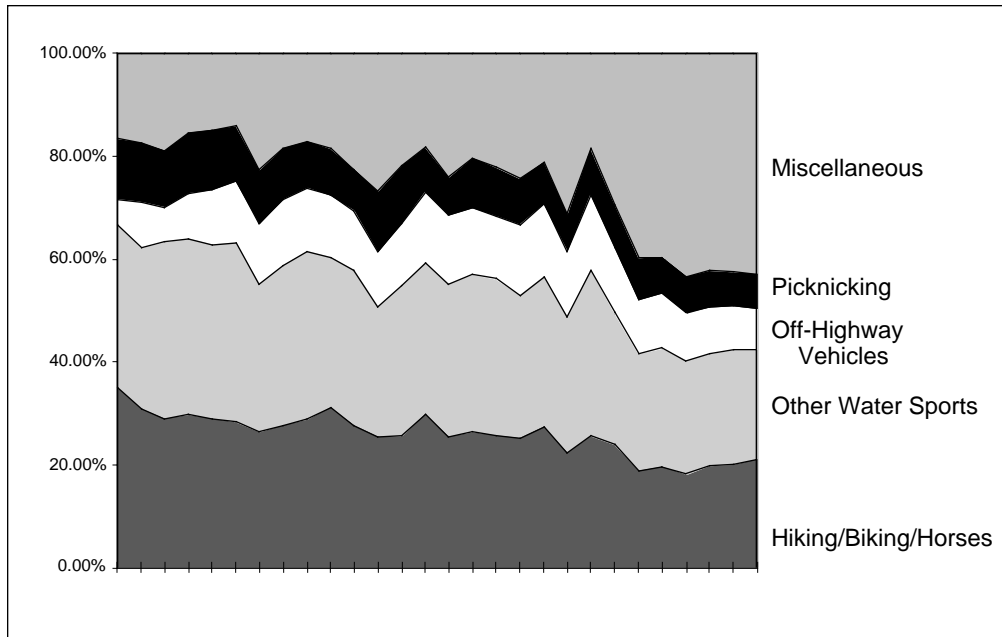


FIGURE 19.23
Shares of "miscellaneous" class of USFS RVDs, 1966–93 (Toiyabe National Forest not included).

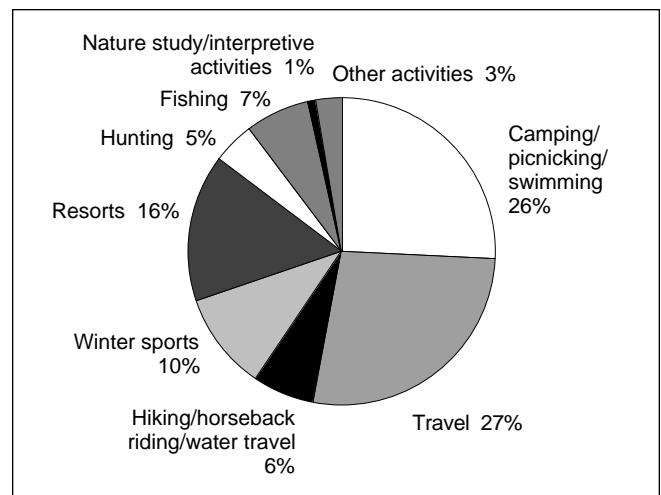
binned total for Sequoia and Kings Canyon National Parks averaged 1,435,153 annual RVDs, however, approximately 77% of Yosemite National Park's average annual RVD figure of 1,853,237. Yosemite National Park's annual RVDs increased by 54% between 1981 and 1993 (figure 19.46), however, and recently, high levels of congestion in Yosemite Valley have required temporary closure of park entrances on weekends. Table 19.4 summarizes the RVD rates for the three individual parks during the twelve-year period 1981–93.

The change in the number of visitors to the park (who may visit for either more or less than one RVD) has been even more dramatic from 1971 to 1993. This time-series highlights Yosemite's continued growth in popularity while Sequoia and Kings Canyon remained relatively stable. Yosemite received only 2.3 million visitors in 1971, but that number had grown by 64% in 1993 to 3.8 million visitors. In contrast, Sequoia and Kings Canyon each had just under 900,000 visitors in 1971, and each had climbed to an annual visitation rate of around 1.1 million by 1991 (growing by 28% and 21%, respectively, while Yosemite grew by 46% during the same period). Because of a precipitous drop in Kings Canyon visitation in 1991–93, 1993 visitation levels were only 72% of 1971 levels, while Sequoia achieved an overall increase of 21% from 1971 to 1993. Yosemite National Park increased its share of total NPS RVDs in the Sierra Nevada during that time to nearly half (figure 19.47). The 1991–93 drop in Kings Canyon visits appears to be explained primarily by significant declines in tent camping and recreational vehicle RVDs from 1991 to 1993. It is unclear whether this is a result of changes in park management policies regarding camping, but it is somewhat surprising, given the other trends for greater demand for "front country" activities. Disaggregated by activity, RVD trends

show a slight decline in backpacking (with significant variation year-to-year) and a slight increase in concessionaire accommodations (with only slight variations year-to-year). Figure 19.48 shows the pattern by recreational activity class for Kings Canyon.

Visitation is highly correlated with RVD values for all three of the national parks during the 1981–93 period, suggesting that the historical 1971–93 visitation data are a good proxy for RVDs from 1971 to 1981. Average visitation appears to be fairly steady, with no clear trend in the RVD versus visitation

FIGURE 19.24
Eldorado National Forest mean annual RVDs by activity class, 1987–93.



data for 1981–91. As noted earlier, the average annual RVD ratio was 2.24 for Yosemite during this period and ranged from a low of 2.20 to a high of 2.29 (figure 19.49).

Yosemite has been facing a changing mix of entry modes, however, as bus tours have grown in importance recently. Buses transport large numbers of visitors into the park very efficiently, but those same buses can contribute to the perception of crowding within Yosemite Valley whenever many of them arrive at about the same time. Both parking availability and congestion at popular sites have become problems in management of the Yosemite Valley area. They were already identified as problems when the 1980 General Management Plan was adopted but have become more acute since then.

Many of the current visitors to Yosemite Valley are probably comfortable with the “urban” nature of the Valley floor,³ many other potential visitors avoid Yosemite Valley from Memorial Day to Labor Day in order to avoid the congested conditions.⁴ Recent proposals to “winterize” seasonal accommodations and to increase visitation during off-peak “shoulder” seasons could therefore reduce opportunities for those potential visitors to experience Yosemite Valley under the conditions they prefer. This could reduce opportunities for visitors to experience Yosemite Valley under the conditions they prefer even as total visitation and RVDs increased. This scenario raises concerns about conflicts between similar uses and the impact of congestion on the quality of recreational experiences, which is discussed in more detail later. It is a problem that could apply generally to the Sierra Nevada under future conditions.

Bureau of Land Management

The Bureau of Land Management (BLM) manages land scattered throughout the Sierra Nevada that is located primarily along the periphery of the national forests (figure 19.50). Three BLM resource areas are located within the Sierra Nevada core area: Bishop, Folsom, and Eagle Lake (figure 19.51). Portions of other BLM resource areas, such as Caliente and Redding, intersect the Sierra Nevada region but are not predominantly within the core area. The BLM accounts for recreational activities upon its lands and measures them by visitor hours. Use data for 1992 were converted from the visitor-hour measurements to recreational visitor days (RVDs), using the Forest Service RVD definition (one RVD equals one twelve-hour visit). During 1992, the total RVDs for the three resource areas was 1,660,033. Camping accounted for approximately 43% of all recreational activities that occurred on BLM lands in the three resource areas. Approximately 19% of all RVDs in the Bishop, Folsom, and Eagle Lake Resource Areas were in motorized activities, while 15% were in fishing and/or hunting. Somewhat surprisingly, only 4% of the total annual RVDs were attributed to off-road vehicle use. Nonmotorized and site-based activities accounted for 13%, boating and water-based activities accounted for 6%, and only 1% of annual use was in the winter (figure 19.52).

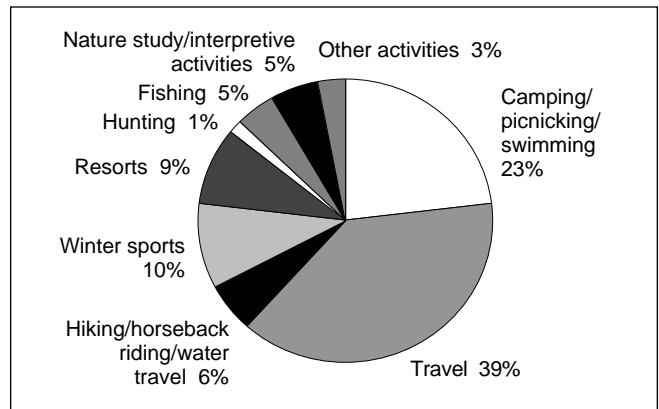


FIGURE 19.25

Inyo National Forest mean annual RVDs by activity class, 1987–93.

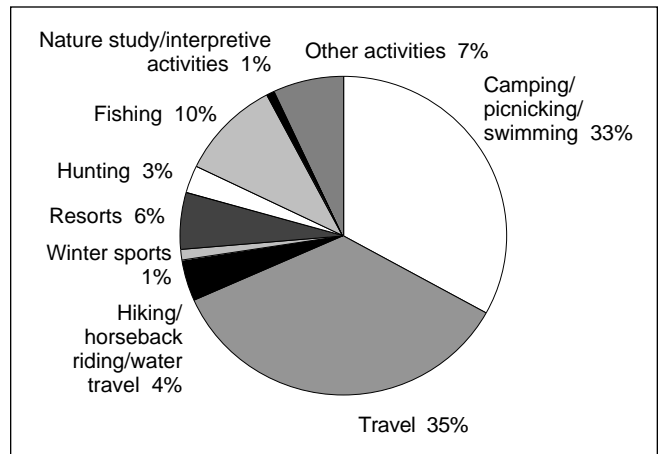


FIGURE 19.26

Plumas National Forest mean annual RVDs by activity class, 1987–93.

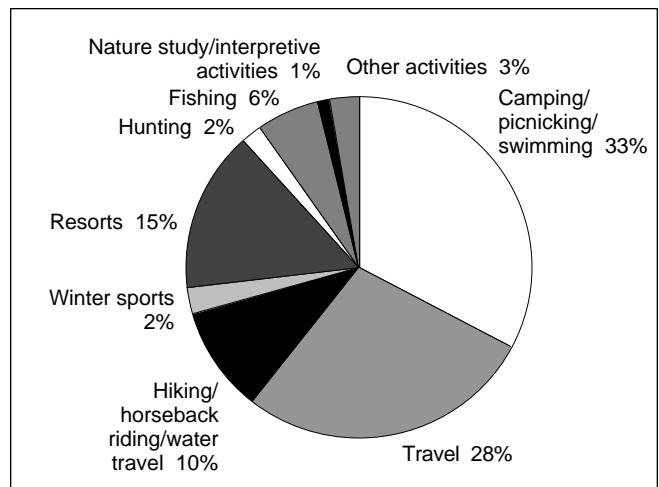


FIGURE 19.27

Sierra National Forest mean annual RVDs by activity class, 1987–93.

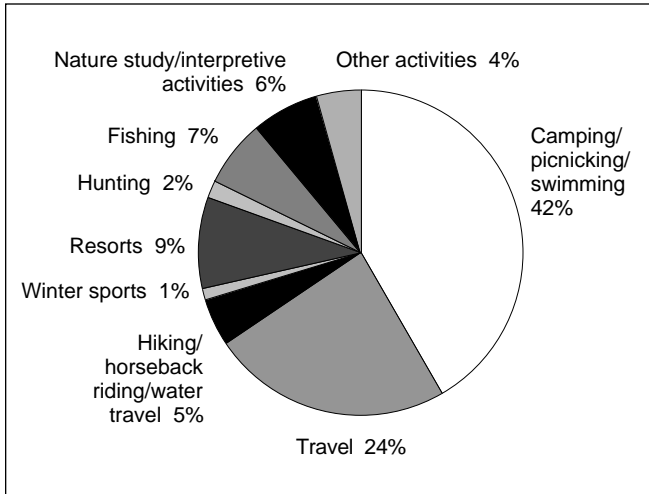


FIGURE 19.28

Sequoia National Forest mean annual RVDs by activity class, 1987-93.

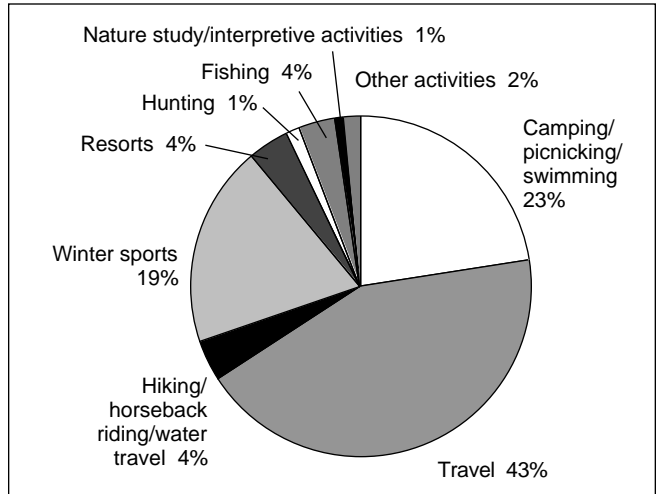


FIGURE 19.30

Tahoe National Forest mean annual RVDs by activity class, 1987-93.

Folsom Resource Area had approximately three times more total RVDs than either Bishop or Eagle Lake Resource areas (figure 19.53). This higher level of use probably reflects the proximity of the BLM lands in the Folsom Resource Area to the urban population of the Sacramento metropolitan area and the rapidly growing western Sierra Nevada foothills. Population is much more sparse in both the Bishop and Eagle Lake Resource Areas. Table 19.5 summarizes fishing and hunting RVD information for each resource area. More people fished at the Bishop Resource Area than Folsom or Eagle Lake; it had approximately 80% of the total fishing RVDs. This probably reflects the high-quality fly-fishing resource of the eastern Sierra Nevada in Mono and Inyo Counties. Hunting RVDs

were highest at the Eagle Lake Resource Area, which drew nearly 90% of the total hunting RVDs for the three areas. The Eagle Lake data includes many lands outside the core area, however, so much of this activity may have occurred on the Modoc Plateau.

This breakdown by BLM resource area for the hunting and fishing classes highlights that each resource area (and the subareas within that administrative unit) has very different RVD profiles by activity class. Geographically specific assessments must be made to evaluate the implications of the policy scenarios for recreational activities on BLM lands in the Sierra Nevada. A more detailed breakdown by geographic area and activity class is available from the California Environ-

FIGURE 19.29

Stanislaus National Forest mean annual RVDs by activity class, 1987-93.

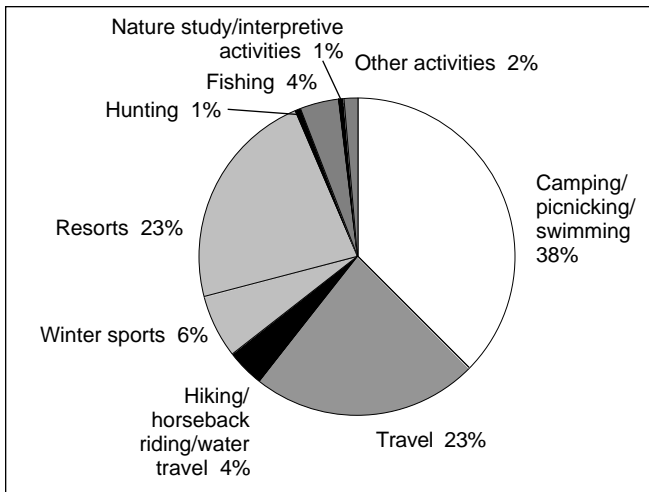
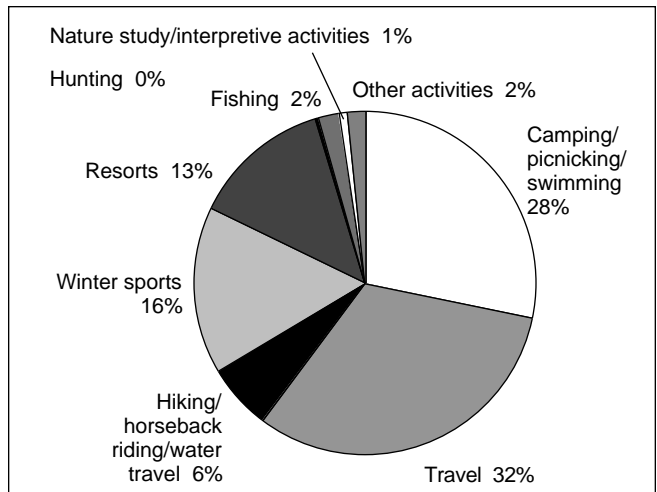


FIGURE 19.31

Lake Tahoe Basin Management Unit mean annual RVDs by activity class, 1987-93.



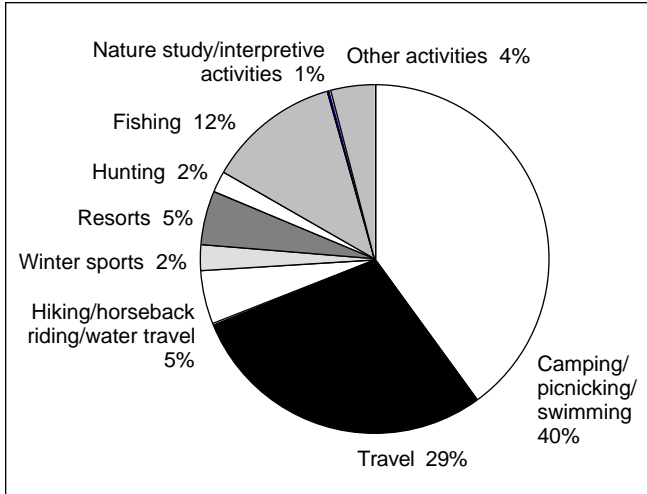


FIGURE 19.32

Toyabe National Forest mean annual RVDs by activity class, 1987–92.

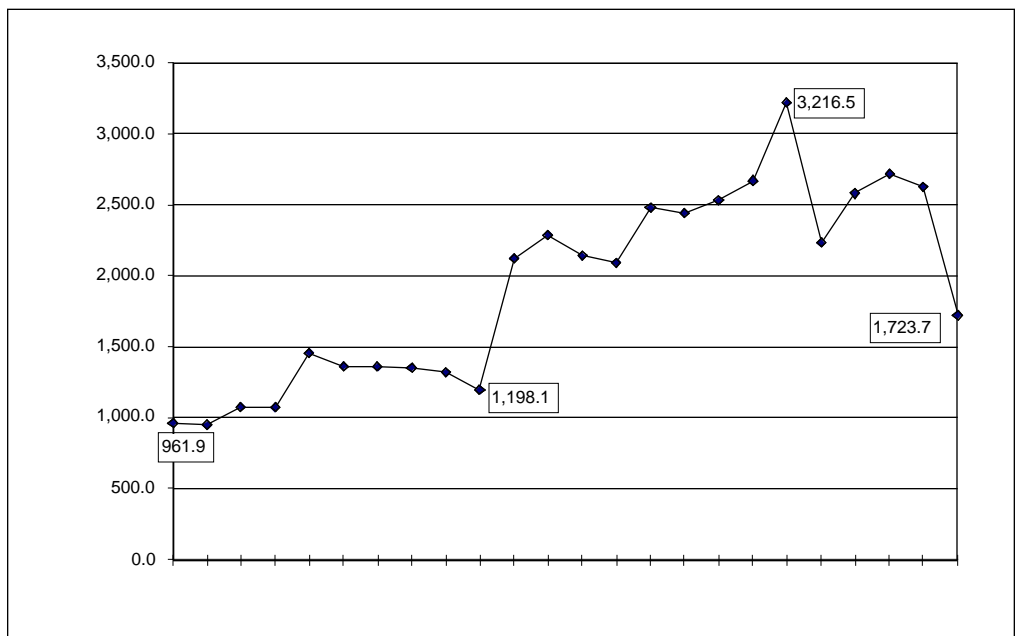
mental Resource Evaluation System (CERES) project of the Resources Agency of the State of California (<http://ceres.ca.gov/snep>), and the Alexandria Project at the University of California, Santa Barbara (<http://alexandria.sdc.ucsb.edu/>). The RVDs by activity class in the Bishop Resource Area are described in more detail later.

Bureau of Reclamation

The Bureau of Reclamation annually accounts for the recreational use of its twelve facilities that are located within the Sierra Nevada. Between 1970 and 1992, these facilities experienced an overall 14% increase in total number of recreation days, from 3,392,000 to 3,881,000 recreation days per year (figure 19.54). These RVD figures were seriously constrained by the 1987–94 drought, however, for the total RVD figures reached a peak of 6,566,000 in 1987 (the last year before the drought affected reservoir levels). The average RVD figure for the 1970–92 period was 3,917,000. Almost all of these RVDs were related to flat-water boating, fishing, and associated camping or day use on shore. Due to their location, Bureau of Reclamation reservoirs are an important provider of these types of recreational opportunities for residents of the Central Valley and the Reno metropolitan area and for visitors to the Lake Tahoe–Truckee area. Folsom Reservoir alone accounted for 42% of the average 1970–92 total Bureau of Reclamation RVDs. It serves as an important recreational resource for both the Sacramento metropolitan region and the rapidly growing Sierra Nevada foothill regions of Placer and El Dorado Counties (figure 19.55). In addition to the drought, however, increased concerns about flooding in the Sacramento area following the February 1986 floods resulted in modified reservoir operation. Further modifications may result following the 1995 floods or due to significant development of the floodplain north of Sacramento. The future capacity of Folsom Reservoir to provide recreational opportunities at pre-drought levels is therefore in question. Future RVD activity is therefore likely to approximate the average 1970–92 levels rather than return to the unusually high RVD levels of 1987. Devel-

FIGURE 19.33

Annual ski area RVDs on USFS land, (Eldorado, Inyo, Sequoia, Sierra, Stanislaus, and Tahoe National Forests, and Lake Tahoe Basin Management Unit), 1967–91.



