

AN ASSESSMENT OF RECREATION USE IN CALIFORNIA: SIGNIFICANT MARKET VALUES AT RISK FROM ESCAPED WILDFIRES

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This writing discusses recreation and unique values in California, how these resources are affected by wildfire, and provides an economic analysis of the values at risk. Part one identifies recreation values, part two assesses their commodity and non-commodity market values, and three discusses the documented and estimated annual losses to California's economy which results from escaped wildfires. The references used during the study are provided in Part four.

Beyond the obvious value of timberland, always at risk from fire, but sometimes insured against such losses, are less tangible financial values inherent in California's timberlands. National, State and County Parks whose principal feature are beautiful forests are an important draw for out-of-state and out-of-country tourism. Such parks, such as Yosemite, often exert a powerful draw on the imagination, and contribute to the world perception of California as the place that "has it all", not just beautiful beaches, shimmering deserts, snow-capped mountains, and fertile valleys, but some of the world's most spectacular hunting, fishing, hiking, and camping country as well. Recreation visits to state parks, national forests, and national parks exceed all other states in the nation (U.S. Department of Commerce, 1986). California's timberlands are a principal reason why people from all over the world visit not just our wooded regions, but our state as a whole. Visitation figures are important as a means of gauging just how many people visit California's wild lands and forests, and just how much money those facilities generate themselves, but this is only a part of the picture, for many tourists attracted by recreation opportunities make a significant contribution to the state economy which is not reflected in the identification of actual recreation market values. Visitors get to California by purchasing airline tickets, they stay in hotels, purchase meals and supplies, and often do many other things besides recreation. Of course not all recreation use comes from outside the state as resident Californians enjoy recreation on their lands as well.

I. RECREATION AND UNIQUE AREAS IN CALIFORNIA

For the purpose of this discussion, recreation is defined in terms of Recreation Visitor Days (RVDs). One RVD represents 12 hours of participation in any activity. According to information contained in CDF's assessment of forest resources (1988), forest and rangeland recreation on state and federal lands was 104.8 million RVDs in 1986 (see Table 1). This figure does not include RVDs on private and other non-federal, non-state lands since few data are available to quantify this recreation use. National forest use amounted to almost 55 million RVDs, national parks 19.9 million RVDs, state parks 15.3 million, Bureau of Land Management lands about 8.7 million, and other federal lands, such as the Army Corps of Engineers and Bureau of Reclamation 5.4 million RVDs (CDF 1988:71). These numbers reflect those types of recreation normally occurring on forests and rangelands, and do not include coastal or urban recreation. The assumption here is that recreation values on forest and rangelands are at greater risk to damage by wildfire.

National Forest Recreation. National forest recreation in the state is estimated to represent one quarter of nationwide national forest recreational use, although the 20 million acres of national forest land represent only 11 percent of the national total. Recreation on national forests is distributed among the 21 units administered in the state. The figures used were obtained from draft Forest Management Plans and represent an average year of recreation use. The average annual total for all forests for this period is 65.4 million RVDs, which is significantly above the 55 million RVDs the Forest Service reported as actual use in 1985 (CDF 1988:71).

The San Bernardino National Forest, with 7.5 million RVDs, supports the most recreational use of any national forest in the state, probably due to its proximity to and easy access from major population centers. Together, the San Bernardino, Angeles, Los Padres, and Cleveland National Forests account for nearly 22 million RVDs, one third of national forest recreation use in California. The Shasta-Trinity Forest supports the most RVDs of any forest in the northern half of the state, with 5.5 million. Three units in the central Sierra, the El Dorado, Tahoe, and Lake Tahoe Basin Management Unit (LTBMU), account for about 13 million, nearly 20 percent of total use. Forest Service estimates are based on recorded campground registrations and wilderness permits, as well as observed use levels for trails, picnic areas, and other facilities. The density of use is also high on southern California and central Sierra Nevada forests. The LTBMU, a relatively small unit, has a density of more than 24 RVDs per acre. High use appears to be a function of good access, as well as proximity to large population centers.