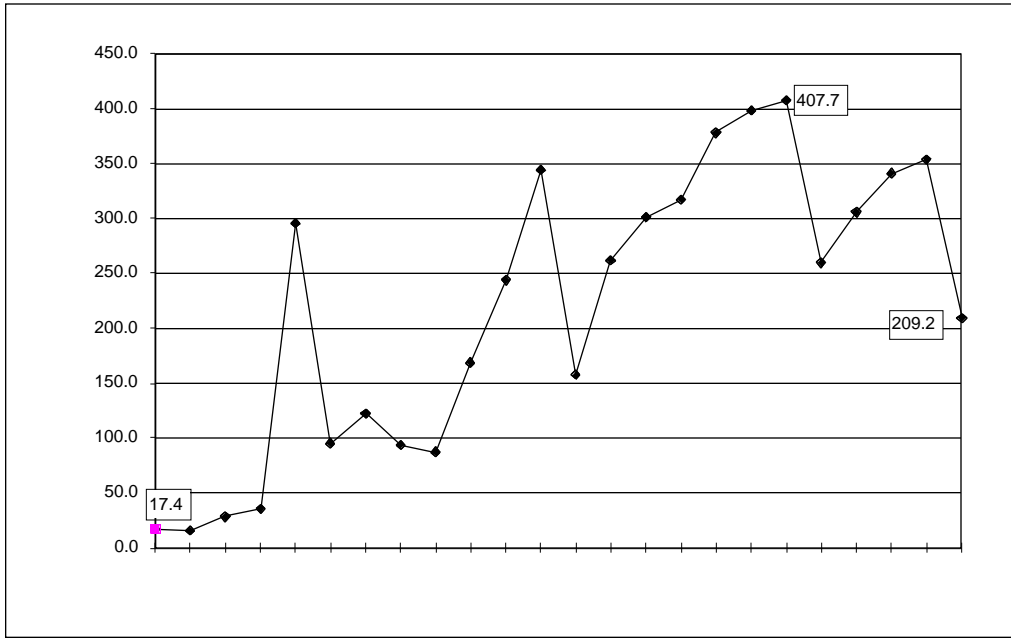


FIGURE 19.34
 Annual ski area RVDs on the Eldorado National Forest.

opment of an upstream Auburn Dam for flood control would reduce restrictions on operation, however, while potentially increasing competitive opportunities for flat-water recreation.

Army Corps of Engineers

The Army Corps of Engineers operates several reservoirs within the Sierra Nevada, but no data were available from

the California offices of the Corps regarding recreational use levels or trends at those facilities. Relative to recreational use on other public lands within the Sierra Nevada, the Corps of Engineers facilities are believed to be little visited. Our RVD records nevertheless underestimate RVDs for those activities occurring at Corps facilities. An example of a Corps facility not reflected in our data is Englebright Reservoir, located on the Yuba River along the boundary of Yuba and Nevada Coun-

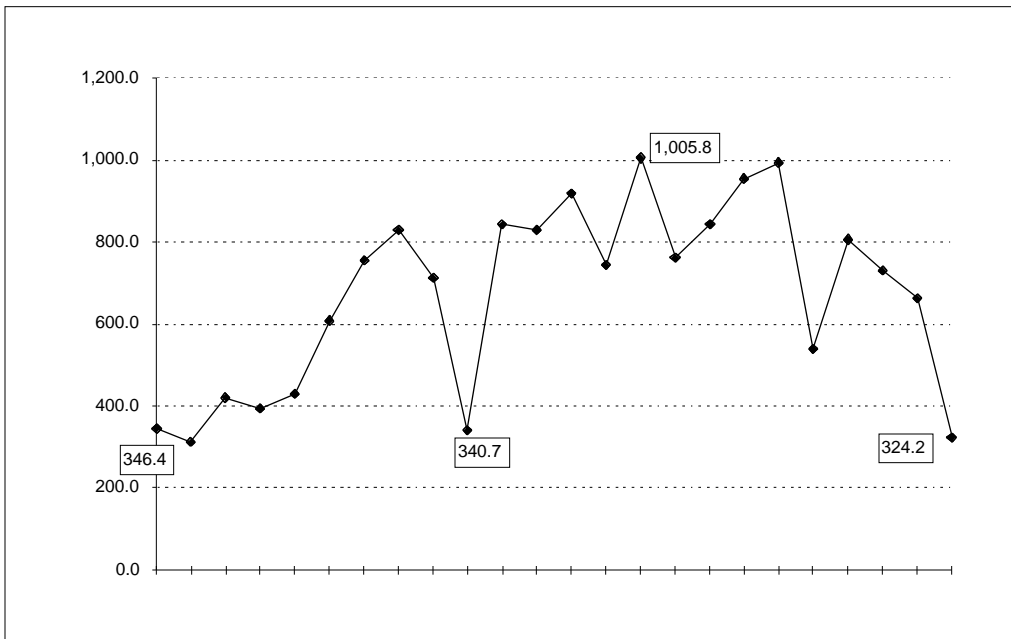
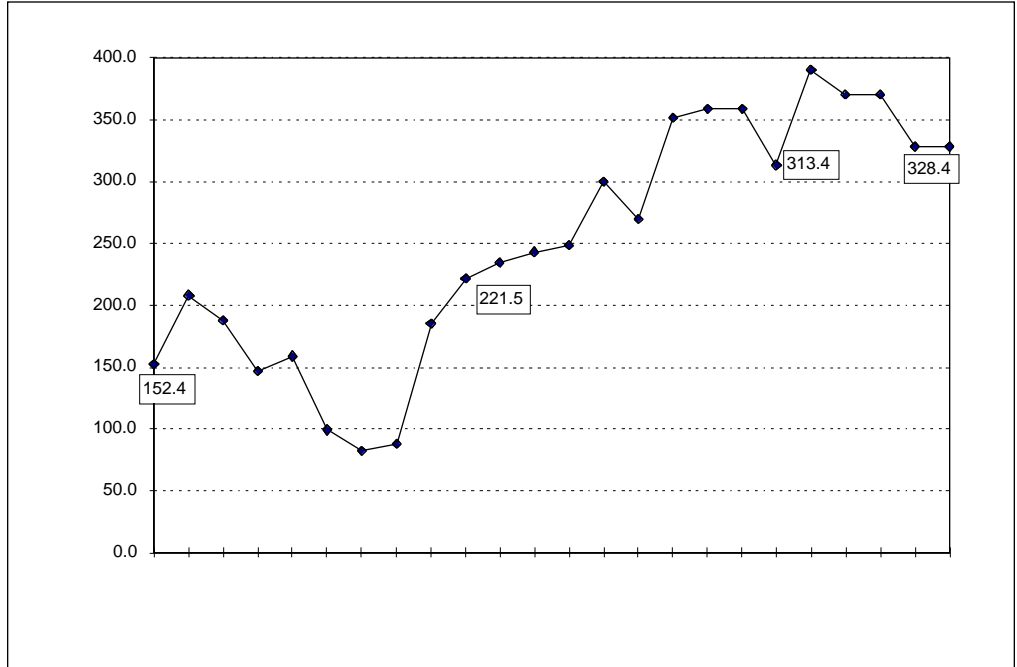


FIGURE 19.35
 Annual ski area RVDs on the Inyo National Forest.

FIGURE 19.36

Annual ski area RVDs on the Lake Tahoe Basin Management Unit.



ties. Almost all of these recreation days would be related to flat-water boating, fishing, and associated camping or day use on shore.

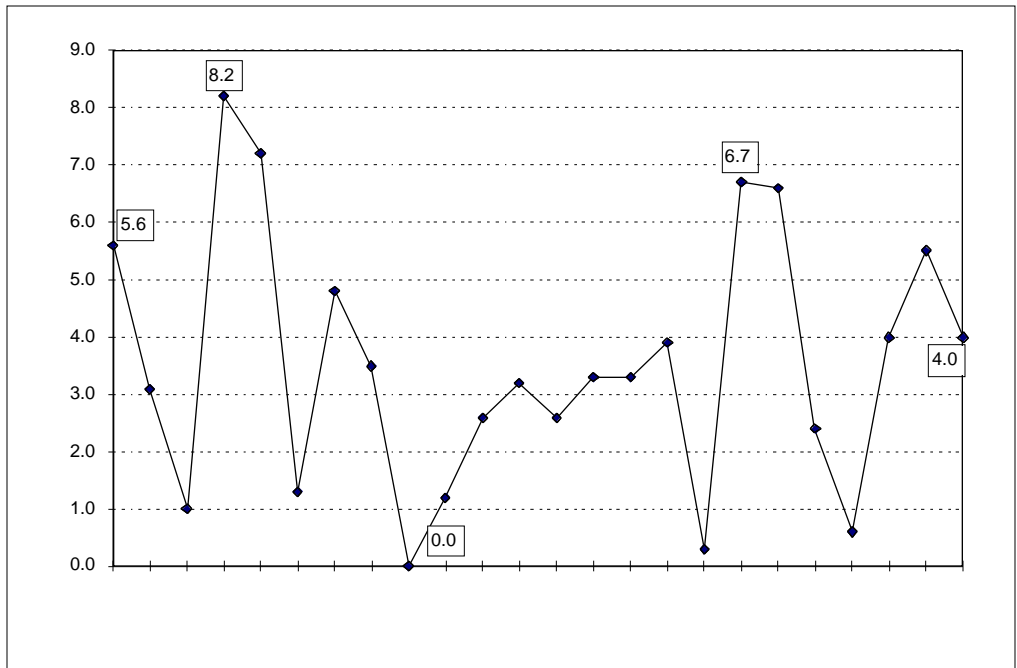
STATE AGENCIES

California Department of Parks and Recreation

The State of California administers parks throughout the Sierra Nevada (figure 19.56), and maintains very reliable an-

FIGURE 19.37

Annual ski area RVDs on the Sequoia National Forest.



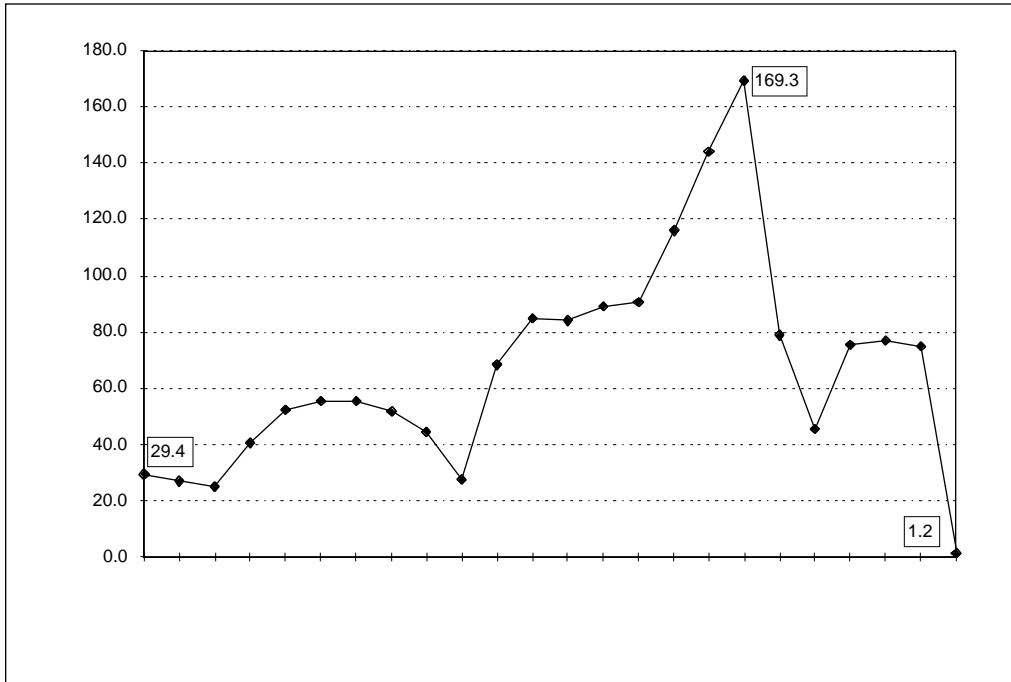


FIGURE 19.38
 Annual ski area RVDs on the Sierra National Forest.

nual use figures based upon entrance fees collected. These parks are part of one of the best state park systems in the United States (Ostertag 1995). We analyzed twenty-nine years of state park use data for Alpine, Butte, Calaveras, El Dorado, Fresno, Madera, Mono, Nevada, Placer, and Tuolumne Counties. Between 1963 and 1992, the total number of visitors per year decreased by 9%, from 7,984,899 to 7,241,246 individu-

als per year (figure 19.57). This occurred despite an increase in the state's population from 10 million in 1960 to nearly 31 million in 1990. Visitation may be either constrained by available capacity (e.g., campground reservations are usually required throughout the summer, and requests typically exceed spaces on weekends) or negatively affected by the relative cost of admission to the state units (generally higher than

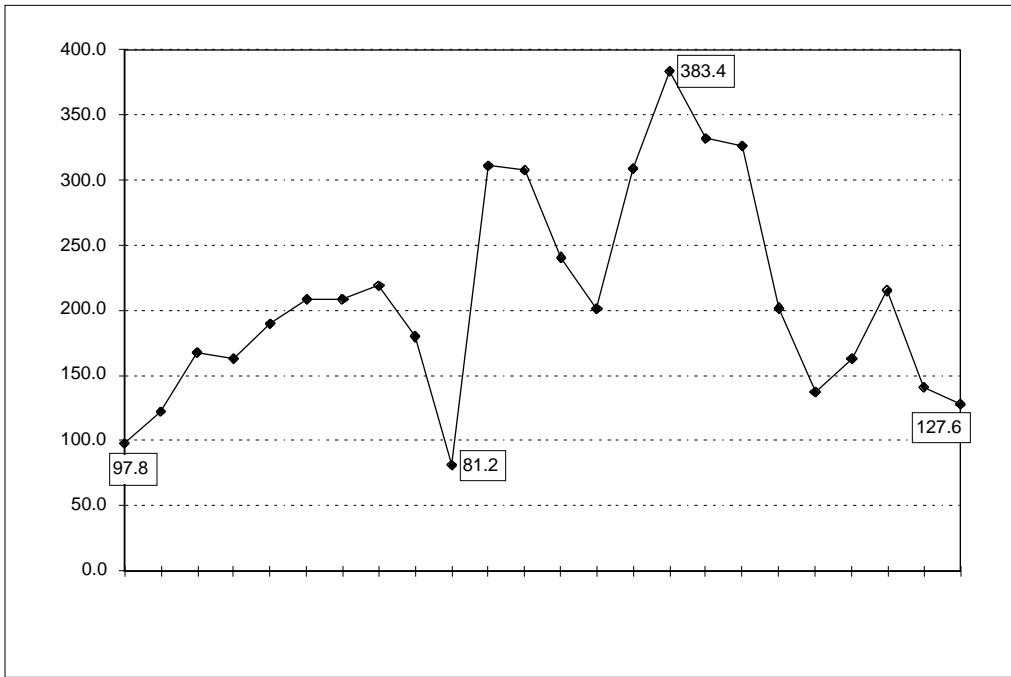
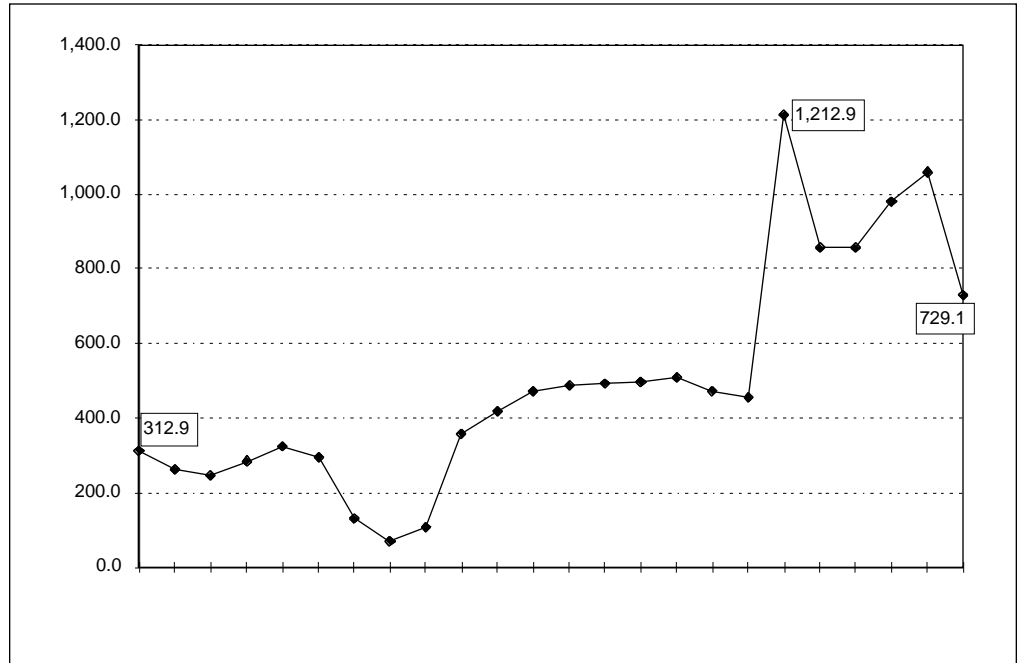


FIGURE 19.39
 Annual ski area RVDs on the Stanislaus National Forest.

FIGURE 19.40

Annual ski area RVDs on the Tahoe National Forest.



nearby facilities on federal lands). The mean annual total number of visitors for that twenty-nine-year period was 6,474,592 individuals per year and 6,413,253 for the more recent 1987–93 period.

These figures do not include the South Yuba River Project in Nevada County, which had an estimated 671,000 visitors in 1991–92 (South Yuba River Citizens League 1993) on lands either owned by the state (but not yet formally designated as a state park) or managed by the federal Bureau of Land Management. The BLM has entered into an agreement to transfer those lands to the state to develop a state park along the corridor that would eventually connect Malakoff Diggins State Historic Park and Bridgeport Covered Bridge State Historic Park downstream along the South Yuba River in Nevada County. These user figures include an estimated 170,000 visitors at the Highway 49 crossing alone. With the inclusion of the South Yuba River Project visitation figures, the overall visitation for the Department of Parks and Recreation in 1992 were comparable to those in 1963. The system grew after 1963 and reached a peak of roughly 9 million visitors in 1965–66, however, dropping to around 6 million visitors in 1967–68. The historic low of 4.9 million visitors occurred during the 1976–77 drought.

These visit estimates were converted to RVDs using the Yosemite RVD ratio of 2.24 to derive a total of 15,868,723 RVDs in the system in 1993. This RVD rate makes the state Department of Parks and Recreation (CDPR) the second most important public provider of RVDs in the Sierra Nevada, exceeding the combined totals of the Bureau of Reclamation, Bureau of Land Management, and National Park Service. The potential impact of California’s state fiscal problems on rec-

reational activity in the Sierra Nevada can therefore be significant if it results in further strains on the state parks in the region. Evaluation of policy scenarios designed to manage recreational activities on the public lands in the Sierra Nevada must also clearly include careful consideration of state recreational policies. The relationship between state and federal recreation policy has generally been weak, with most of the state’s recreation planning capacity eliminated through recent state budget cuts. Site-specific planning may be occurring in the field, but we found little evidence of cooperative planning or data sharing at the regional level between state and federal recreation agencies.

Even using the lower RVD per visitor ratio of Lassen Volcanic National Park (1.03), RVDs for CDPR facilities still total about 7.3 million RVDs per year. This total is approximately equal to the total RVDs for park service and Bureau of Reclamation facilities combined.