Recreation on national forests can be characterized as developed, dispersed, and wildlife oriented. Developed recreation takes place at specific sites and is dependent on the availability of facilities such as boat ramps, campsites, picnic tables, or ski resorts. Dispersed recreation generally requires access routes such as roads and trails, but can occur anywhere. Wildlife-oriented recreation also occurs throughout forests and rangelands with the specific goal of interaction with fish or wildlife. Wildlife-oriented recreation tends to be a major component of use on forests such as the Klamath, Six Rivers, and Modoc which are all popular deer hunting and fishing areas. Dispersed recreation is high on the Shasta-Trinity and makes up more than half the use on most of the Southern California forests. Statewide, dispersed recreation makes up 49 percent of all national forest recreation, developed is 43 percent, and wildlife-oriented is 8 percent.

Winter recreation (skiing, snow shoes, ice skating, hiking, camping, etc.) may be either developed or dispersed. Because national forests encompass nearly all the state's snow zone, opportunities for winter recreation on these lands are important. Forty-two developed downhill ski areas are operated by private concessionaires who lease national forest land. Twenty serve as loci for cross-country skiing and other winter sports, and cross country skiing and snowmobiling also occur dispersed throughout the forests. There are no comprehensive data for the amount of winter snow recreation occurring on national forests (CDF 1988:72). The Tahoe and Inyo National Forests, however, both with major ski resorts, indicate in their management plans that there were nearly 498,000 and 988,000 RVDs, respectively, of primarily downhill skiing in 1982. Mammoth Mountain Ski Area on the Inyo N.F. ranks first nationwide in the number of annual skier visits and provides more than 50 percent of skiing on the state's national forests. Over the last 10 years, skier use on the Inyo N.F. has increased about 12 percent annually, with more than 80% of the skiers coming from Southern California.

California is expected to experience the greatest increases in recreational use of any Forest Service region in the United States in the next century (U.S. Forest Service: 1981). Recreation on national forests statewide is estimated to increase 55 percent from 65.4 million RVDs to 102 million RVDs over the next 40 years, based on projected changes in population and recreation facilities. Mendocino National Forest projects the largest change at 94% increasing use from 1.2 million RVDs to almost 2.4 million by 2025. Tahoe projects the largest absolute change, increasing from more than 5 million RVDs of current use to more than 9 million. The least change is assured for Six Rivers, increasing 86,000 RVDs over the five decades, less than 14%. Tahoe National Forest projects snow recreation to increase to 830,000 RVDs over the period, while Inyo N.F. estimates that within 30 years alpine skiing will reach nearly 2.2 million RVDs.

Wilderness Use. National Forests. Wilderness areas are usually designated for preservation of natural resources, but also may be used for some forms of dispersed recreation, such as hiking, camping, or cross-country skiing. More than 3.8 million acres of national forest are classified by law as wilderness. The area of each forest in wilderness varies significantly, ranging from nearly 45% of Sierra National Forest to less than 2% of Plumas N.F. About 1.8 million acres of national forest land were added to the wilderness system as a result of Congressional action in 1984. Wilderness recreation makes up about 5 percent of all national forest recreation in the state. There are 46 national forest wilderness areas in California. Wilderness areas within close proximity to urban areas tend to receive the highest use, such as Desolation Wilderness near Sacramento and the San Francisco Bay Area, and Cucamonga, San Geronio, and San Jacinto Wilderness Areas near Los Angeles. Use of wilderness areas has varied over time and location within the state. Total use peaked in 1977 at more than 3 million RVDs and reached a low in 1983 of about 1.7 million RVDs. The level and pattern of use of the John Muir Wilderness are significant components of total wilderness use. There are also about 1.9 million acres of national park, 400,000 acres of state park, and 20,000 acres of BLM land in wilderness. Wilderness use figures are not available for these lands (CDF 1988:76).

National Park Recreation. Sixteen of the 20 units administered by the National Park Service (NPS) in the state provide recreation opportunities. Use amounted to nearly 19.9 million RVDs in 1986, accounting for 17 percent of

national park use nationwide, although only 6 percent of national park land is in California (USDI National Park Service, 1986).