California Department of Fish and Game

The California Department of Fish and Game maintains very accurate county-level hunting and fishing license sales records. These records record the county of sale, rather than the county of residence of the licensee. We analyzed seven years of hunting and fishing licensing information for the following counties: Alpine, Amador, Butte, Calaveras, El Dorado, Fresno, Inyo, Kern, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tehama, Tulare, Tuolumne, and Yuba. Though the boundaries of these counties do not exactly correspond with the boundaries of the Sierra Nevada, at least a portion of each falls within the Sierra. Three other northern counties

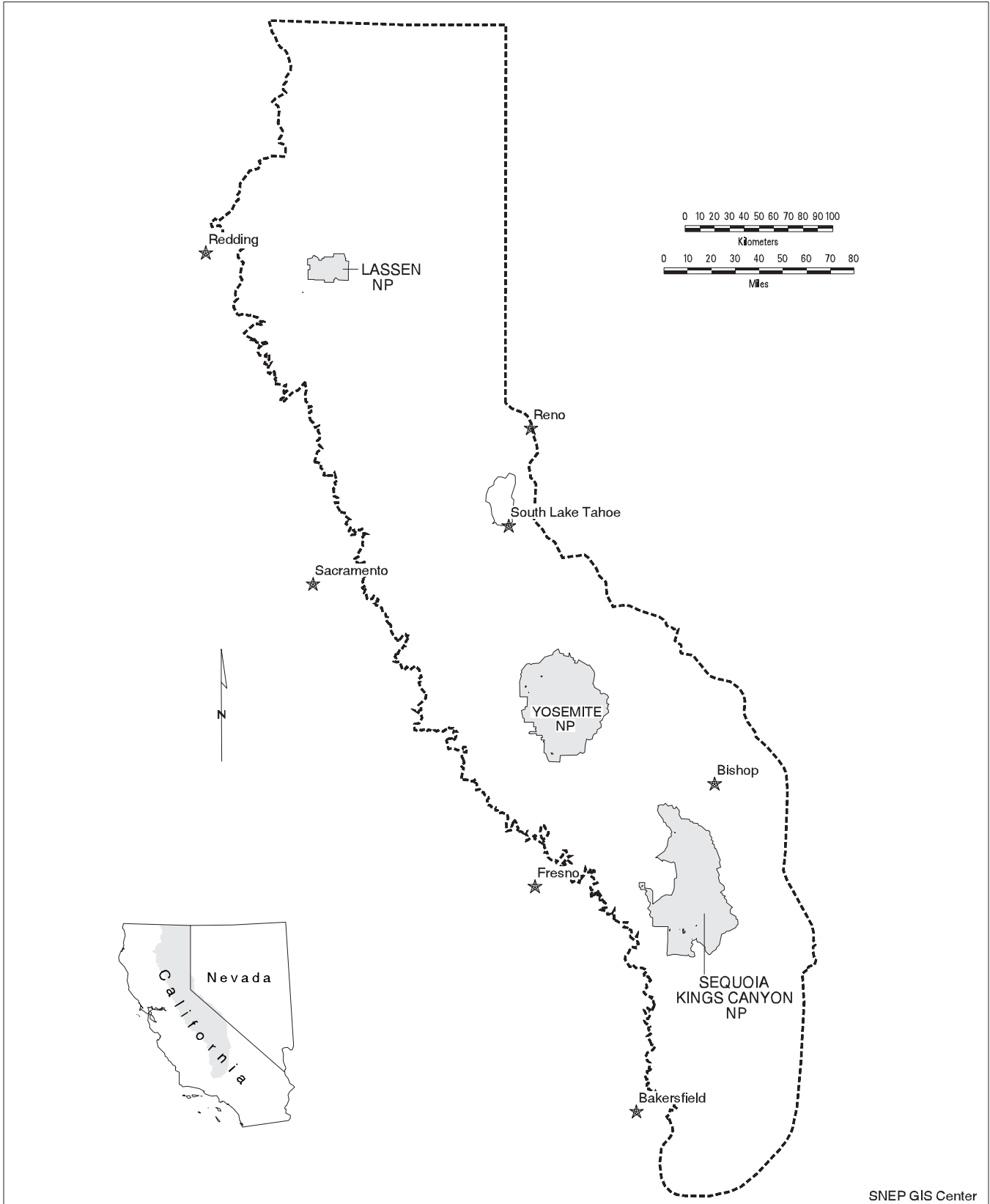
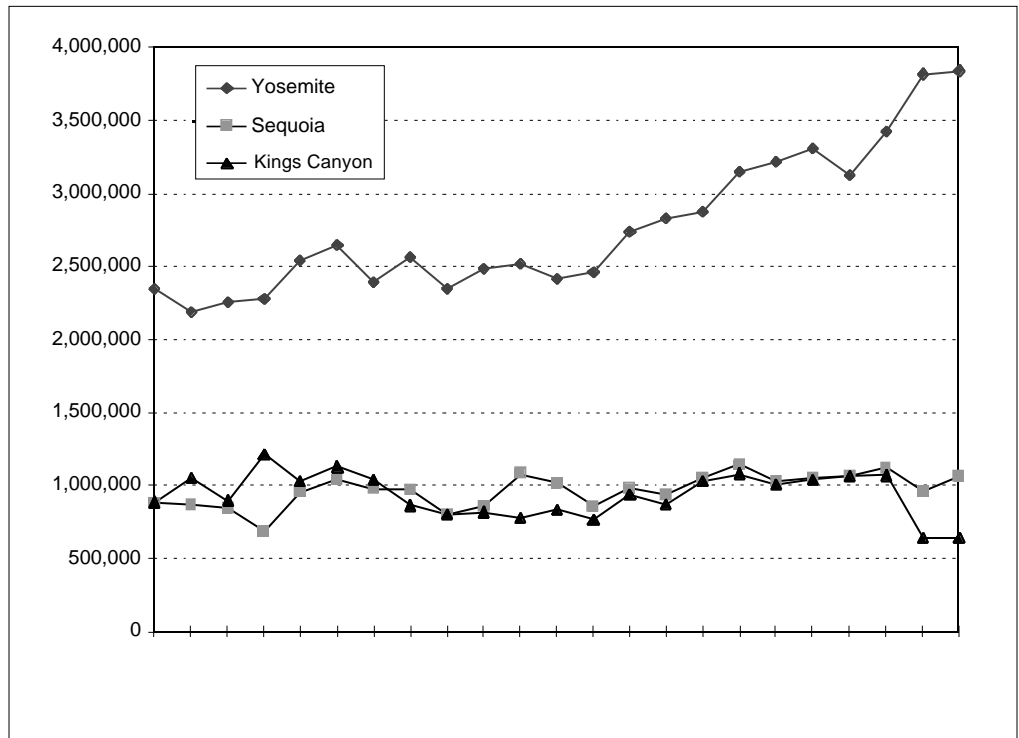


FIGURE 19.41

National parks within study area.

FIGURE 19.42

Recreational visitors to national parks, 1971–93.



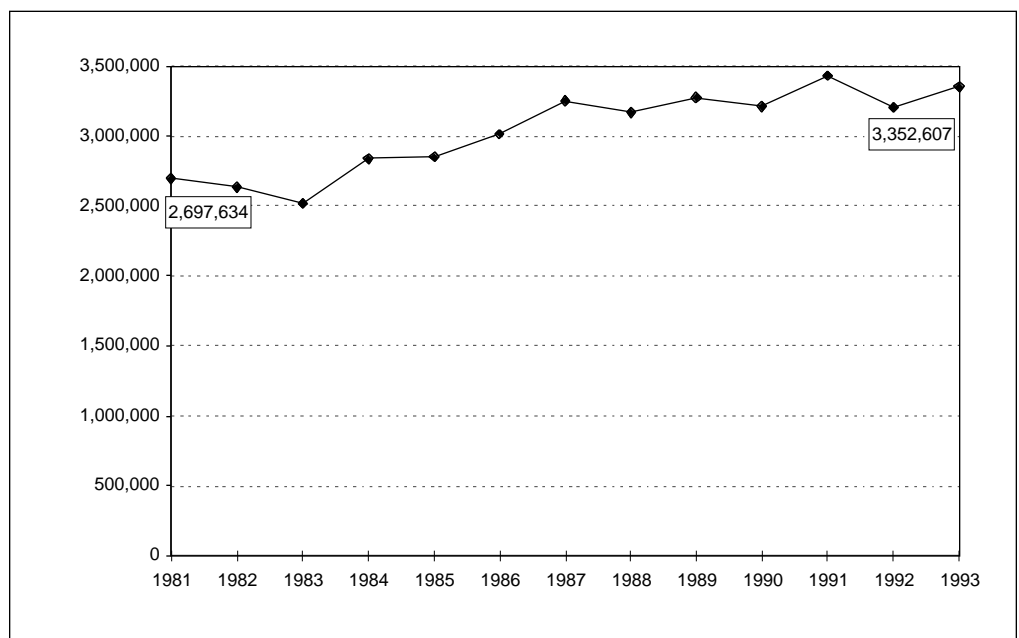
(Shasta, Lassen, and Modoc) were excluded from the analysis due to their position outside of the Sierra Nevada. Licenses sold in those three counties (and many other counties outside the Sierra Nevada, where 92% of California residents live) may nevertheless be an important source of information about fishing and hunting recreationists in the Sierra Nevada. We

undertook this analysis of the Sierra counties in order to determine if trends in hunting and fishing among Sierra Nevada residents differed from trends among the California population in general. We found that local trends were generally consistent with statewide trends.

Between 1986 and 1993, there was an overall decrease in

FIGURE 19.43

Total annual RVDs for Sequoia, Kings Canyon, and Yosemite National Parks.



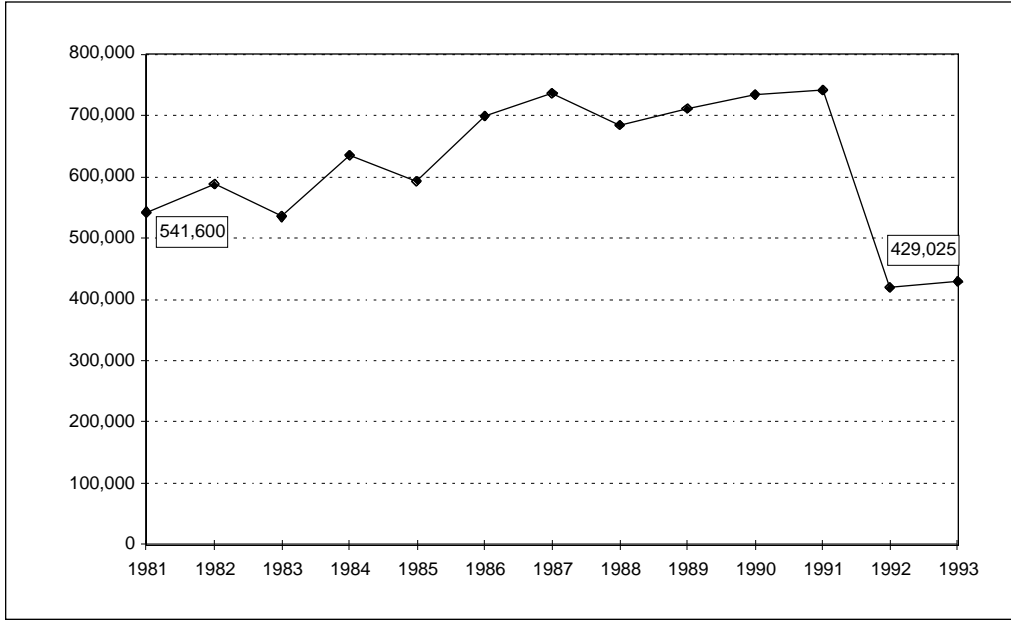


FIGURE 19.44
Total annual RVDS for Kings Canyon National Park.

the total number of fishing and hunting licenses issued. During the 1986–87 fishing season, 298,939 fishing licenses were issued, dropping by 4% to 282,341 in 1992–93 (figure 19.58). The total number of issued hunting licenses decreased by 15% between the 1986–87 and 1992–93 seasons, from 73,712 to 62,955 (figure 19.59). The total mean annual number of licenses issued during the seven-season period is summarized in table 19.6, showing that fishing is considerably more popular than hunting in the counties in the Sierra Nevada (by more than four-to-one).

The five counties within the Sierra Nevada region that issued the most fishing licenses were Fresno, Kern, Butte, Mono, and Inyo Counties. An analysis of USFS recreational visitor day (RVD) data during the years 1987–93 supported the county-level analysis of fishing licenses: Inyo National Forest contained the highest proportion of fishing RVDs for Forest Service areas within the Sierra Nevada (figure 19.18). These RVDs on USFS lands were probably dominated by nonresident recreationists, however, including residents in the Central Valley portions of Fresno, Kern, and Butte Counties, which

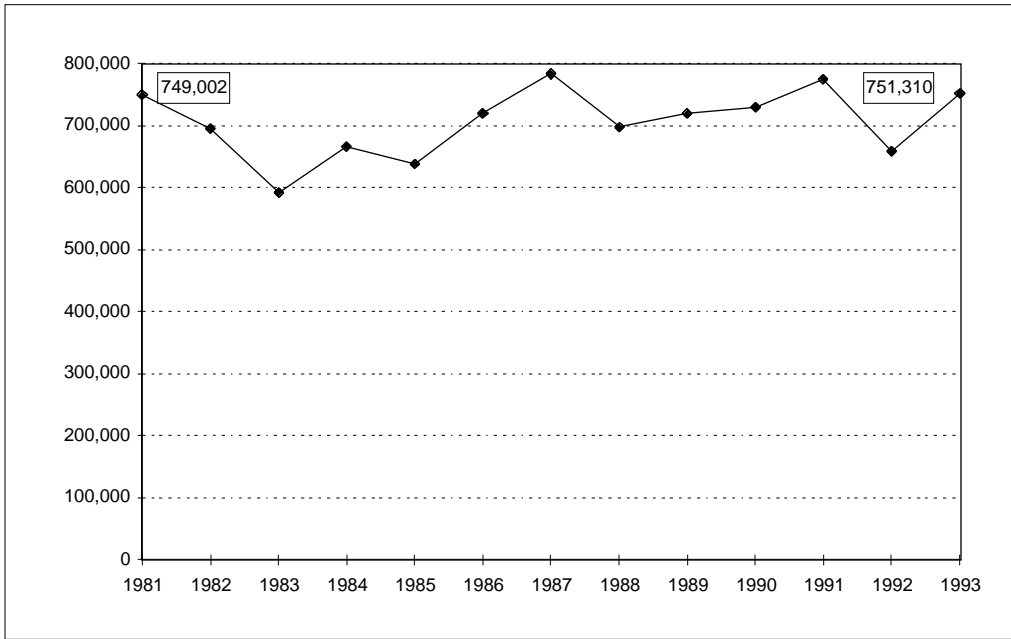
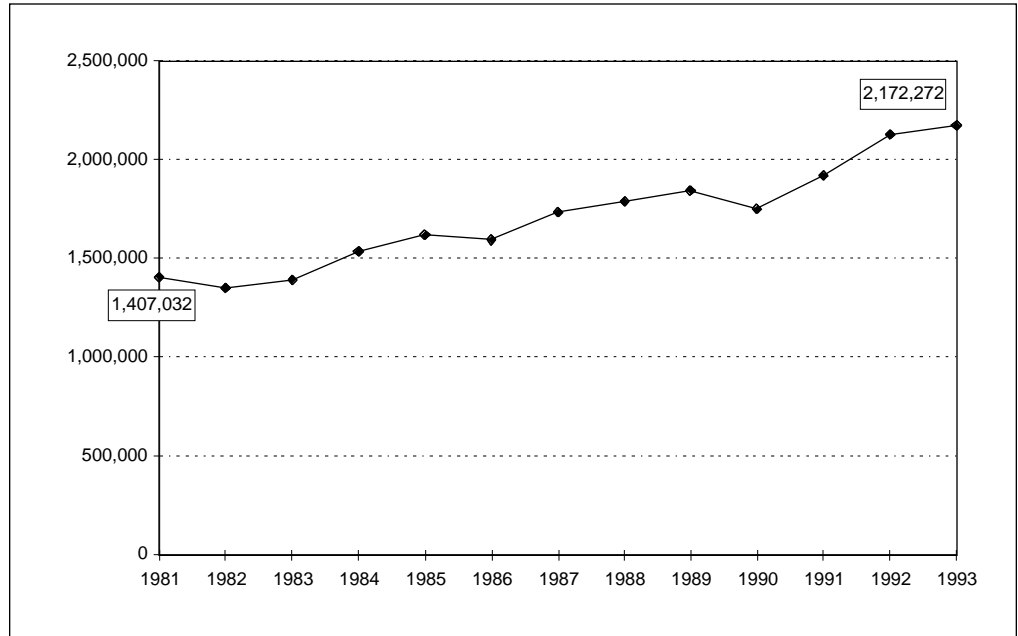


FIGURE 19.45
Total annual RVDS for Sequoia National Park.

FIGURE 19.46

Total annual RVDs for Yosemite National Park.



issued the largest number of hunting licenses (figure 19.60). These three counties extend into the Central Valley and have much higher populations than most of the other counties in the Sierra Nevada region.

Hunting and fishing licenses issued in other counties in California are often used in the Sierra Nevada. Those recreational activities that occur on public lands would generally be captured in agency-specific recreational use data, but hunting and fishing on private lands is generally unaccounted for in our data. The total number of fishing licenses issued by the state dropped 16%, from 1,708,900 in 1986 to 1,430,646 in 1993. The seven-year mean was 1,532,787 fishing licenses. Fishing, like whitewater rafting, is also significantly affected by annual weather variations. The prolonged drought of 1986–94 could therefore have dampened these figures somewhat. Hunting licenses appear to be on a long-term decline, however, which is a trend that was identified before the drought and generally would not have been negatively affected by the drought. Hunting licenses issued statewide declined 18%, from 351,389 in the 1986–87 season to 287,096 in 1992–93. The seven-year mean was 319,198. This drop appears to be related

to the continuing urbanization of California’s population and changing social values regarding hunting. Fewer than 1% of Californians now hunt.

Restrictions on some types of hunting (e.g., mountain lions) may also have reduced the number of hunting licenses, but hunting licenses are predominantly issued for deer or waterfowl. Deer hunting is also on the decline. Land-use changes and the impact of habitat alteration on the probability of a successful hunt may also be reducing the relative attractiveness of deer hunting in the Sierra Nevada. This decline in hunting activity has also been accompanied by an apparent increase in nonconsumptive wildlife-related recreational activities, such as nature study, photography, and painting.⁵ Hunting is likely to continue to decline in the Sierra Nevada.

Fishing activities have also undergone recent changes, with growing interest in fly-fishing for “natural” trout and expansion of catch-and-release programs. Fishing activity that depends primarily upon hatchery trout production, fish plantings by the Department of Fish and Game, and bait fishing nevertheless appear to continue to dominate total RVD activity within the fishing sector. The relative economic value

TABLE 19.4

National Park Service area recreational visitor day summary.

National Park Service Area	1981 Total RVDs	1993 Total RVDs	Percentage Change	Mean Annual RVDs, 1981–93
Sequoia National Park	749,002	751,310	+ 0.3	764,770
Kings Canyon National Park	541,600	429,025	-20	670,383
Yosemite National Park	1,407,032	2,172,272	+ 54	1,853,237

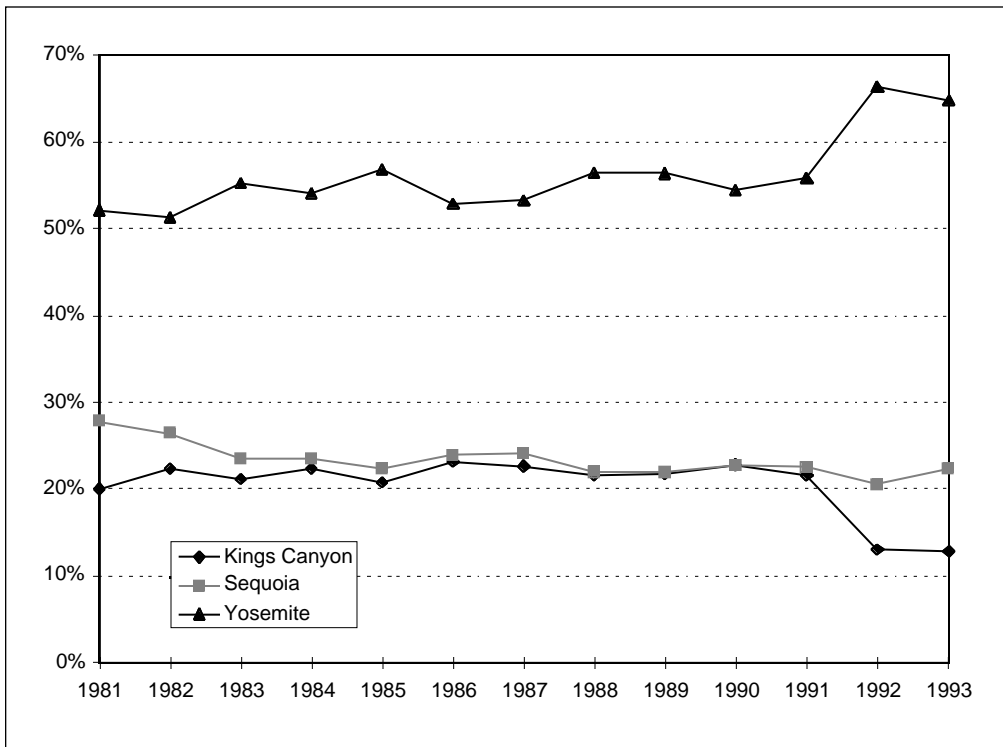


FIGURE 19.47
 Park shares of National Park Service RVDs, 1981-93.

of these different types of fishing appears to be significantly different, however, as are the implications of trends within the fishing activity class for land and resource management in the Sierra Nevada. Unfortunately, there are no good quantitative data available for an accurate estimate of specific activities within the fishing activity class for the entire Sierra

Nevada. More detailed results are presented in Knauer and Duane (1994) for the eastern Sierra Nevada.⁶ This data weakness seriously limits SNEP's ability to analyze the policy implications of various land and resource management scenarios. We project fishing demand to remain relatively stable, as growth in California's population overcomes any declines