Yosemite, the third most visited park in the nation, after the Blue Ridge Parkway and Yellowstone, accounted for 33 percent of national park use in the state. Golden Gate National Recreation Area accounted for 19 percent, while Sequoia and Kings Canyon each accounted for 14 percent (USDI National Park Service, 1986). National park visitation estimates are based on entrance and registration records. These estimates do not identify type of recreation. Nationwide, national park use has generally been on the rise over the last 10 years, with some fall off in use in the late 1970s. Within the state, use of parks dropped significantly in the late 1970s, and somewhat in 1983. However, use reached a record high in 1986, exceeding 1985 visits by nearly 7 percent. Closer examination of recreation in individual parks shows that, with the exception of Golden Gate National Recreation Area (GGNRA), and Yosemite, Sequoia, and Kings Canyon National Parks, use in most parks amounts to less than 1 million RVDs and has remained relatively constant over the last 10 years. Recreation at GGNRA has risen from less than 1 million RVDs in 1976, to almost 4 million RVDs in 1986. Yosemite use has dropped from nearly 9 million RVDs to about 6 over the same period. Use at Sequoia and Kings Canyon has averaged between 2 and 3 million RVDs for the last decade. The National Park Service projects that use of parks nationally will continue to increase. There are no specific projections for California, but based on past trends, the state appears to be following the national pattern. Because non-resident use of national parks is high, recreation visits are significantly influenced by many variables that have little to do with availability or condition of park land. These include factors such the price of fuel, value of the American dollar, and tourism abroad.

Other Federal Recreation. In 1985, BLM statewide recreation use was 8.5 million RVDs (Bureau of Land Management, 1985). This represents 42 percent of national BLM recreation. Nearly one third of this was camping, and another third was off-road vehicle (ORV) use. ORV use has been restricted to designated areas in parts of the California desert, because of damage to sensitive sites.

The Bureau of Reclamation (BOR) and the Army Corps of Engineers (Corps) provide recreation at many of their water projects. BOR has 42 administrative units in the state, most of which are managed by other public agencies and offer some recreational opportunities. The five sites managed by BOR supported about 2.7 million RVDs in 1986 (California Department of Parks and Recreation, 1987). The Corps has 23 recreation sites, but again, most are managed by the Corps for recreation also provided about 2.7 million RVDs in 1986 (California Department of Parks and Recreation, 1987). Recreation at these sites includes picnicking and water-based activities. There are hunting and camping opportunities available on military reservations.

State Park Recreation. The state park system contains nearly 300 units and covers almost 1.3 million acres. Anza-Borrego State Park and Wilderness in San Diego County account for nearly half of the total state park acreage. Average size of the other parks is 5,000 acres. Approximately half of the 300 units are estimated to support some form of wildland recreation. This does not include state beaches or historical sites located in predominantly urban areas, but it does include parks that are located next to water bodies in forest and rangeland areas. Examples of these include Folsom Lake State Recreation Area and D.L. Bliss State Park on the shores of Lake Tahoe.

The California Department of Parks and Recreation conducts total counts of recreation use on some parks and samples use on others. It is estimated that 127 state parks, for which use data are maintained, support some type of forest and range recreation. This amounted to 15.3 million RVDs of use in 1986. This is about half of total state park use and represents an increase of nearly 6 percent over 1985. Fifty-nine percent of recreation on forest and range parks was day use, the remainder was overnight camping. Recreation use statistics on a regional basis indicate that state parks support high amounts of recreation in the coastal and southern areas of the state, where the population is larger and there are fewer national forests. The highest use parks in each region are indicated on the map. Folsom Lake, outside of Sacramento, supports nearly 1 million RVDs. Lake Perris in Riverside County supports more than 900,000 RVDs, and Big Basin Redwood State Park in Santa Cruz County more than 500,000 RVDs of recreation annually.

Regional Recreation. The Central Sierra Region is the most heavily used recreation area in the state. This is a function of the large number of recreation opportunities on national forests and parks (including Lake Tahoe) and the close proximity of major population centers. Southern California also supports high number of RVDs, particularly on national forests. Southern California has less national forest acreage (about 1.8 million acres) than any other region except the North Coast Region (0.9 million acres). Yet the amount of national forest use is higher

than anywhere else in the state and 30 times greater than the North Coast. Recreation use in the San Joaquin Region, encompassing the southern Sierra Nevada, is also high, most likely because of relatively easy access from Southern and Central California.

Recreation on Other Lands. Recreation on lands other than those owned by the state or federal government is more difficult to assess because there is little coordinated record-keeping and few available records. These other lands include private recreation facilities, such as campgrounds, hunting clubs, public utility lands, and county, city and regional parks. Recently, the Department of Parks and Recreation compiled survey data on more than 7,700 local public recreation facilities throughout the state. More than 400 million visits were recorded. Activities ranged from jogging in city parks to overnight camping in regional parks. These data are not directly comparable to the statistics presented earlier because they include facilities that are not on forests and rangelands and the measurement units are visits rather than RVDs. Nonetheless, they provide an indication of the amount of recreation taking place in all local parks.