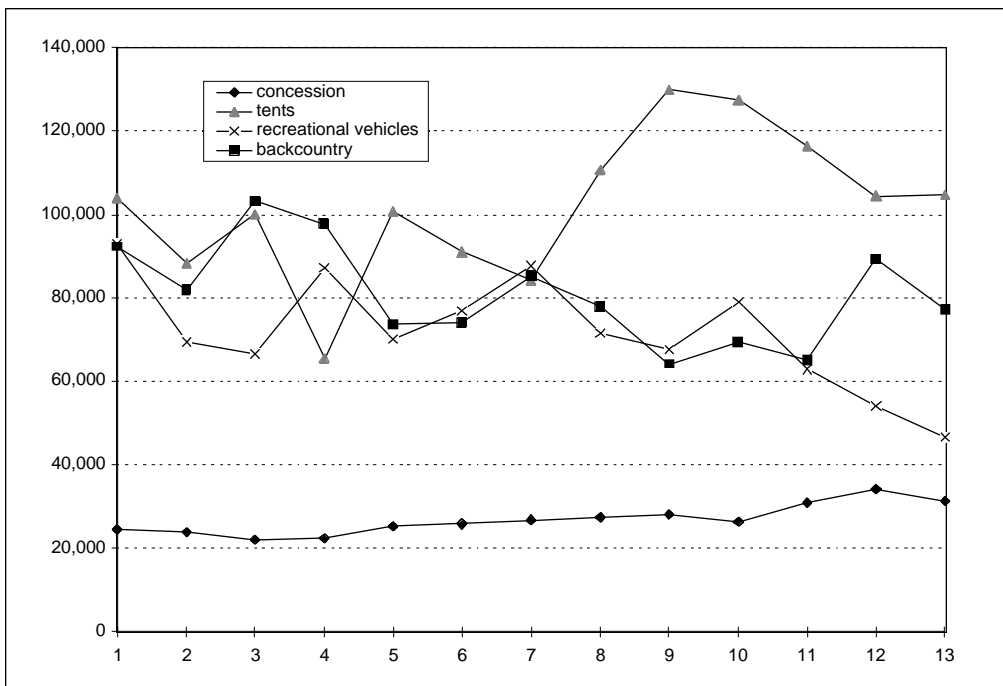
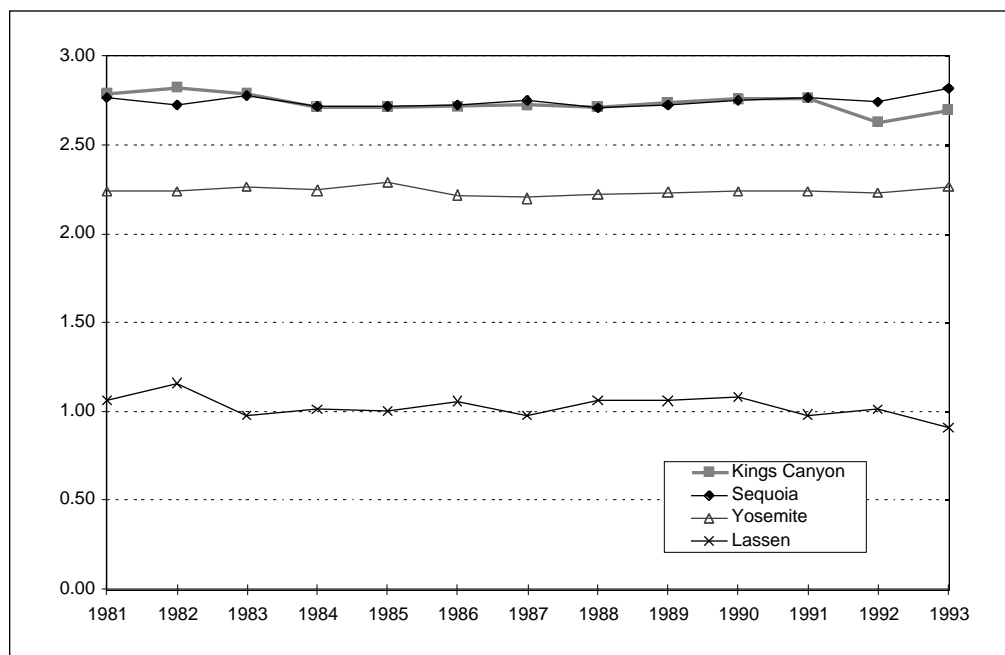


FIGURE 19.48
 Kings Canyon RVDs by activity, 1981-93.

FIGURE 19.49

RVDs per visitor in national parks, 1981–93.



in per-capita fishing rates. We also believe that drought is primarily responsible for the 1986–93 decline, although other social, demographic, economic, and resource availability factors are also important.

Nevada Department of Parks

The state of Nevada Department of Parks operates the Lake Tahoe State Park on the east shore of Lake Tahoe, which is the most popular park in the Nevada system. Unfortunately, we were unable to obtain visitation or RVD figures for the park. This omission means that our total RVD estimates are considerably lower for the Lake Tahoe Basin than they should be.

PUBLIC UTILITIES

Pacific Gas and Electric Company

Pacific Gas and Electric accounts for annual overnight use of its campgrounds in Alpine, Amador, Butte, El Dorado, Fresno, Madera, Nevada, and Plumas Counties. Between 1985 and 1993, the total number of overnight visitors to PG&E’s campgrounds increased by 60%, from 27,176 to 43,434 (figure 19.61). Camping capacity may also increase moderately at PG&E facilities in the future under the terms of relicensing conditions required by the Federal Energy Regulatory Commission. That additional capacity would probably be developed over the next five to fifteen years, during which the existing licenses for many PG&E hydroelectric facilities will either expire or

be renewed. There is also a possibility that some PG&E facilities will be acquired by other parties, however, with unknown consequences for the future operation of PG&E campgrounds. PG&E also operates a small number of facilities for the use of its employees, but visitation figures for these were unavailable.

The visitation figures for PG&E indicate numbers of overnight visitors, who can be assumed to have participated in more than one RVD for each of their visits. Using the 2.24 RVD ratio described earlier, we estimate 97,292 RVDs in 1993 at PG&E facilities and an average of 44,737 RVDs using the 1.03 RVD ratio.

East Bay Municipal Utility District

The East Bay Municipal Utility District operates Pardee and Camanche Reservoirs on the Mokelumne River, which have an average annual day use visitation rate of 306,106 RVDs. Table 19.7 shows the historical pattern of day use at the two reservoirs for 1988–94. Figures for overnight use are unavailable.

Other Utilities

We also sought information from Sierra Pacific Power, Southern California Edison, San Diego Gas and Electric, the Los Angeles Department of Water and Power, the Metropolitan Water District, the City of San Francisco Hetch Hetchy Water Department, and irrigation districts and water agencies throughout the Sierra Nevada. In general, they had limited records for recreational activity at their reservoirs, or they indicated that their recreational activity was recorded sepa-

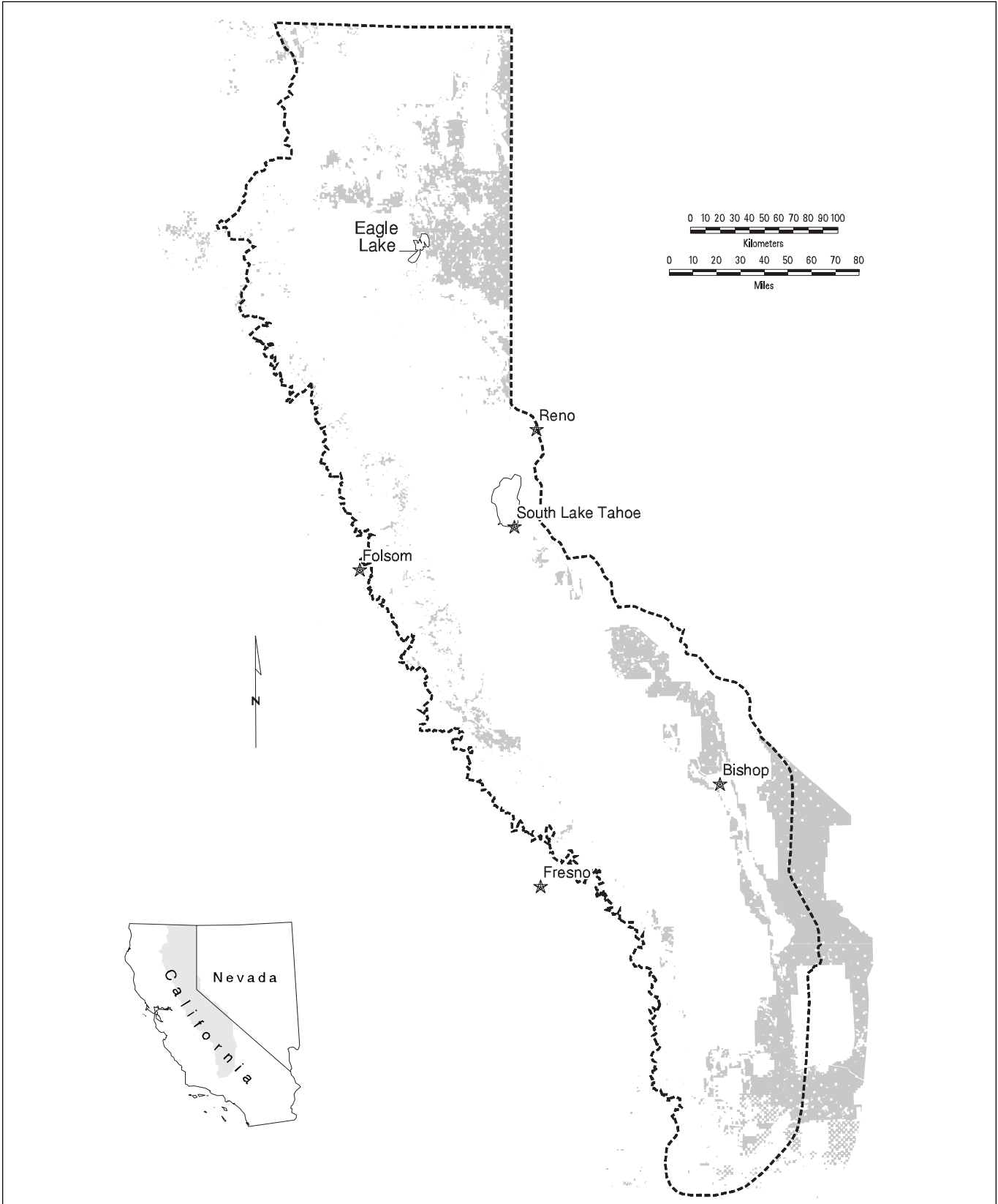


FIGURE 19.50

Bureau of Land Management lands within study area.

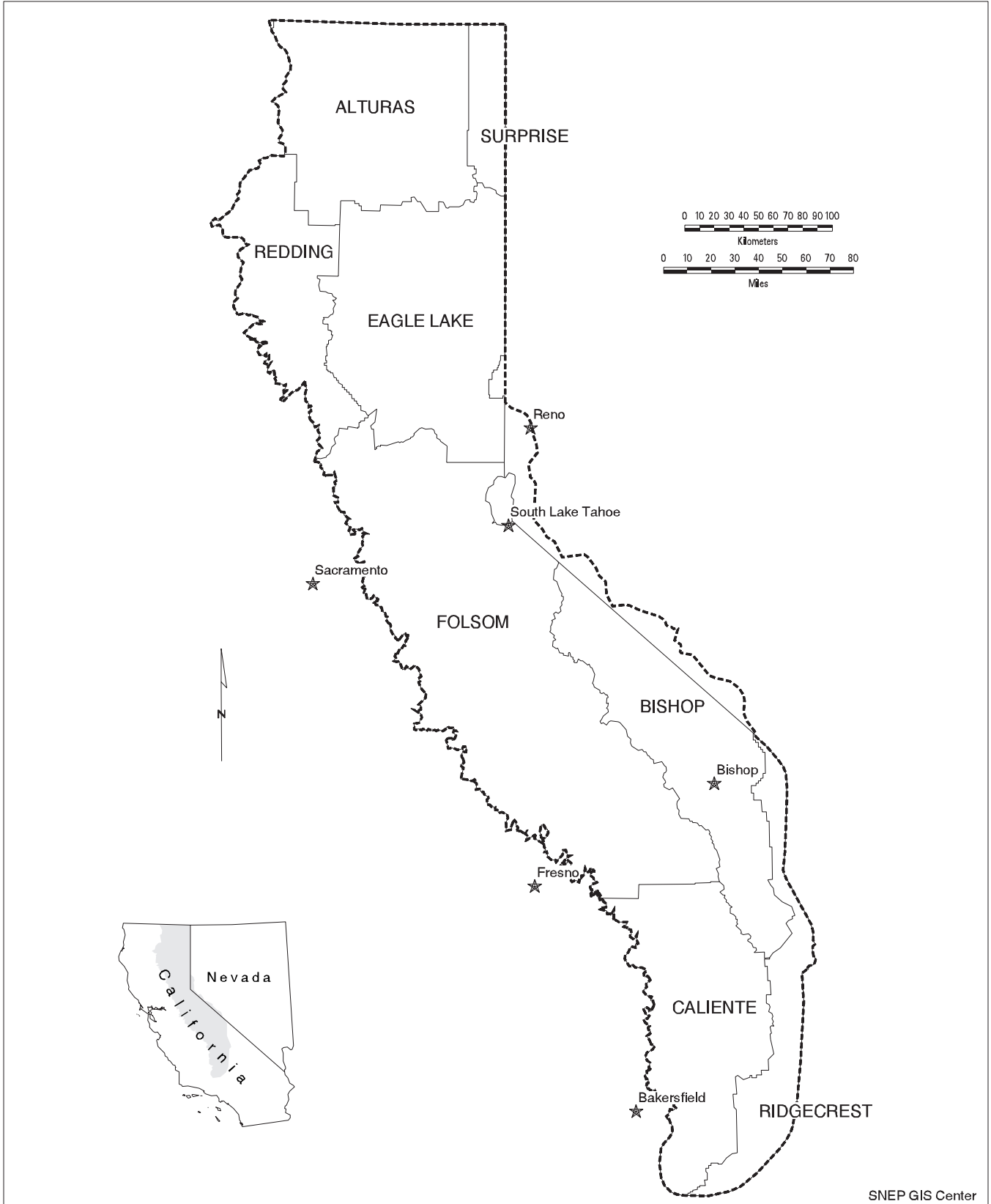


FIGURE 19.51

Bureau of Land Management resource areas.

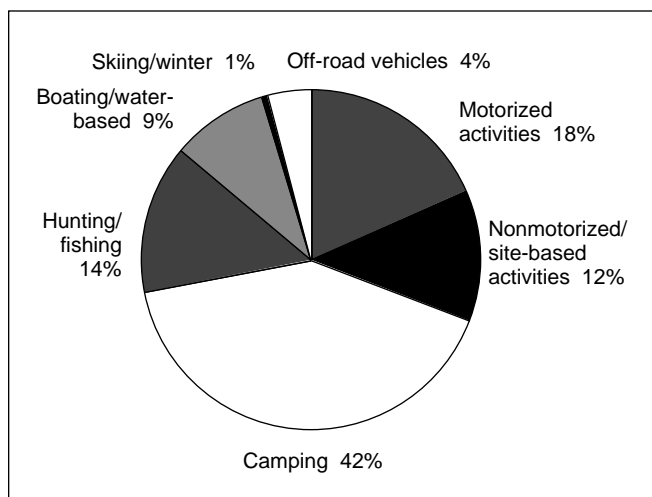


FIGURE 19.52

1992 RVDs by activity type for BLM lands.

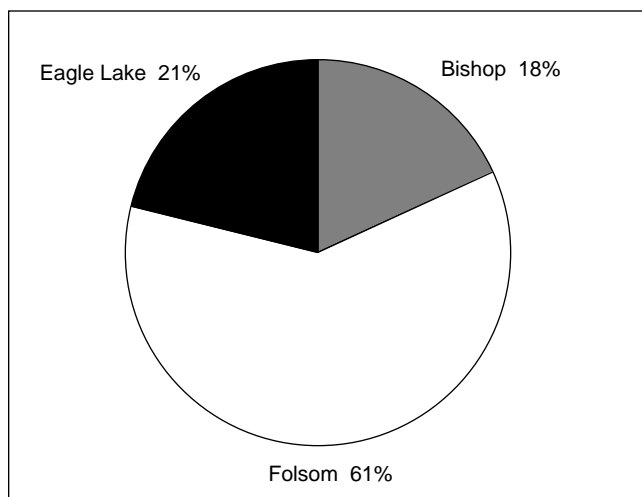


FIGURE 19.53

Mean percentage of total BLM RVDs for Bishop, Folsom, and Eagle Lake BLM Resource Areas.

rately by another entity (e.g., the U.S. Forest Service). In many cases this reflected the fact that their facilities were licensed by the Federal Energy Regulatory Commission and built on federal lands; PG&E was exceptional in its private ownership of most of its reservoir sites and recreational facilities. We therefore have no RVD estimates for other utilities. The lower-elevation reservoirs are generally not on federal land, however, and activities at those sites are not adequately reflected in our overall RVD estimates for the Sierra Nevada.

Privately Operated Camps

Many cities, counties, and nonprofit associations (e.g., the Boy Scouts, Girl Scouts, 4-H, and Campfire Girls) operate resorts and/or camping facilities in the Sierra Nevada. We were unable to get reliable or consistent data for these activities, however, across the Sierra Nevada. Individual visitation figures for a limited number of organizations are summarized in the California Environmental Resource Evaluation System (CERES) project of the Resources Agency of the State of California (<http://ceres.ca.gov/snep>), and the Alexandria Project at the University of California, Santa Barbara (<http://alexandria.sdc.ucsb.edu/>). Many of these facilities also operate under special use permits from the Forest Service, and their figures are included in USFS estimates of RVDs.

significant levels of recreational use on many of the major rivers located within the study area, these activity types are often difficult to quantify either seasonally or annually. El Dorado County administers river-based recreation for the South Fork of the American River (SOFAR), one of the most popular destinations for river enthusiasts in the United States (Wilderness Conservancy 1989). The county has an eight-year record of annual user days for private and commercial use (figure 19.62). Commercial, or professionally guided, river trips require permits and have decreased by 10% between 1987 and 1994. With the exception of 1993, every year during this period was a drought year in California. Privately led river trips do not require permits, thus the county's annual user-day record is less reliable for these than for commercial trips. El Dorado County accounts for privately led river trips during the summer season, from May to September 1, but its sampling procedure is not defined. These river-based recreational activities without permits have increased by 150% during the eight-year period. Following a lawsuit in 1994, El Dorado County is now planning to assess all types of recreational use on the river and revise its permit system (with an accompanying environmental impact report) in the next three years. Changes to the permit system could lead to requirements that private trips also get permits, which could in turn be either

LOCAL AGENCIES

El Dorado County

River-based recreational activities, such as kayaking, rafting, and canoeing, have increased in popularity. Though there are

TABLE 19.5

Hunting and fishing RVDs for Bishop, Folsom, and Eagle Lake Resource Areas during 1992.

	Bishop Resource Area	Folsom Resource Area	Eagle Lake Resource Area
Hunting RVDs	17,042	1,408	139,267
Fishing RVDs	72,242	6,567	11,683

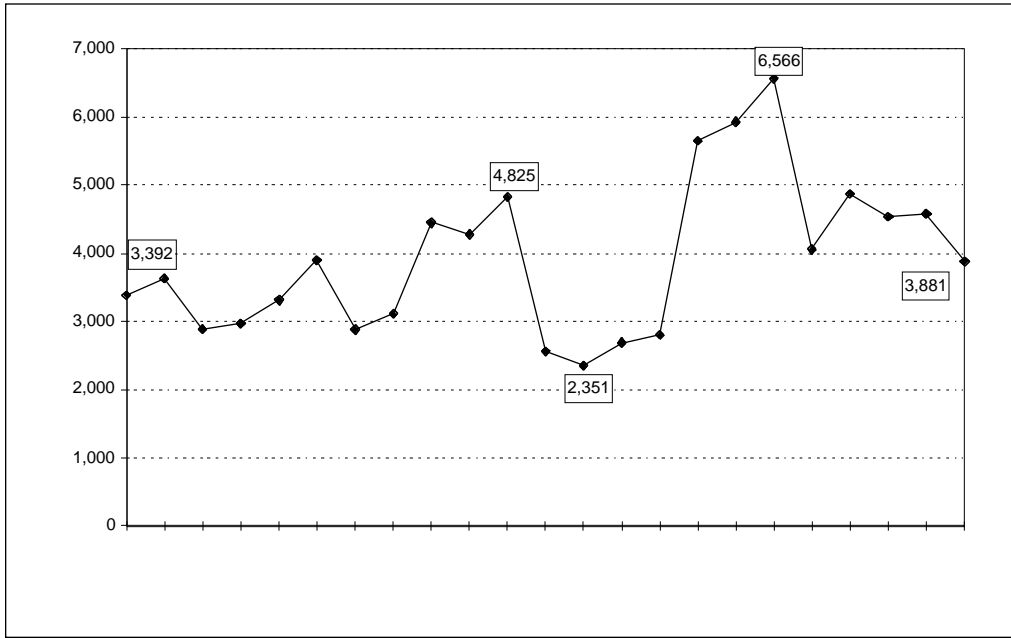


FIGURE 19.54
 Annual recreational use of Bureau of Reclamation facilities.