Estimates of recreation on private and other non-federal, non-state lands are much more difficult to find. According to the Rand McNally Campgrounds and Trailer Park Directory (Rand McNally & Company, 1985), 358 of the more than 1,400 campgrounds in the state are located on private lands. It is not possible to separate out those campgrounds that are in predominantly coastal or urban settings, but an indication of the recreation opportunities on private lands is provided. More private campgrounds exist in regions of the state where there are fewer national forests and, in general, larger populations (aside from the North Coast). The large number of private campgrounds in the Southern California Region reflects the importance of all ownerships in supplying recreational opportunities to the large regional population.

Commercial hunting clubs represent another type of private recreation opportunity. In 1985, there were 49 commercial hunting club licenses issued in 25 different counties. Regionally, the Sacramento and San Joaquin Valleys dominate the commercial hunting club market because of extensive acreage of water fowl habitat. Hunting clubs often utilize agricultural lands as well as wildlands, and in some instances, constitute an exclusive use of rural land.

Wildlife-Oriented Recreation. In 1986-87, more than 2.5 million fishing licenses were sold, worth more than \$37 million. The popularity of fishing, as judged from the sale of licenses, continues to remain high. The 1976-77 drought caused a significant drop in license sales.

Hunting is also a popular recreational activity. More than 450,000 hunting licenses, worth about \$7.8 million, were sold in the 1986-87 season. About 289,000 deer tags were sold. Deer hunting increased dramatically in popularity following World War II, but appears to have slowly declined over the last 20 years. Crowding, declining quality of experience, increasing costs, and changing values have all affected the popularity of the sport. Nearly 50 percent of the deer are taken in nine counties, primarily in the northern third of the state, although every county is hunted except San Francisco. An average of more than 2,000 deer are annually harvested in Mendocino and Siskiyou Counties. Deer kill estimates are based on the number of deer tags returned.

A survey sponsored in the mid-1980's by the Department of Parks and Recreation indicates that more people may participate in nonconsumptive types of wildlife recreation than do actual hunting and fishing, such as birdwatching or wildlife photography, (CDF 1988:84). Interviews with a random sample of 2526 people statewide, over the age of 18, were conducted in mid-1987. Of this sample, 857 people, or nearly 34 percent, said that they spent some or most of their leisure time outdoors and participated in at least one nonconsumptive wildlife activity. Another 820 or 32.5 percent, indicated they spent some or most of their leisure time outdoors and participated in at least one nonconsumptive wildlife activity and also fished and/or hunted. Only 72, or about 3 percent stated they spent some or most of their leisure time outdoors, and hunted and/or fished, but did not participate in non-consumptive wildlife activities (California State University, Chico, 1987).

Origin of Recreationists Within California. Another survey sponsored by the Department of Parks and Recreation examined Californians' recreation travel patterns and looked at several activities including camping, lake and stream fishing, big and small game hunting, downhill and cross-country skiing, hiking and climbing, and nature appreciation. In 1980, 32 percent of the people participating in these activities came from the Los Angeles area, while another 30 percent were from the San Francisco Bay Area. About 10 percent of these participants came from Sacramento and areas north, while the remaining 28 percent were from parts of the state south of Sacramento, outside of Los Angeles and San Francisco.

People from different parts of the state make up varying proportions of statewide participation in specific activities. More than 35 percent of all people camping come from the Los Angeles area, while most anglers and hunters come from the San Francisco Bay Area. Per capita participation rates in various activities indicate that Northern Californians, especially people from the San Francisco area, are more likely to participate in all of these various activities. Los Angeles area residents have the lowest per capita participation rates in all activities except for lake fishing. Nature appreciation is the most popular of all activities.

Non-Resident Recreation. Non-residents constitute a significant portion of recreational use of the state's wildlands. The California Department of Tourism estimates that non-residents accounted for 46 percent of the 48 million trips taken California during 1983-84. Nearly 3 million non-resident trips are estimated to have had outdoor recreation as the primary purpose and consisted of visits to the state's parks and forests (Keye, Donna and Pearlstein, Inc., 1985). About 21 percent of all international visitors of the U.S. in 1980 spent time in California. Of these visitors, 78 percent listed "pleasure/vacation" as the reason for their visit (Bousseloub, 1982). Among all international visitors to California in 1979, about 44 percent visited "sites of natural wonder or scenic beauty", and 27 percent camped or backpacked (Tourmark Limited, 1980).

Trends in Recreation Participation. Over the last 20 years, recreation in the nation as a whole has changed. More Americans are physically active. The National Park Service sponsored a survey of recreation habits of Americans in 1982-83. They compared the results with data collected in 1960 and 1965. Jogging was an activity that was not popular enough to be asked about two decades ago, but 26 percent of those interviewed in 1983 reported that they had run or jogged in the previous year. Twenty-eight percent of the people interviewed in 1982-83 reported bicycling as compared to 9 percent of those interviewed in 1960. Nineteen percent of the respondents said they camped, up from 8 percent. Eight percent went canoeing or kayaking versus 2 percent in 1960. The one outdoor activity that showed a decline was hunting, dropping from 13 percent in 1960 to 10 percent in 1982-83 (USDI National Park Service, 1986). This is similar to the trend in California.

Participation in camping statewide is projected to increase by more than 26 percent, the result of a growing population. However, per capita participation in camping is expected to decline by 2 percent. Lake and stream fishing are projected to increase by nearly 3.2 percent, with a 2 to 3 percent increase per capita participation. Hunting shows an 11 percent total increase but a more than 20 percent decline in per capita participation, due mostly to declines in small game hunting. Winter sports show the largest increase at more than 50 percent, with a nearly 17 percent increase in per capita participation. A per capita increase is expected in downhill skiing and snowmobiling, with slight decreases in cross-country skiing.

Judging the effect of changing quality of recreation experience on participation rates is difficult. If, for example, campgrounds or trails have been severely burned, will people stop camping or hiking in these areas? Factors that influence recreation quality vary by individual. For some, burned forests degrade an experience; for others, burned forests provide unique recreation experiences. Our research indicates that RVD use patterns may or may not change. Factors influencing these patterns include fire location, intensity, proximity to water resources, and presence or absence of recreation facilities. Degradation of the aesthetic quality of a forest sometimes leads people to substitute other sites or to participate in another type of recreation.

Archaeological and Historical Sites. Archaeological and historical sites represent another type of unique resource found in California. These include prehistoric Indian village sites, petroglyphs, pictographs (rock paintings), midden deposits, human burials, caves, hunting blinds, and bedrock milling sites. Historic sites include buildings and structures of historical significance (such as Fort Ross, Bodie, etc.), Gold-Rush-era mining sites, wagon roads and trails, and cemeteries. Many of these historic resources contain irreplaceable values which are at risk from escaped wildfires. Some of these sites are situated on national and state park lands and directly contribute to the recreation use of a park. Most sites, however, have little recreation value as the public is often discouraged from unsupervised visitation due to relic hunting, site vandalism and other impacts. As discussed in chapter two, these sites have unique values in addition to contributing to recreation use of forest and range lands.

As of 1995, there are over 100,000 recorded archaeological sites in California. 59,000 of these are on federal lands, 33,000 are on private or other lands, 6,000 on state lands, and 12,000 are located on county, city or special district properties (California Office of Historic Preservation 1995). The California Office of Historic Preservation (1995) has estimated that approximately 100,000 additional unrecorded (undiscovered) archaeological sites exist within the state. This latter group is most at risk from wildfires since their locations are not known, and consequently difficult to protect during fire suppression activities. Additionally, California has

85,000 recorded historic buildings, most of which are situated in wildlands. This figure does not include historic districts in cities, which are excluded from this assessment. It is primarily the 85,000 structures in rural (wildland) locations that are at risk from escaped wildfires in California.