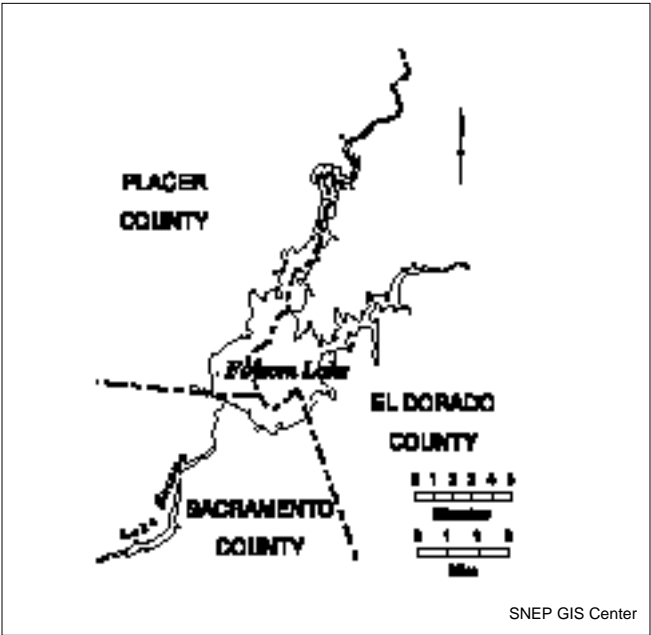
limited or expanded under future county policies. Table 19.8 summarizes use on the South Fork of the American River between 1987 and 1994.

Note that all of this visitation data follows the construction of the New Melones Dam in the early 1980s, which eliminated the second most popular whitewater run in the United States on the Stanislaus River (Palmer 1982). Because there are no data for the South Fork American River before this period, it is difficult to estimate how much of the current recreational activity there formerly took place on the Stanislaus. There is also considerable whitewater recreation on the Middle Fork and North Fork American River, but there is no permit system in place to ensure reliable data collection for those rivers. Proposals by the U.S. Army Corps of Engineers to build the Auburn Dam could affect this activity on the Middle Fork and North Fork of the American River if the Auburn Dam floods those whitewater runs.

Other popular whitewater rivers in the Sierra Nevada include the North Yuba River, the Tuolumne River, the Merced River, and the Kern River. The Stanislaus River also saw considerable whitewater use again during the drought, when New Melones Reservoir was low enough to expose the free-flowing whitewater run temporarily. No estimates are available for whitewater recreation on these rivers outside of federal or state lands cited earlier.

generally available in a consistent format for the entire Sierra Nevada. There is a significant “gray literature” of unpublished reports and studies of recreational activity in the Sierra Nevada, however, that is not available in a consistent format. This literature includes unpublished reports, theses, dissertations, and surveys administered by agencies, academics, or local organizations with an interest in recreation and tour-

FIGURE 19.55
 Folsom Lake and surrounding area.



THE EASTERN SIERRA

The data summarized above were generally supplied by public land and resource management agencies and are therefore

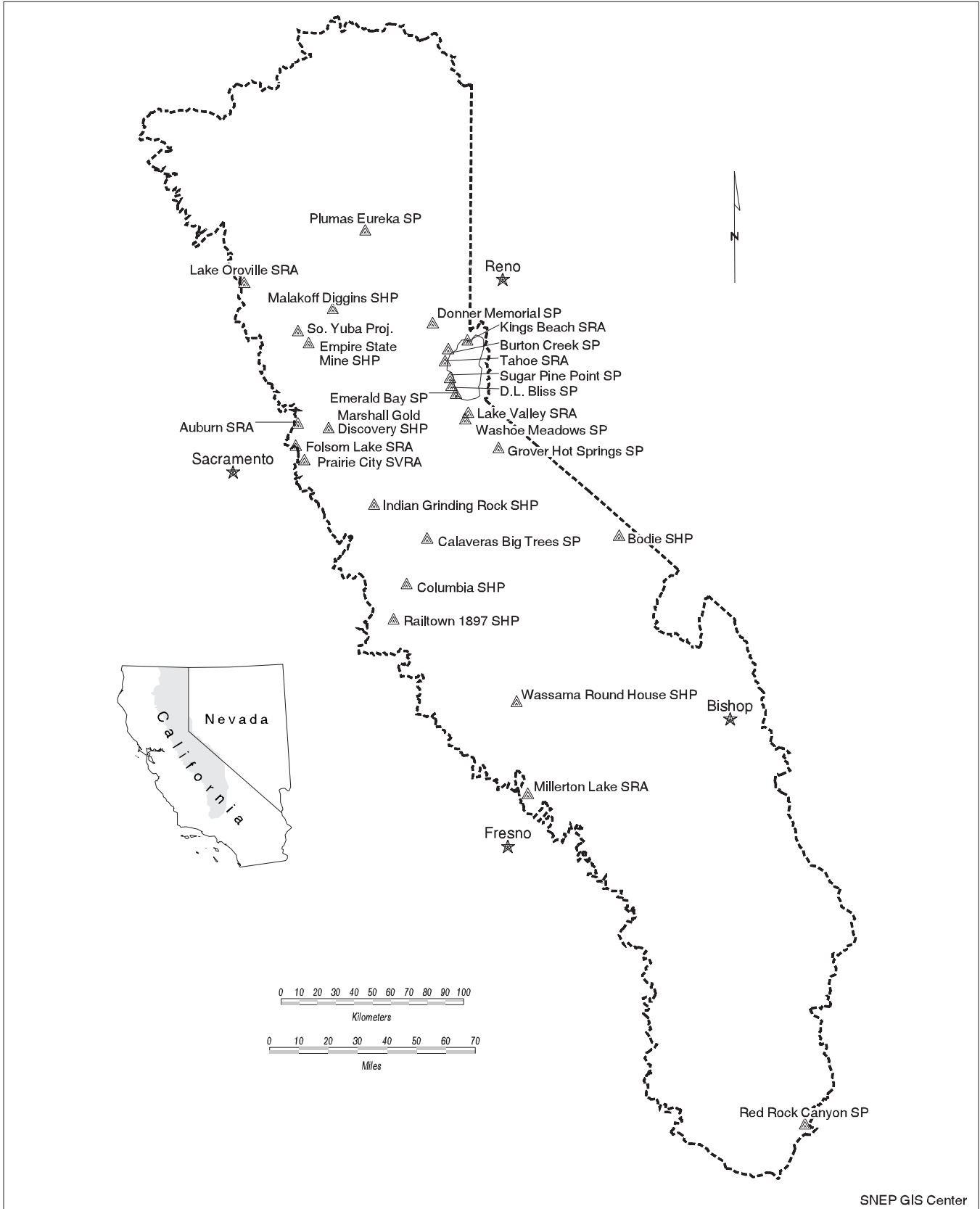
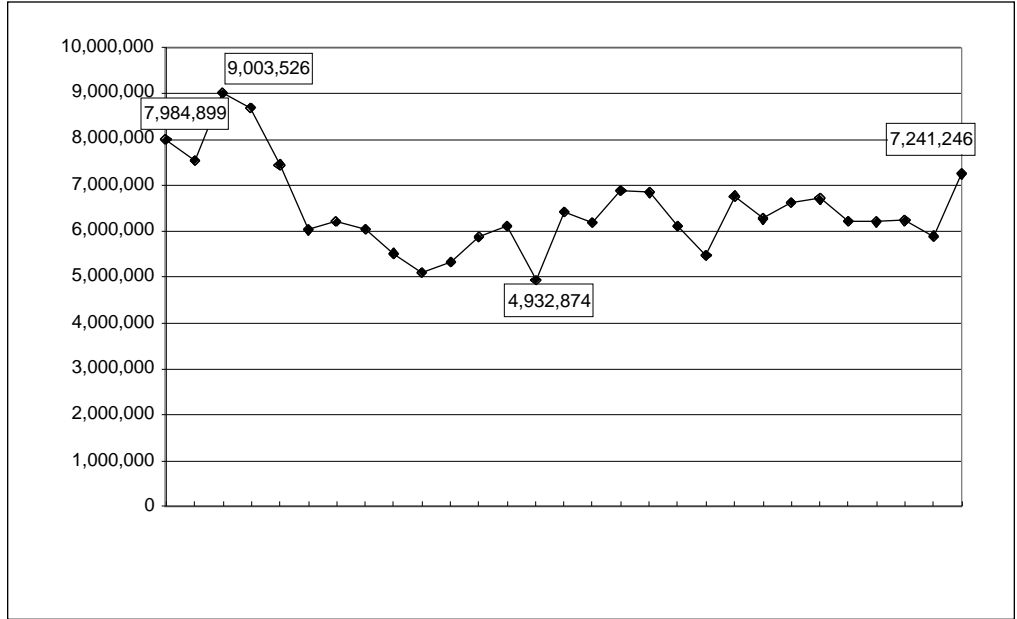


FIGURE 19.56

California state park units.

FIGURE 19.57

Number of annual visitors to California state parks.



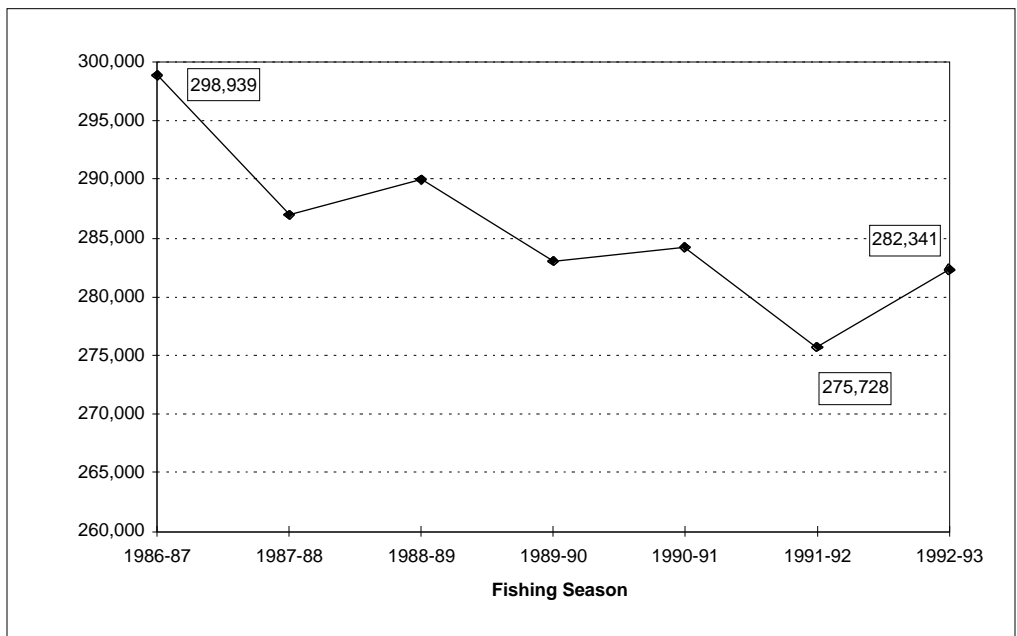
ism. These latter organizations include both private corporations and nonprofit groups. Finally, decision-making documents such as environmental impact statements (EISs) or environmental impact reports (EIRs) often include important information about recreation within parts of the Sierra Nevada. The data in these reports are generally not in digital form, nor are EISs or EIRs distributed widely.

It is therefore difficult and expensive to acquire this data and to analyze it for its relationship to recreational use pat-

terns in other areas. We were unable to acquire, evaluate, analyze, and interpret this type of data for the entire Sierra Nevada within our budget and time limitations. But because we believe that this type of data is crucial to any comprehensive understanding of recreation in the Sierra Nevada, we have undertaken such an attempt for the eastern Sierra subregion of Mono and Inyo Counties. The communities in this area have a high level of dependence on and interest in recreation and tourism, so the literature may be more comprehensive

FIGURE 19.58

Annual number of fishing licenses issued within Sierra Nevada counties, 1986–93. Data compiled from the following counties: Alpine, Amador, Butte, Calaveras, El Dorado, Fresno, Inyo, Kern, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tehama, Tulare, Tuolumne, and Yuba.



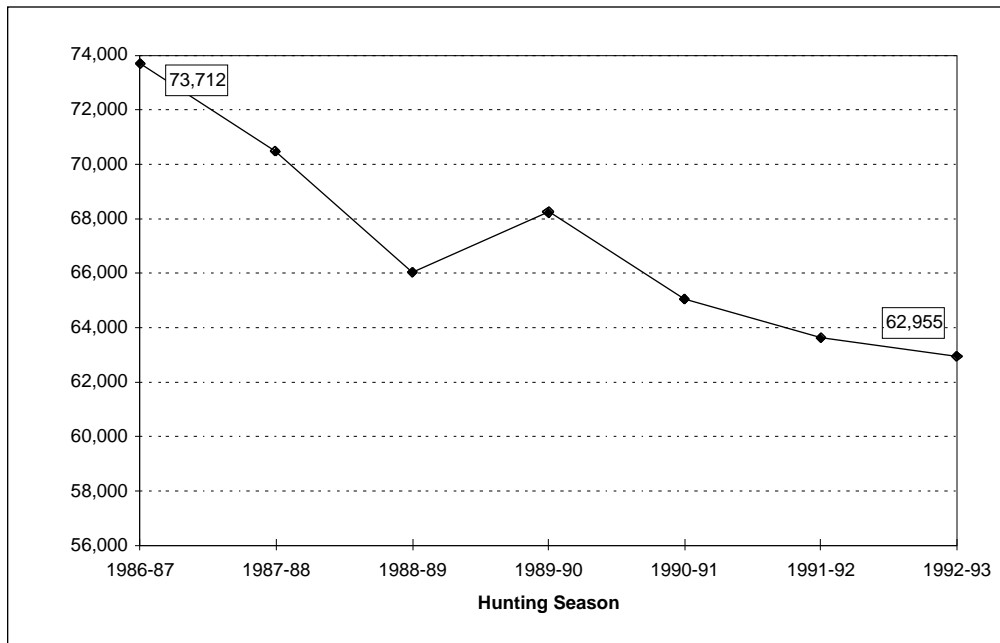


FIGURE 19.59

Annual number of hunting licenses issued within Sierra Nevada counties, 1986–93. Data compiled from the following counties: Alpine, Amador, Butte, Calaveras, El Dorado, Fresno, Inyo, Kern, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tehama, Tulare, Tuolumne, and Yuba.

for this area than any other subregion in the Sierra Nevada outside the greater Lake Tahoe area. We nevertheless believe that this more detailed case study is illustrative of the types of data that are available and the types of analyses that can be completed at a subregional level.

The eastern Sierra is dramatic desert and mountain landscape where the Mojave Desert, the Sierra Nevada, and the Great Basin meet. This landform juncture is characterized by extraordinary topographical features, a rich diversity of natural communities, and sparse human settlement. The subregion's striking beauty is in its rugged extremes: arid desert valleys (e.g., the Owens Valley) are flanked by two of the highest mountain ranges in the continental United States. The eastern Sierra is a descriptive term that refers to the region along the eastern escarpment of the Sierra Nevada, bounded roughly by Mount Whitney to the south and Yosemite National Park and the Bodie State Historic Park to the north. This 125-mile stretch of the Sierra Nevada bounds the region to the west, with the White-Inyo Range forming the eastern boundary. From south to north, the intervening valleys comprise four distinct basins: the Owens Valley, Long

Valley, Mono Basin, and Bridgeport Valley. The distance from the top of Mount Whitney and a dozen other peaks over 14,000 feet to the floor of the adjacent valleys is nearly two vertical miles. This area is therefore one of the most important and active mountain-climbing regions in the world (Porcella and Burns 1991). Mount Whitney is also less than one hundred miles from Badwater Point in Death Valley National Park, the lowest point in the contiguous forty-eight states at 282 feet below sea level. The second-largest roadless area in the contiguous forty-eight states is also in the eastern Sierra, which is the only place in the country outside Alaska where one can draw a line on a map for 150 miles and not cross a road (Foreman and Wolke 1992). The John Muir Trail and the Pacific Crest Trail draw backpackers, hikers, runners, and equestrians from around the world to the high-country wilderness of the eastern Sierra (Winnett 1978; Schaffer et al. 1989).

Most of the population in the eastern Sierra lives within the basins in the towns of Lone Pine, Independence, Big Pine, Bishop, Mammoth Lakes, June Lake, Lee Vining, and Bridgeport. The population of the region swells when visitors enter the area on winter weekends for skiing and all summer long for outdoor recreation. The local economy, in turn, is heavily dependent upon this influx of recreational visitors. With the exception of water resources, public land and resource management policy in the region emphasizes recreational activities and associated values.

Visitors to the eastern Sierra are treated to vast expanses of open, undeveloped space. During the last century, human settlement patterns have been constrained by the limited amount of private land available for development (Kahrl 1982; Walton 1992). Water for local development has also been limited by control of water rights by the Los Angeles Depart-

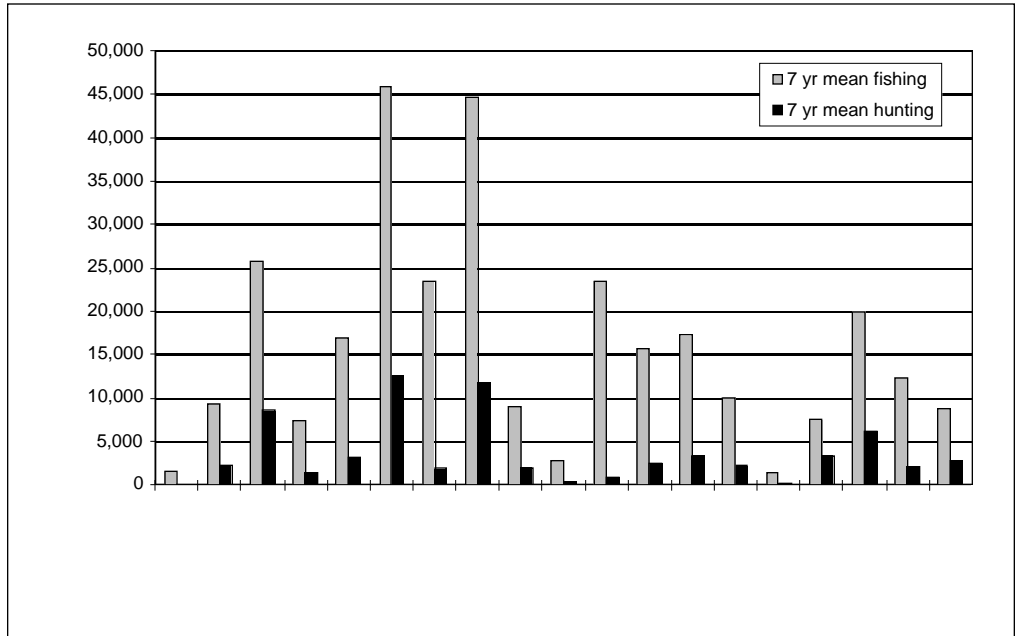
TABLE 19.6

Total mean annual fishing and hunting licenses issued, 1986–93.

License Type	Mean Annual Licenses Issued (1986-93)
Fishing	285,921
Hunting	67,157

FIGURE 19.60

Mean number of fishing and hunting licenses issued within Sierra Nevada counties, 1986–93.



ment of Water and Power (LADWP). Most of the region’s land is either publicly held or owned by the LADWP. Recreation and tourism is a mainstay of the local economies. Visitors travel from within the state of California, from out-of-state, and from other countries to participate in a wide variety of active and passive recreational activities. Many of those activities occur on public lands in the region. The dominant land

manager and recreation provider in the area is the Inyo National Forest (figure 19.63). The California Department of Fish and Game plays an important role in local recreation through its management of fish and wildlife that serve as a critical draw to the ribbons of water that thread from the high escarpment of the Sierra Nevada crest down to the high desert on the valley floors.

FIGURE 19.61

Annual overnight use of Pacific Gas and Electric Company campgrounds.

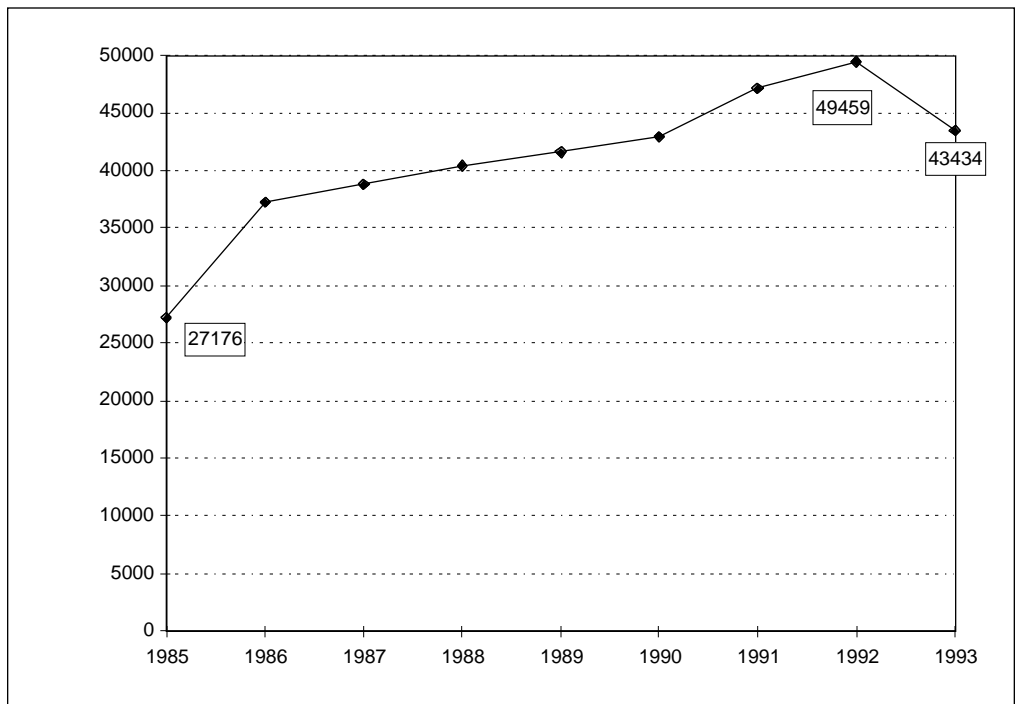


TABLE 19.7

EBMUD recreational day use.			
Year	Camanche	Pardee	Total
1988	107,157	209,886	317,043
1989	258,190	83,149	341,339
1990	338,401	139,965	478,366
1991	318,456	103,909	422,365
1992	387,001	95,240	482,241
1993	388,090	99,247	487,337
1994	345,447	100,795	446,242
Sum	2,142,742	832,191	2,974,933
Mean	306,106	118,884	424,990

It is primarily the magnificent natural landscape that draws visitors to the eastern Sierra. Local economic well-being is therefore directly related to the condition of that landscape. The Coalition for Unified Recreation in the Eastern Sierra (CURES), a local group in Inyo and Mono Counties, is now pursuing a marketing theme for the area that calls for potential visitors to "Experience the Wild Side of California." CURES and the Inyo National Forest provided unpublished materials to SNEP in 1994 to allow us to examine recreational activity and user data at a less aggregated level than that which we reported for the entire Sierra Nevada. These more detailed data (summarized in Knauer and Duane 1994) allow us to gain some insight into the complexity of the coarse-grain information we reported on recreational activities by agency or subregion. Although many individual studies have either empirically or descriptively documented the social and demographic characteristics of visitors to the region, none were

multijurisdictional in approach. The objective of our study was to synthesize the results of existing studies and create a database that would be useful to policy makers, private citizens, special interest groups, and regional groups such as CURES. It can also serve as a model for subregional investigations in other parts of the Sierra Nevada.

Methodology

We summarized, analyzed, and synthesized over thirty existing secondary resources in the eastern Sierra. Resource types included formal empirical studies, land management agency use statistics, informal visitor surveys, and qualitative research conducted by agencies and academics. We also observed and monitored several ongoing recreation planning and management processes and interviewed key informants involved in recreational activities in the eastern Sierra.

The integrity of information was not uniform between secondary resources, however, due to differing research methods, varying temporal and spatial extents of study areas, and inconsistent research documentation. Secondary resources were first summarized to identify research methods, data integrity, and study results. Relevant socioeconomic data from each study were entered into Excel 4.0 for Macintosh spreadsheets. Data were then thematically pooled across studies into three information classes, and all values were normalized to account for rounding within and between studies. The three main categories of recreation and tourism information were (1) visitor information, (2) trip information, and (3) visitation. Visitor information refers to social demographic characteristics of individual visitors, such as age. The trip information class contains information relevant to the visitor's trip to the

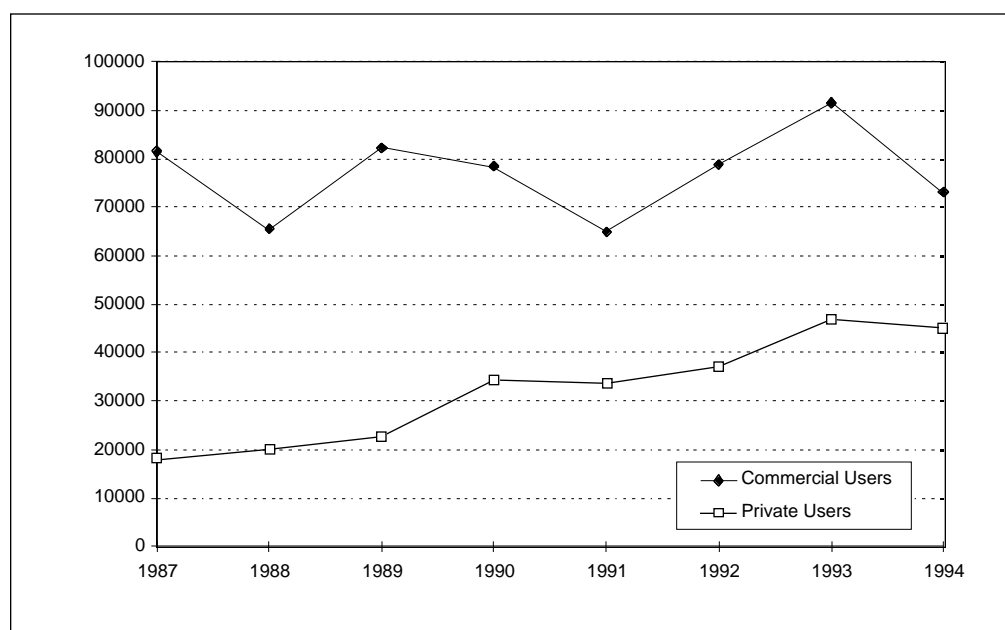


FIGURE 19.62

Annual commercial and private users on the South Fork of the American River.

TABLE 19.8

User-day summary for the South Fork of the American River.

User Type	1987 User Days	1994 User Days	Percentage Change
Commercial	81,466	73,021	- 10
Private	18,000	45,000	+ 150
Total	99,500	118,000	+ 19

eastern Sierra, such as lodging type. The visitation class comprises visitor records from specific institutions, such as the Forest Service or museums. Three data matrixes were created to summarize the specific types of information that were contained within each secondary resource. Information gaps in the recreation and tourism database were then identified, and key informant interviews were conducted to gather additional information to fill in some of the gaps.

Sources

All of the reports that we reviewed are summarized in Knauer and Duane (1994), an unpublished report that is available from the California Environmental Resource Evaluation System (CERES) project of the Resources Agency of the State of California (<http://ceres.ca.gov/snep>), and the Alexandria Project at the University of California, Santa Barbara (<http://alexandria.sdc.ucsb.edu/>).

Visitor Information

Visitors to the eastern Sierra during the summer season are generally younger than visitors in the winter. Sixty-nine percent of summer visitors were less than 45 years of age, while 57% of winter visitors were 45 years or older. Forty-four percent of all winter visitors to the region were 55 years or older (figure 19.64).

Approximately 80% of visitors to the eastern Sierra region reside within the state of California. Out-of-state visitors comprised about 15%, while the proportion of foreign tourists averaged 2% during the winter and 10% during the summer season. Most of the California visitors are from southern California, reflecting the access provided by U.S. Highway 395. Access to northern and central California is cut off by the Sierra Nevada except in the summer and autumn, when the Tioga Pass road (state route 120) is open through Yosemite National Park. Many foreign visitors appear to travel through the region as part of more extended holidays originating in either Los Angeles or San Francisco and terminating at the other. These “open jaw” trips often pass through the eastern Sierra as part of a larger trip that will include either Yosemite National Park or the Lake Tahoe region, Death Valley National Park, and Las Vegas, Nevada (often with a flight to Grand

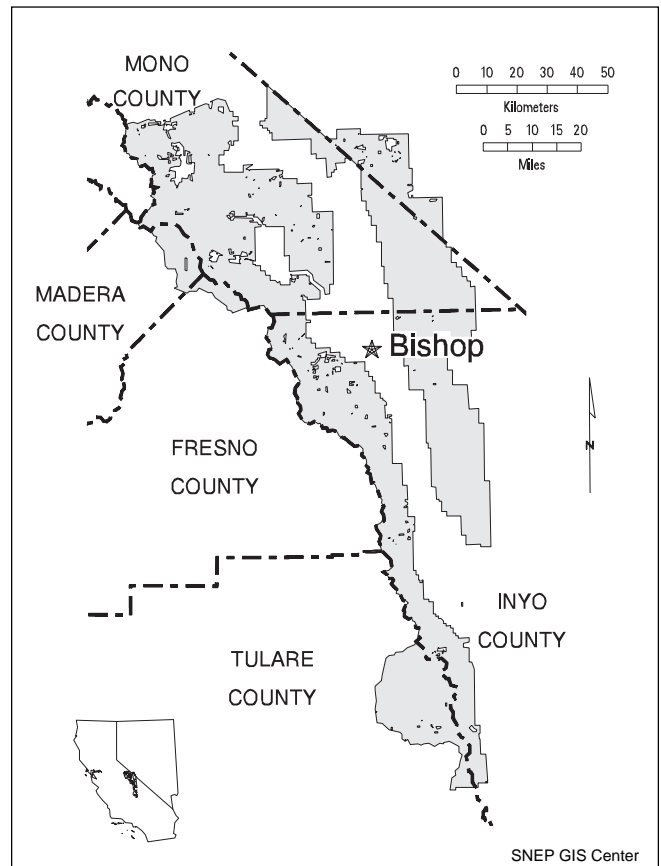
Canyon, Arizona, from Las Vegas). Many domestic out-of-state travelers visit the area as part of a longer trip to the Sierra Nevada, California, and/or the national parks in the western United States.

The gender of summer visitors to the eastern Sierra was 35% female and 65% male. A narrower and more specific study of mountain bicyclists on the Inyo National Forest found that only 25% of this user group was female and 75% male. Winter visitors appear to be more balanced by gender.

Existing studies have not assessed the racial composition of visitors throughout the entire eastern Sierra region. Two comprehensive empirical studies of visitors to the Inyo and Toiyabe National Forests indicated that few minority tourists travel to the eastern Sierra region. Close to 90% of visitors to the eastern Sierra are Caucasians; approximately 5% are Hispanics; and slightly more than 3% are Asians. The remaining 2% of visitors are of Native American or African American descent. Discussions with Forest Service officials suggest that visitors of non-Caucasian racial backgrounds comprise a greater proportion of overall visitation than was documented within the two surveys. Officials also indicate that visitors’ trip preferences and trends often differ according to race and ethnicity. Despite a lack of empirical studies that document

FIGURE 19.63

Inyo National Forest and surrounding area.



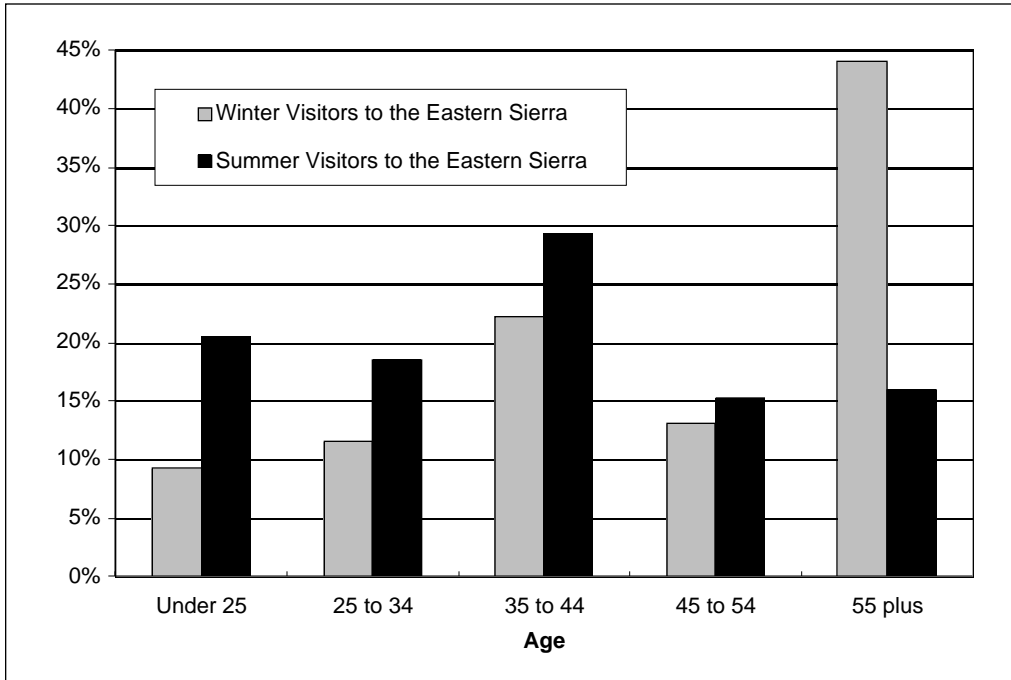


FIGURE 19.64

Age class of visitors to the eastern Sierra.

these trends in the Inyo National Forest specifically, USFS officials believe that many minority visitors prefer to recreate in and visit more developed, accessible sites, as opposed to less developed, remote sites. This theory is consistent with research findings by Deborah Chavez and others in southern California forests near the Los Angeles area (Laidlaw 1992; Chavez 1992, 1993a, 1993b; Chavez et al. 1993a, Ewert et al. 1993), where the majority of visitors to the eastern Sierra reside.

A large proportion of visitors to the eastern Sierra have at-

tended college, with approximately 25% holding a bachelor's degree and a little more than 15% possessing a graduate degree. Summer visitors to the Mammoth Lakes area tended to have less formal education than winter visitors (figure 19.65) (Sports Research 1989, 1990). This difference may in part be explained by the higher incomes of winter skiers. Access to camping facilities during the summer also increases the feasibility of travel to the area for travelers with lower incomes. Even in the winter, moreover, about twice the fraction of visitors to the eastern Sierra subregion in general (20%) camped

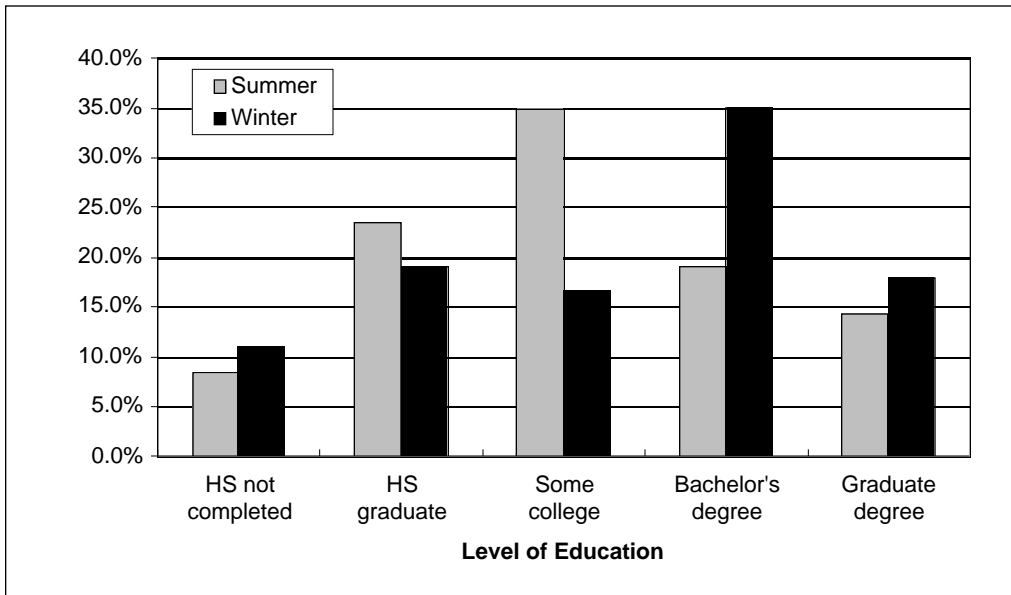


FIGURE 19.65

Mean level of education of visitors to the eastern Sierra.

as compared with visitors to Mammoth Lakes specifically (10%). The shares of total visitors camping increased only slightly in the summer, however, to around 25% and around 12% of visitors, respectively.⁷

The mean annual income of summer visitors to the Inyo National Forest and the Mono Basin Scenic Natural Area were reported in two studies (Lee and Brown 1989; Jones and Stokes Associates 1993) in income classes that ranged from under \$10,000 to over \$80,000. These studies used slightly different income classifications for the highest income class, but they are comparable. Slightly more than 25% of all survey respondents reported an annual income between \$20,000 and \$40,000. Approximately 40% of surveyed visitors had an annual income between \$40,000 and \$80,000. Seventeen percent of visitors to these areas earned over \$80,000 per year, while one-third had an annual income of at least \$60,000. Based upon the mean values within each income class, the mean income was over \$55,000 (figure 19.66).

Trip Information

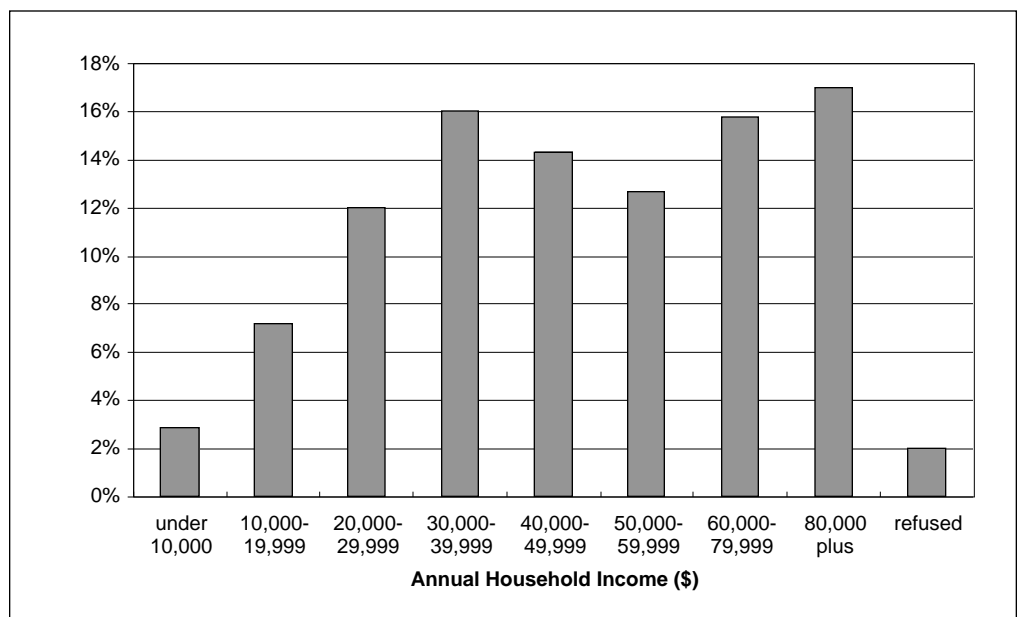
There is no existing study that comprehensively examines the trip characteristics of visitors to the eastern Sierra region. Existing studies were not designed to assess the travel patterns, spending patterns, or activity patterns of visitors who travel throughout the region. Several surveys collected such trip-related information within specific subregions of the eastern Sierra, however. Typically, 60% of winter visitors to the Mammoth region stayed two to three days, 25% stayed four to five days, and 12% stayed over six days. These data highlight the important relationship between public land RVD estimates and recreational activities on private land that have social, economic, and ecological importance to the Sierra Ne-

vada. Even if all winter visitors to the Mammoth region were skiing on all of the days they were visiting, for example, the mean RVDs associated with their mean visits of 3.62 days in the area (assuming the mean of each class and a mean of seven days for those staying over six days) would only be 2.11 for the activity of skiing itself (assuming one skier-day equals seven hours of recreational activity). Total time in the area, however, would be 7.24 RVDs. Only 29% of the RVDs for the visits to Mammoth area would then be recorded as RVDs related to skiing on lands administered by the USFS. Relying on the USFS estimates of RVDs for the region can therefore significantly underestimate total RVDs for the eastern Sierra.

In contrast to these high mean stays for the Mammoth region, 25% of summer visitors to the Mono Lake Scenic Natural Area and Death Valley typically spent only three to four hours exploring their destination site. Approximately 35% spent five to eight hours on a single visit to those sites, while only 21% stayed longer than eight hours. Another 19% visited the site for less than a total of two hours (figure 19.67). Most of these same visitors spent considerably more time in the eastern Sierra during their visits, however, despite the relatively brief stops at these two highly scenic attractions. Note that visitors' stays are also probably considerably longer in the spring and autumn, when the lower temperatures at these two desert sites encourage longer stays.

Visitors to the eastern Sierra stay at hotels, condominiums, campgrounds, private residences, and other types of accommodations (figure 19.68) (Mammoth Mountain Ski Area 1984, 1989; Sports Research 1989, 1990; Pizarowicz 1991; Littlejohn 1991; Klages and Associates 1992). Approximately 40% of summer visitors choose to stay at hotels, with camping being the second most favored accommodation choice during the summer (24% across multiple studies). A 1989 summer sur-

FIGURE 19.66
 Annual household income of summer visitors to the Inyo National Forest and Mono Basin Scenic National Recreation Area.



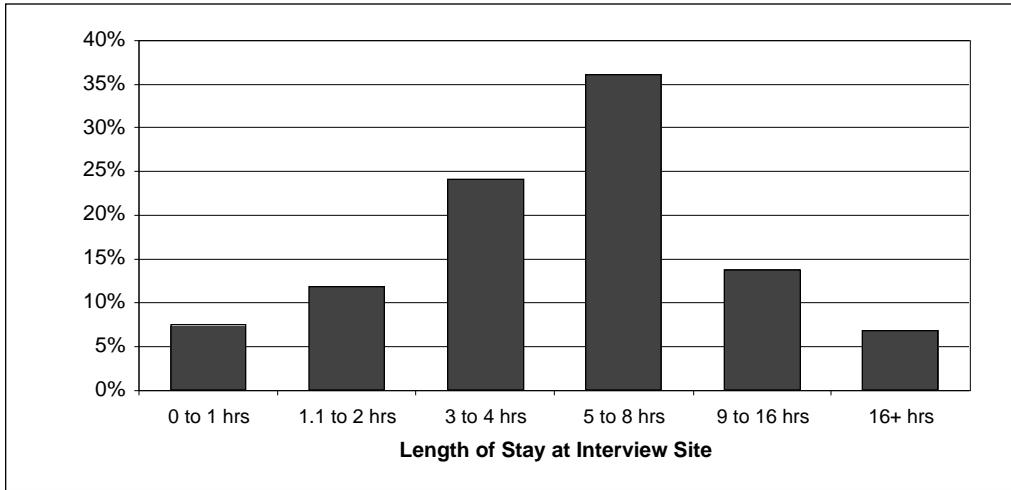


FIGURE 19.67
 Single-visit length of stay for summer visitors to Mono Lake and Death Valley.

vey of visitors in the Inyo National Forest found considerably higher rates of camping, however, with 68% of respondents camping (Lee and Brown 1989). Both the timing and location of visitor surveys influence the results, so it is important to avoid coarse generalizations from these limited studies. Summaries and analysis of the individual studies should be consulted in Knauer and Duane (1994) to determine which studies are most applicable in specific circumstances and local conditions.

Surveys of winter visitors in the eastern Sierra are dominated by the detailed market research conducted by the Mammoth Mountain Ski Area. These surveys show that slightly less than 40% of winter visitors rent condominiums during their stay in the eastern Sierra, and about 30% choose to stay in a hotel. The preference for condos most likely reflects seasonal trends in the Mammoth subregion, since many skiers opt to rent a condominium rather than stay in a hotel room. As noted earlier, 20% of all winter visitors to the eastern Si-

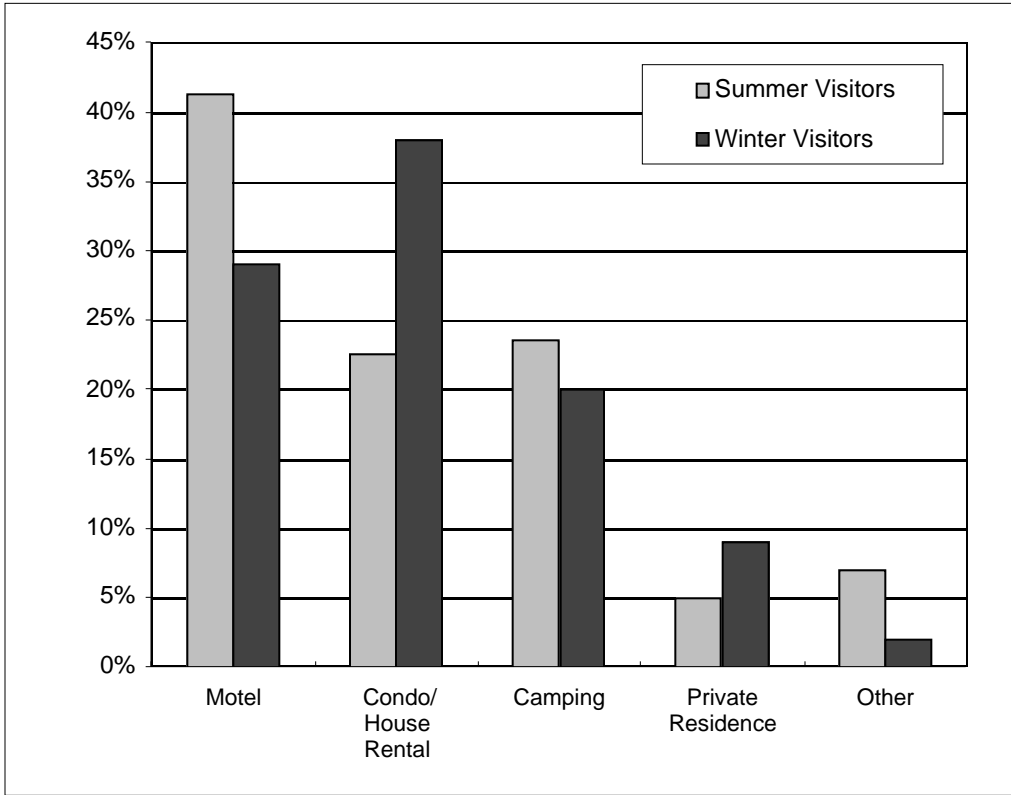


FIGURE 19.68
 Type of accommodations.

erra camp, although existing studies did not adequately differentiate between various types of camping. Ten percent of Mammoth visitors even camped in the winter, which is surprisingly high given the elevation and the relatively cold winter conditions. These figures increased to 25% and 12%, respectively, in the summer months.

None of the existing visitor surveys adequately assessed the activities that visitors to the eastern Sierra pursued during their stay. This type of information may be inferred through an examination of the visitor statistics from various land management agencies, museums, and others. Two recent surveys assessed the principal reason visitors travel to the Mono Basin area (Jones and Stokes Associates 1993). The most favored activity varied by body of water. Survey respondents at Mono Lake reported that activities pertaining to the site's unique natural history were most favored, such as sightseeing (59%), viewing the tufa towers (12%), photography (10%), and bird-watching (9%). The majority of visitors surveyed at Grant Lake and Crowley Lake, on the other hand, responded that the principal reason for their visit pertained to fishing. This reflects the unusual features of Mono Lake and its distinctiveness as a natural feature. Both the Grant Lake and Crowley Lake visitor responses are probably typical for other artificial reservoirs in the region, where fishing is often the primary activity of visitors. Many associated activities, such as camping, may also be dependent upon these fishing opportunities.

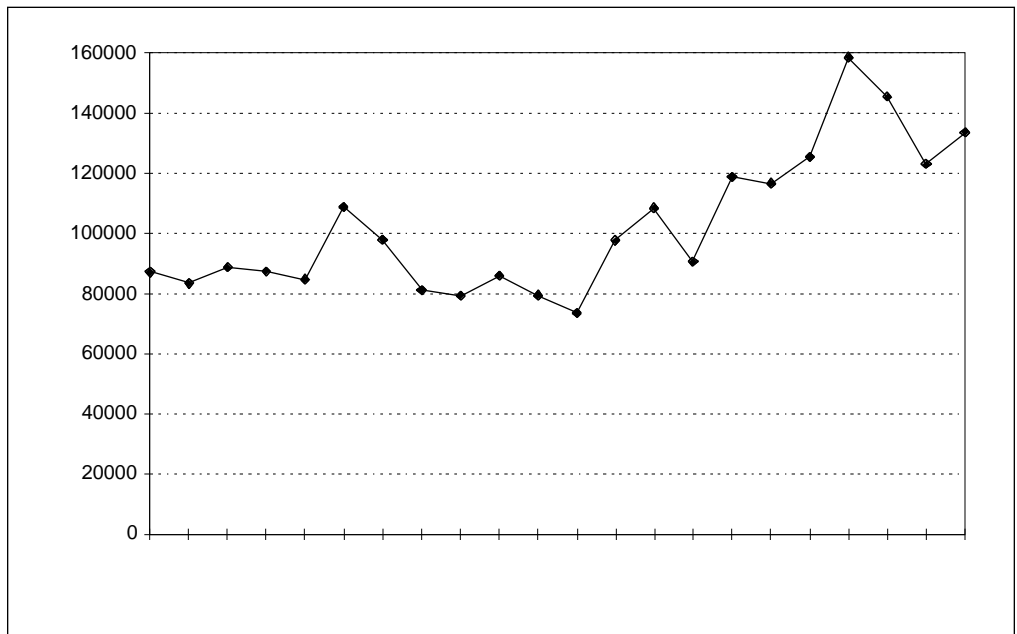
Visitation and Use Information

Land management agencies in the eastern Sierra include the BLM, the National Park Service, the USFS, the Los Angeles

Department of Water and Power, Mono County, Inyo County, and the incorporated cities of Bishop and Mammoth Lakes. More detailed recreational use and visitation statistics were not available for the National Park Service (Sequoia-Kings Canyon), BLM-administered lands, or property administered either by the Los Angeles Department of Water and Power or local governments. More detailed visitor-use statistics were available for the National Park Service Devils Postpile National Monument, the Inyo National Forest, the Toiyabe National Forest, and Mammoth Mountain Ski Area. We therefore focus on those here.

The National Park Service administers very little land within the eastern Sierra proper, but its two largest units in the Sierra Nevada Kings Canyon and Sequoia National Parks are immediately adjacent to the Inyo National Forest. Within the Inyo National Forest in the Mammoth subregion is the Devils Postpile National Monument. In 1979, the park service limited automobile traffic into Devils Postpile and initiated a bus service to alleviate traffic problems along the narrow road leading down into the canyon of the San Joaquin River. The road is generally open for private vehicles early each morning and late each evening, and parties with campground or resort reservations can enter the area during the day. Following the introduction of the bus service, there has been an 18% increase in the overall number of visitors and a 22% decrease in the mean number of cars traveling into Devils Postpile (figure 19.69). The results of this sixteen-year experiment could have management implications for other high-demand areas experiencing transportation problems, including the Lakes Basin area near Mammoth Lakes, the Whitney Portal area near Lone Pine, and Yosemite Valley on the other side of the Sierra Nevada.

FIGURE 19.69
Historical visitor use of Devils Postpile National Monument.



Inyo National Forest

The Inyo National Forest is the primary provider of recreational opportunities within the eastern Sierra and maintains annual records of visitor use of its land at the ranger district level. These records are then aggregated into the forestwide records that are reported to the regional office in San Francisco, which are the data we reported on earlier for the entire Sierra Nevada. There are four ranger districts in the Inyo National Forest: the Mount Whitney, White Mountain, Mammoth Lakes, and Mono Lake Ranger Districts.⁸ Recreation and tourist activities on the Inyo National Forest are diverse, ranging from technical climbing of Mount Whitney (the tallest mountain in the contiguous United States) to sightseeing from automobiles. Some areas, such as the Mammoth Lakes region, have intensive developed “front country” uses that sometimes conflict. Other areas, such as the John Muir Trail through the Ansel Adams Wilderness and the John Muir Wilderness, are among the most popular dispersed backcountry recreational sites in the country. These competing demands for different types of recreational experiences (and the high demand for recreation in the area) sometimes lead to conflict, both between prospective users competing for wilderness permits (e.g., backpackers camp out all night to get the first-come, first-served permits issued each morning) and between different types of backcountry users (e.g., between large, commercial pack trips and smaller, private backpacking trips). More detailed analysis of the recreational activities on the Inyo National Forest therefore offers a useful window into the problems of recreational use management in the Sierra Nevada.

Similar issues confront land and resource managers throughout the range.

Detailed RVD statistics from 1991, 1992, and 1993 were assessed forestwide (figure 19.70). As noted earlier, however, our detailed analysis of both the data and data collection practices in the field raised general questions about the integrity of USFS RVD statistics for three reasons: (1) the accounting practices for RVDs vary among ranger districts and over time due to changes in personnel and/or methods; (2) RVD classes are ambiguous and not clearly defined; and (3) it is nearly impossible to sample and therefore account for all visitor activities throughout such a vast, dispersed geographic area. Some ranger districts are conservative in their visitor counts, reporting only those RVDs for which an actual sample was taken. Other ranger districts seem quite liberal in their estimates of some activities, perhaps in recognition of the importance of recreation to the local economy and internal Forest Service management incentives. Despite the possible data incongruities, several interesting trends were apparent within the Inyo National Forest when data were disaggregated to the ranger district level.

As noted earlier, the “travel” RVD class accounted for the highest number of RVDs on the Inyo National Forest. Due to the remote location of the Inyo National Forest relative to population centers, most visitors tour the region by automobile. Other, less popular modes of transportation used to access the Inyo National Forest include motorcycles, buses, and bicycles. Visitors prefer tent camping to other types of camping (e.g., trailer camping). Hiking, walking, and horseback riding are the most common ways of exploring the interior of

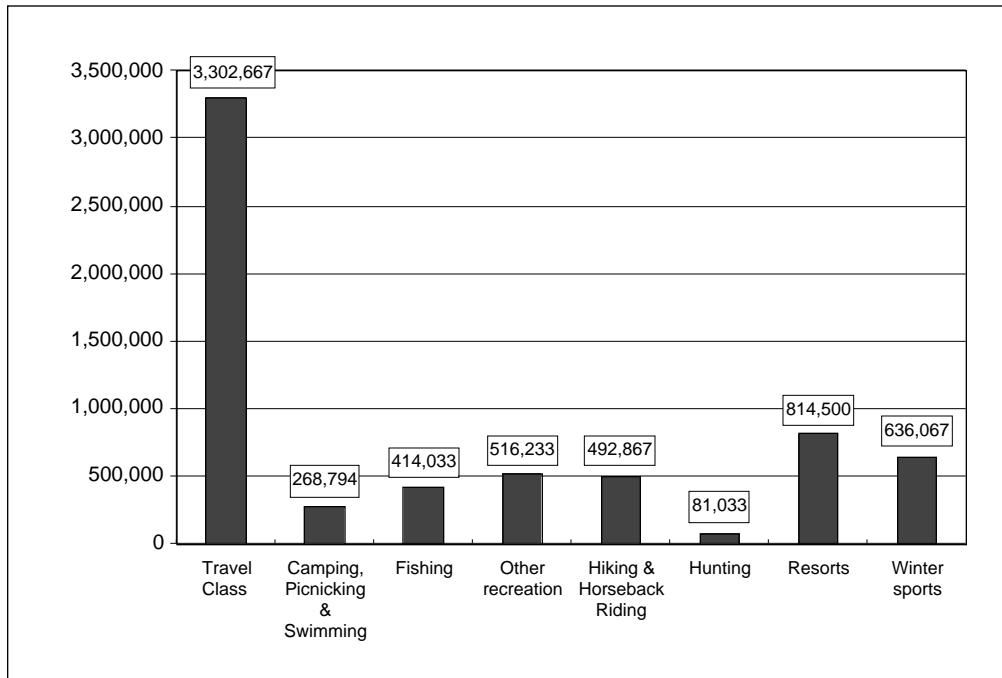


FIGURE 19.70

Mean number of RVDs per activity class for the Inyo National Forest, 1991–93.

the Inyo National Forest. Big-game hunting and cold-water fishing occur more than small-game hunting, bird hunting, or ice fishing. Skiing, both cross-country and downhill, are the most popular winter sports on the Inyo National Forest.

The Inyo National Forest includes portions of the John Muir Wilderness and the Ansel Adams Wilderness, and many day-hikers, backpackers, rock climbers, mountain climbers, and stock (e.g., horses, mules) users travel to these wilderness areas using trailheads that are located on the Inyo National Forest. Overnight visitors to these wilderness areas are required to fill out a backcountry permit, thus allowing the Inyo National Forest to maintain records regarding party size and length of stay. Most backcountry travelers obtain permits for the Ansel Adams Wilderness through either the Mono Ranger District or the Mammoth Ranger District. Backcountry permits for the John Muir Wilderness are most often acquired from the Mammoth Ranger District, Mono Lake Ranger District, Whitney Ranger District, and White Mountain Ranger District. Over 12,000 wilderness permits were issued during 1993, 7% to stock users and 93% to individuals traveling on foot (figure 19.71). Only fourteen percent of the 847 stock permits were noncommercial; while 86% of those using stock entered the wilderness with a commercial guide. Commercial permittees “write their own permits,” however, so there is no independent confirmation of the usage figures reported. The backpacking permits, by contrast, are issued directly by USFS personnel. Some prospective backpackers who are unable to get permits enter on commercial stock permits and then continue their trips backpacking. The steep eastern escarpment of the Sierra Nevada has also created a good business in carrying backpacks up to the high country on the backs of mules, so some trips are “assisted” by stock.

These raw estimates of permits issued for stock and foot access to the wilderness understate the importance and im-

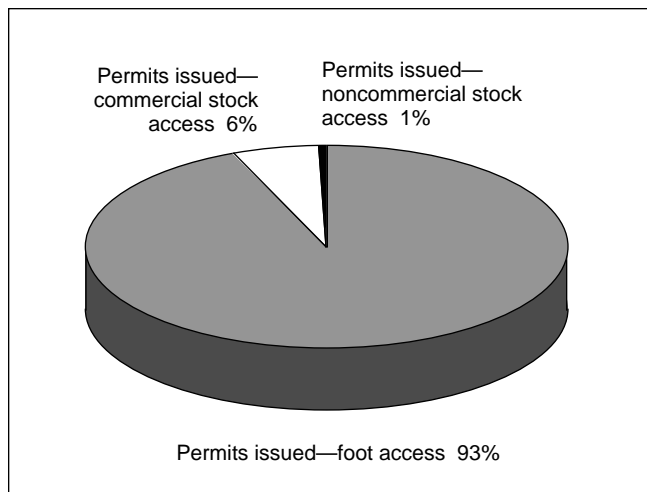
port of stock access. In 1993, there were approximately 89% more stock users on a given permit than backpackers in both the Ansel Adams and the John Muir Wildernesses. The mean number of backpackers per wilderness permit was 3.19, while stock users averaged 6.02 individuals per wilderness permit (figure 19.72). Visitors with noncommercial foot-access permits spent an average of four days in either the Ansel Adams or John Muir Wilderness. Stock users typically spent about 36% more time in the John Muir Wilderness than backpackers. Backpacker trips in the Ansel Adams Wilderness during 1993 were, on average, about 11% shorter than those taken by stock users (figure 19.73). Taken together, the effects of both larger group size and longer trip length for stock users resulted in stock users’ accounting for 13% of wilderness permit RVDs even though they were issued only 7% of the wilderness permits. Approximately 80% of wilderness-permit RVDs on the Inyo National Forest were for the John Muir Wilderness, with the remaining 20% for the Ansel Adams Wilderness. There were a total of 39,870 visitors and 371,122 RVDs in wilderness use in the Inyo National Forest in 1993. Note that the average RVD ratio of 9.31 for these visitors is more than four times the average RVD ratio for Yosemite National Park visitors.

Downhill skiing is an activity requiring a permit on the Inyo National Forest and occurs primarily in the Mammoth and June Lakes subregion. There is a fairly reliable RVD record for the Mammoth Mountain ski area, because the concessionaire submits annual ski ticket sales records to the Forest Service. Forest Service officials subsequently convert the ticket sales records into RVD units. Unfortunately, RVD counts for the Mammoth Mountain Ski Area reflect all four seasons; disaggregated data was not available to assess the ratio of winter RVDs to annual totals. The twenty-seven-year Mammoth Mountain Ski Area use record does not show a consistent growth trend as measured by RVDs. There was a 64% increase in Mammoth Mountain Ski Area RVDs between 1966 and 1986, but RVDs decreased by 33% between 1986 and 1993. Over the twenty-seven-year period, there has been a 46% net increase in RVDs.

The timing of snowfall as well as other factors appear to be important determinants of skier RVD levels. These other factors include economic conditions in southern California (the primary market for skiers at Mammoth Mountain and June Lake) and the cost of skiing. Historical snow levels for the region have been quantified by the Los Angeles Department of Water and Power through measurement of the snow’s water content. We therefore correlated twenty-seven years of snow water content data for the Mammoth region to the ski area’s annual RVD counts. A simple overlay of the two data sets (figure 19.74) shows a relatively weak relation between these two variables. To further test the strength of the relationship, a regression analysis was performed, and its results supported the conclusion that the dependent variable of RVDs was not strongly affected by the independent variable of snow levels (r -squared = 0.027; t -value = 0.845). A stronger relation-

FIGURE 19.71

Proportion of 1993 permits by type issued for the John Muir and Ansel Adams Wilderness Areas. Total permits = 12,095.



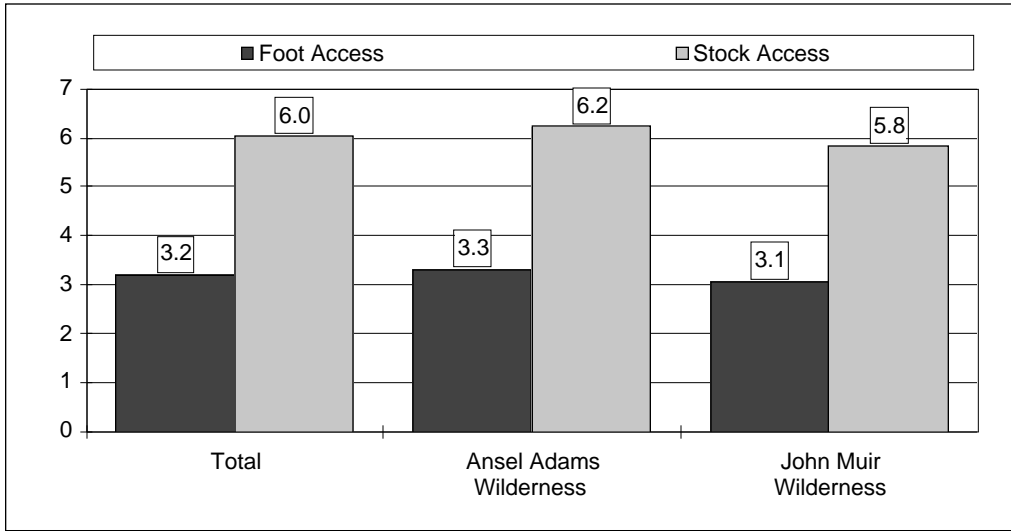


FIGURE 19.72

Mean number of people per wilderness permit issued by the Inyo National Forest, 1993.

ship between the amount of snow and RVDs may have emerged if the Mammoth Mountain Ski Area RVD data was disaggregated by season, but overall snow levels are still unlikely to be significant. Other factors appear to be more important.

The drought of 1987–94, together with changes in the Southern California economy, appears to have put a long-term damper on growth in skier RVDs at Mammoth Mountain. Even the good snow year of 1992–93 did not restore RVDs to their pre-drought level, and young snowboarders are now estimated to account for 25% of current “skier” RVDs. Broader demographic changes and economic changes in the southern California area make it unlikely that the Inyo National Forest skier RVDs will continue to grow as fast as they did before 1987. This has important implications for future land and resource management in the region, for at least two new ski

developments have been proposed for the Inyo National Forest. Increased competition from destination resorts in Utah and Colorado, together with local accessibility problems within the town of Mammoth Lakes, appear likely to continue to be as important as federal land management policy to the health of the local ski industry.

Mammoth Mountain Ski Area also offers multiseasonal, nonskiing recreational activities through its “Adventure Connection.” Currently, the Adventure Connection coordinates a wide variety of recreational opportunities, including a mountain-bike park, the largest organized mountain-bike event in the country, an artificial rock-climbing wall, a ropes course, orienteering courses, guided fishing, guided hiking, guided mountain biking, dog sledding, and snowmobiling. There were no statistics available as to how many recreationists, overall, have taken part in the activities coordinated by the

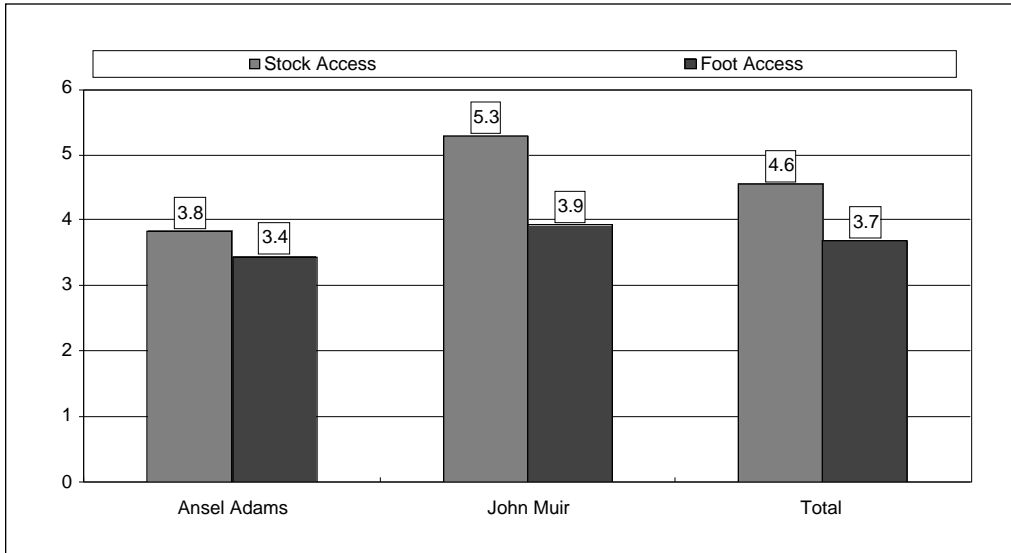
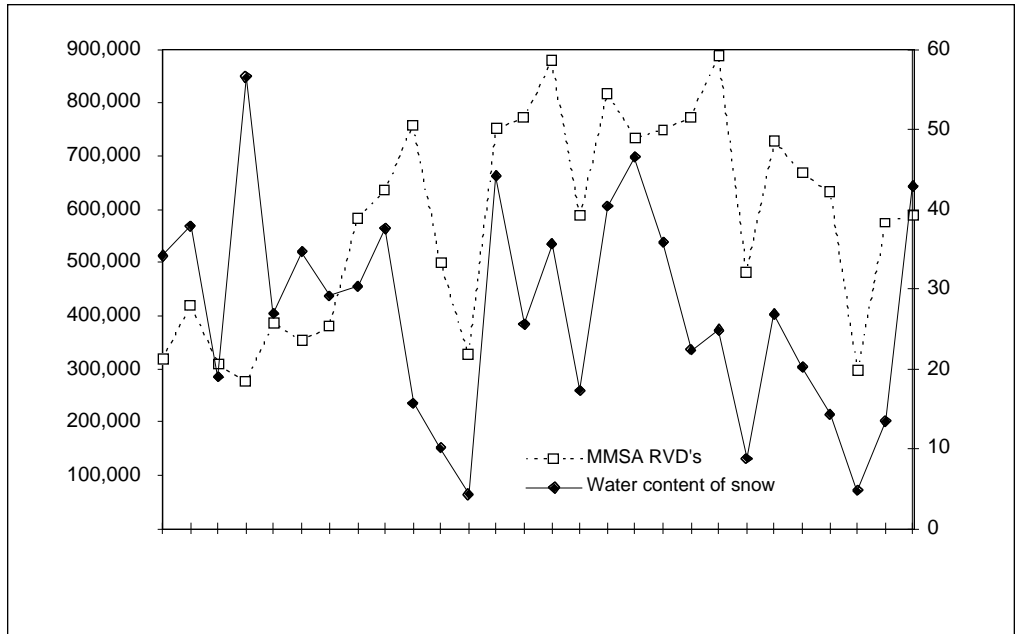


FIGURE 19.73

Mean number of days per wilderness permit issued by the Inyo National Forest, 1993.

FIGURE 19.74

Comparison of Mammoth Mountain Ski Area RVDs and annual water content of snow for the Mammoth region.



Adventure Connection. Between 1990 and 1993, however, there was an overall 160% mean increase in ticket sales for the mountain-bike park. Over two thousand riders participate in the annual mountain-bike races, and between 1993 and 1994 there was a 14% increase in the number of race participants. The ropes course, outdoor artificial wall, and orienteering courses are administered through a subcontract with Adventure Associates, a firm based in Berkeley, California. During the 1994 summer and fall season, over six thousand individuals used the artificial climbing wall and ropes/challenge course. These numbers appear relatively small compared with skier RVDs, but they represent significant new areas of growth in recreational activity on the Inyo National Forest. They are also activities that do not fit neatly into the traditional recreational activity classes, making it difficult to track them across jurisdictions or over time and highlighting the need for more disaggregated RVD data in order to assess the relative importance of emerging trends in recreation. These activities would generally appear under the "miscellaneous" class in USFS data.

Off-highway vehicle (OHV) or off-road vehicle (ORV) use on public lands occurs in both Inyo and Mono Counties, although minimal data was available regarding levels of use, user profiles, or seasonality of use. Specific types of off-highway vehicles used include all-terrain vehicles, four-wheel drives, dune buggies, and snowmobiles. Certain OHV/ORV activities are seasonal in nature, such as snowmobiling within the Mammoth subregion. Both the Forest Service and the BLM allow OHV/ORV use on portions of their eastern Sierra land, but the BLM data is more disaggregated than the USFS data. Surprisingly, BLM data for the Bishop Resource Area show only 42,450 RVDs for off-road vehicle use (5% of the total of

860,875 RVDs) and 6,175 RVDs for snowmobiling (1% of the total RVDs). Local OHV/ORV advocates have argued through CURES that OHV/ORV use is quite significant to the local economy, but it appears to be a relatively small activity. Camping accounted for 60% of the Bishop Resource Area RVDs, fishing accounted for another 9%, and nonmotorized recreation accounted for 6% of the total RVDs. Some of these other activities may have been conducted in conjunction with OHV/ORV activity, but OHV/ORV activity itself appears to be a relatively small part of overall recreational activity even on those lands that appear most suitable for such activities. Detailed information about snowmobiling activity on the Inyo National Forest was unavailable, but snowmobile permittees appear to be having a difficult time financially. Forest Service officials have also indicated that demand is unlikely to support expansion of concession operators. It is therefore doubtful that there is sufficient demand to support additional snowmobile activity, given the current availability of opportunities.⁹

Conclusions

This more detailed study of recreational activities in the eastern Sierra offers useful insights into user characteristics and the distribution of RVDs at a finer spatial and temporal scale, but it should not be interpreted as representative of the entire Sierra Nevada. Similar subregional analysis should be completed of the "gray literature" of unpublished reports and agency data for other subregions of the Sierra Nevada. A few themes do emerge in the eastern Sierra, however, that we believe are consistent with conditions throughout the Sierra Nevada:

- Recreational users are primarily Californians who live outside the Sierra Nevada.
- Recreational users are primarily Caucasians and do not represent the ethnic diversity of the rest of the state of California, where most of the recreationists live.
- Recreational users are primarily traveling to the area via private automobile.
- Recreational users are primarily male (especially in the summer).
- Recreational users in the winter are more affluent and well educated than users in the summer.
- Each wilderness permit issued for a stock user results in nearly twice as many RVDs as each wilderness permit issued for backpackers, with the additional impact of stock use on those permits and the associated impacts on riparian zones and subalpine meadows.
- Recreational activity in isolated portions of the Sierra Nevada is highly dependent upon access to urban centers (e.g., the Tioga Pass road closes for part of each year).
- Recreational activities in particular areas are often linked to recreational activities in other areas in the Sierra Nevada, California, and the West for out-of-state visitors.
- The relative importance of skiing in traditional ski resort communities is declining as spring, summer, and autumn activities continue to grow in importance and skiing stays flat.
- Levels of recreational activity vary widely on a seasonal and annual basis in response to many factors outside either the Sierra Nevada or resource management policy.

Even this limited set of conclusions suggests some important issues for consideration throughout the Sierra Nevada. Combined with the coarser-scale data we have for the entire Sierra Nevada, our more detailed assessment of recreation in the eastern Sierra Nevada raises a number of issues. It is clear that additional information must be considered in order to evaluate those issues, however, for the data that we worked with in this assessment is inadequate for policy formulation.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

Recent management experience in Yosemite Valley (where congestion led to closure of several entrances to Yosemite National Park on a series of summer weekends in 1995), together with other high-intensity-use areas such as Mammoth Lakes and Mount Whitney, raises the important point that

there are often conflicts over desired conditions for recreational opportunities even within a given activity class, institution and/or management unit.

These types of conflicts may become more important for many recreation providers in the Sierra Nevada if California's population continues to grow, as forecast, to 63 million people by the year 2040 (California Department of Finance 1993). If the population of the state of Nevada is 2–3 million, roughly 65–66 million people will be within a one-day drive of the Sierra Nevada in 2040. Our assessment suggests that current use on public lands in the Sierra Nevada for the agencies reported here is slightly less than two RVDs per year for each resident of these two states. Recreational activity has been relatively steady, however, despite a doubling of the population in both the Sierra Nevada itself and California and Nevada during the 1966–93 period. A doubling of the population of California and Nevada between 1990 and 2040 will therefore not necessarily double total demand for recreational activity in the region and increase conflicts between different types of recreational activities. Growth in demand for recreational opportunities exceeded population growth as American incomes grew rapidly and the "baby boomers" were born and raised during the two to three decades following World War II, but demand has been stagnant since then. This shift coincided with stagnating personal incomes per capita and smaller families following the 1946–64 "baby boom."

The growing population of California also has quite different social, demographic, economic, and ethnic characteristics than the dominant recreational users in the Sierra Nevada today. The state's emerging population is therefore likely to have different needs and demands for recreational opportunities in the Sierra Nevada in the future. Anticipating the character of those needs and demands is a challenge. In general, the current recreational activities of this emerging population appear to be directed more toward "developed" and "front-country" activities than many of the traditional wilderness-type uses that have been so important in the Sierra Nevada throughout the past three decades. We should not project that recreational demand profile into the future without caution, however, for recreational activities are influenced by many social forces. Increased affluence, together with decreased access to other open space, could change those patterns within a single generation. It is impossible to say how the groups that are minorities in California in 1995 will value the wilderness landscape when they constitute a majority of the population fifty years from now. What is clear is that they will be among the recreational users of the Sierra Nevada then, and potential differences in their use patterns will therefore be relevant.

Even without a proportionate doubling of demand, however, conflicts are likely to increase between recreational activities and other uses of public lands and resources. Significant population growth in California would diminish access to and availability of open space and other recreational opportunities on private lands throughout the state, increas-

ing the importance of the public lands in less populated regions such as the Sierra Nevada. The result would probably be increasing pressure to manage the remaining public lands in the Sierra Nevada to provide recreational opportunities for non-local Californians. The social, demographic, and economic characteristics of those non-local Californians will therefore be a critical determinant of what types of recreational activities will be demanded. The population of the Sierra Nevada is overwhelmingly Caucasian and projected to remain that way (Duane 1996). Potential conflicts could therefore emerge between the local population and the recreational needs of the larger urban populations to the degree that any of the future residents of the Sierra Nevada moved to the region to escape California's growing ethnic and cultural diversity. Public agencies providing recreational opportunities in the Sierra Nevada need to address this potential conflict proactively in planning today. Good research is being conducted on these issues, but we still have very little information about how different populations in California view recreational opportunities in the Sierra Nevada specifically or the role of public and private lands in providing it. Primary research is necessary to identify potential trends, evaluate their management implications, and formulate strategies to meet future recreation demand. Those strategies should explicitly account for the role of private recreation in the Sierra Nevada, which we were not able to address systematically in this chapter.

Analysis of policy scenarios must also consider the aesthetic impacts of various land and resource management activities on recreational activities. These aesthetic impacts include visual quality, noise levels, and general perceptions of human disturbance. Each of these elements affects the experience of recreationists—even if the source of the impact is outside the jurisdiction of the administrative unit on which the recreational activity occurs. Wilderness areas are affected by adjacent uses on other public lands, for example, and recreation on public lands is affected by development and use patterns on private lands. Similarly, competing recreational activities within a given area will affect the quality of the recreational experience for other recreationists in the area. User perceptions must therefore be integrated into recreation planning in a systematic way that addresses changes in the quality of the experience. The Recreational Opportunity Spectrum (ROS) system of the USFS attempts to establish a common framework for characterizing different types of recreational experiences, but it has not been integrated systematically across all recreation providers in the Sierra Nevada with empirical field research to determine how management actions affect visitors' perceptions of the recreational experience. This is especially true when considering the impact of nonrecreation activities on recreational experiences.

The potential for conflict between competing uses is most apparent for the USFS and the BLM, which both face a multiple-use mandate for management. Agencies such as the park service and California's Department of Parks and Recreation

already manage primarily for recreational activities and the preservation of natural resources that have unique natural qualities. Together they have responsibility for management of some of the most spectacular recreational resources in the Sierra Nevada. The Forest Service remains the most important provider of recreational opportunities in the Sierra Nevada, however, with 57–67% of all RVDs on public lands in the Sierra Nevada taking place on USFS lands.

Expansion of recreational activities on USFS and BLM lands could constrain other management activities, however, including some types of commodity production. But as demonstrated in the SNEP economic analysis by Stewart (1996), recreation is already a more important economic activity in the Sierra Nevada than commodity production. The economic value of recreation and tourism is likely to increase significantly as the population with easy access to the mountain range continues to grow. The recreational resources of the Sierra Nevada are limited and not infinitely substitutable. Land and resource management agencies will therefore need to consider how their management actions today will affect the recreational opportunities of tomorrow for a rapidly growing population.

Our analysis of USFS data shows that the spatial distribution of RVDs is not random. The Inyo, Sequoia, and Sierra National Forests—each of which is adjacent to at least one of the national parks in the southern and central Sierra Nevada—account for 45% of all RVDs on the USFS lands in the Sierra Nevada. Together with the national parks, this portion of the Sierra Nevada probably represents one of the highest levels of recreational activity in the entire world. Over 18.5 million recreational visitor days occur in the national parks and national forests of the southern Sierra Nevada. This is also the region of the Sierra Nevada forecast to experience the greatest population growth in nearby urban centers (especially Fresno and Bakersfield) in the next few decades. As noted in the SNEP air quality assessment by Cahill et al. (1996), the area is therefore threatened by degradation of air quality that could diminish vistas and heighten ecological stress, which could in turn diminish the quality of recreational experiences in the area. The wilderness areas of this region constitute the second-largest roadless area in the contiguous United States, with some of the most spectacular scenery in the world. The Lake Tahoe Basin represents a similar focal point for recreation in the Sierra Nevada, with much of the recreational activity on the Tahoe National Forest, the Eldorado National Forest, and the Toiyabe National Forest occurring in association with activities in the Lake Tahoe Basin Management Unit. The Lake Tahoe Basin is also threatened by diminishing air quality near urbanizing areas such as Truckee and South Lake Tahoe.

Recreational activity is the engine that drives the social, economic, and ecological conditions and management policies in the region. The long-term viability of recreation and tourism in the region may nevertheless be negatively affected by reduced visibility and scenic value just as it has histori-

cally been threatened by reduced water clarity. The landscape of the Sierra Nevada is the primary economic asset underlying recreational activity in the Sierra Nevada. Without that asset, many of the recreation-dependent communities of the Sierra Nevada face social and economic difficulties due to their isolation. Marketing brochures for many of the resorts in the Sierra Nevada emphasize the natural resources of the area, including resorts that themselves offer highly urbanized and developed recreational experiences.¹⁰

Much of the Sierra Nevada functions as California's outdoor playground. As noted in the SNEP economic assessment by Stewart (1996), however, very little of the economic value associated with recreational activity in the Sierra Nevada now goes back into resource management in the region. Local communities also capture very little of the economic value of that activity under existing institutional arrangements. Both the human communities and the land and resource managers of the Sierra Nevada at present make important decisions about future management of the Sierra Nevada without adequate information about the social and economic importance of recreational activity on the public lands in the region. This chapter is a small step toward accounting for the level of and importance of recreation in the Sierra Nevada, but there are still significant gaps in both our knowledge and the ways in which we use that knowledge.

Fully recognizing the potential value of recreational activities in the management of both public and private lands in the region could require significant institutional innovation. There is strong evidence that the existing institutional structure does not adequately reflect the value and significance of recreation in either long-range planning processes or on-the-ground land and resource management actions. Recognizing the level and types of recreational activities in the region is a first step toward such institutional innovation, but it is only a first step. This report only begins to account for the recreational activities in the Sierra Nevada in a consistent way. Institutional arrangements in the Sierra Nevada are generally still a long way from recognizing the value of those activities in management decisions.

Perhaps the biggest gap lies in the relationship between recreation on public lands and related activities on private lands. The estimates of RVDs presented in this report are almost exclusively limited to activities that take place on the public lands. Those activities are the driving force behind considerable related activity on private lands, however, that are not accounted for in our assessment. Many of those public RVDs, in turn, depend upon the provision of services on private lands to support public land recreation. Efforts such as CURES in the eastern Sierra and the Tahoe Coalition of Outdoor Recreation Providers (TCORP) constitute important efforts to improve cooperation and integration across the public and private sectors in the communities that most depend upon recreation for their economic lifeblood. A similar effort could be useful throughout the Sierra Nevada to promote improved data collection, analysis, and consistent policy

direction by both public land and resource management agencies and the private sector dependent upon public-sector recreation. This effort could be coordinated by the state Resources Agency as part of the State of California Outdoor Recreation Plan (SCORP), which is updated every five years or so.

Such efforts must be broadly inclusive, however, to ensure that all of the values of all who are interested in the resources of the Sierra Nevada are incorporated into policy decisions that affect recreation in the Sierra Nevada. These values include social, economic, and ecological concerns that are both long-term and short-term, both local and nonlocal. As the custodians for all Californians and all Americans, state and federal agencies must also ensure that the broadest public interest is served. This is a challenge in a rapidly changing world. The tension between local economic concerns (which often call for expanding recreational activity in the short term) and other social values (which often call for limiting recreational activity over the long term to protect ecological or aesthetic values) is not a new one. It was at the heart of many policy decisions over the past century-and-a-half in the Sierra Nevada that still define the parameters for today's policy debates.

The land and resource management institutions of the twenty-first century will continue to face conflicts over these issues as long as noncommodity uses of the public lands are not valued explicitly. Alternative institutional arrangements may therefore be necessary to create incentives for both public agencies and private landowners to manage in ways that are consistent with the full range of public values. These alternatives may involve anything from incremental steps (such as coordinated data collection among public agencies) to much more comprehensive innovations, such as recreation fees or permit systems for the public lands. We make no specific recommendations here, but we urge careful consideration of a wide range of alternatives.

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NOTES

1. This is an approximate average of estimates used by Bill Stewart (Duane 1996) and Doak and Kusel (1996); it is used here only to approximate RVDs for local residents.
2. Recreational activities at Lassen Volcanic National Park clearly have an impact on several communities in the northern Sierra Nevada, but the park itself is located outside the Sierra Nevada proper and the SNEP core area.
3. Comments made by the Yosemite National Park superintendent at the Association for Environmental Professionals conference, Yosemite National Park, March 1993.
4. Comments made by representatives from the Yosemite Committee of the Sierra Club at the Sierra Now conference, Sacramento, July 1992.
5. This conclusion is based upon a review of marketing materials for workshops and guided activities in the Sierra Nevada for these activities. We found no systematic data for quantitative estimation of these activities or trends.
6. This qualitative characterization of trends within the fishing activity class is based upon our more detailed assessment of data for the eastern Sierra Nevada, which is where most of the fly-fishing in the Sierra Nevada occurs.
7. As explained in Knauer and Duane 1994, this comparison is based upon pooled studies for summer and winter.
8. Reorganization of the Inyo National Forest in 1995 instituted new landscape zones and eliminated ranger districts.
9. This discussion of OHV/ORV activities is based upon analysis of the data and key informant interviews in the area.
10. See marketing materials for the conference titled *Competition and Change: Creating and Economic Vision for Lake Tahoe*, Stateline, Nevada, October 1992, and comments by the author at that conference.

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