II. MARKET VALUE OF RECREATION AND UNIQUE AREAS IN CALIFORNIA

Economists studying recreation use in the United States have been able to calculate a market value for each RVD within recreation categories (USDA Forest Service 1990). The 1995 market value of one RVD is as follows: winter sports \$49.86, resorts \$20.52, wilderness \$16.46, camping, picnicking, swimming \$10.10, mechanized travel and viewing scenery \$10.31, hiking, horseback riding, and water travel \$13.60, and other recreation activities except wildlife and fishing \$65.89. These figures were derived from 1989 data (USFS 1990:18-19) and converted to 1995 dollars using an inflation factor of 1.17 (CDF 1995 Table 1). A weighted average 1995 market value of \$13.26 per RVD was calculated by CDF (1995: Table 1) for this assessment. These values do not include the indirect effect to the state economy resulting from tourism and recreation use as these figures can only be estimated. To illustrate these indirect unmeasurable values, we examined one type of recreation use: hunting and fishing. The Department of Fish and Game provides accurate listings of income generated from hunting licenses, deer tags, duck stamps, etc., but this is at best only a small percentage of the average hunter or fisherman's cash outlay, all of which pumps money into the California economy. What can never be accurately estimated in their entirety are the other expenses generated, all of which enrich California's economy. The money spent on internal transportation, camping gear, motels, meals, gasoline, ammunition, range fees for pre-season target practice, not to mention big-ticket items like expensive rifles, reloading equipment, even vehicles, boats, house trailers, even property near good hunting or fishing spots for the truly committed, accounts for many millions of dollars annually. No doubt, many other millions of dollars contributed to the state's economy can be linked to other recreational use in California, in particular, winter sports and resorts. To what degree recreation users turn to areas outside California or simply skip a recreation trip due to wildfires is explored in Part three.

Certain unique areas in California, such as its major sites of archaeological or historical interest, also attract tourism and contribute to the recreation values. These too are extremely difficult to quantify, but must contribute a sizeable portion of the recreation income generated at state, local and national parks, and national and state forests. Examples where historical features represent a primary attraction to recreation use include the reconstructed Coast Miwok Village at Point Reyes National Seashore, Patrick's Point State Park with its reconstructed Yurok Village, Indian Grinding Rock State Park, the reconstructed, early-19th-century Russian fortress at Fort Ross, Vikingsholm at Emerald Bay in Lake Tahoe, or the standing ruins of a historic mining town at Bodie. There are numerous other examples where California's significant cultural sites contribute to its recreation markets.

The results of our study summarizing the market value of recreation in California is presented in Table 1. The assessment included the entire state, with the exception of urban and coastal areas, not just State Responsibility Area (SRA) lands. The actual recreation values at risk are actually greater than shown for two reasons. First, as discussed above, tourism and recreation use has a huge indirect component to California's economy but is difficult to accurately appraise. Also, the total in Figure 1 does not include private/other lands recreation as we were unable to quantify recreation use on the 51 million acres of private and other lands. There simply are not sufficient records kept of this private/other lands recreation to be included in the study. Quantifying recreation as described in chapter one, we multiplied the number of RVDs for each ownership by \$13.26, the weighted average cash value per RVD unit, producing the total commodity recreation values. Our study revealed that the total market value of recreation in California, excluding private recreation, is over 1.3 billion dollars per year. This in fact is a conservative figure. Goldman and Gates (1986) calculated the total spending by recreationists in California to be 4.9 billion dollars which resulted in 17.3 billion dollars spent in gross output, 8.2 billion in regional income, and accounted for approximately 207,000 full-time jobs. There is no question that recreation users in California make a significant contribution to the state's economy.

The dispersment of these values is uneven. The USFS has 729 million dollars of recreation in California each year. NPS has 263 million dollars. On State lands, including State Parks, Fish and Game reserves, State Lands parcels and State Forests, recreation values exceed 83 dollars per acre. National Park recreation values are also high, exceeding 56 dollars per acre. Bureau of Land Management (BLM) lands, presumably because the recreation use is so dispersed, is valued at \$6.74 per acre. The statewide average is \$14.03 per acre.

TABLE 1

RECREATION MARKET VALUES IN CALIFORNIA

Landowner	Acres (million)	RVDs (million) **	Dollars per RVD ***	Total Recreation Value in Dollars (million)	Recreation Values in \$ per acre	Average acres burned by wildfire each year	Recreation \$ lost to wildfire per average year
National Park Service	4.7	19.9	13.26	263.87	56.14	4,250	\$35,700
USDA Forest Service	20.4	55	13.26	729.30	35.75	141,000	\$756,100
Bureau of Land Mgmt	17.1	8.7	13.26	115.36	6.74	104,385	\$105,500
Other Federal Ownership	3.3	5.4	13.26	71.60	21.69	22,800	\$74,100
State of California	2.5	15.8	13.26	209.50	83.80	8,500	\$106,800
Private/Other	51	*	*	*	*	276,000	*
Total in California	99	104.8	13.26	1,389.64	14.03	556,935	\$1,172,000

* No data available - see "Recreation on Other Lands" page 4.

** 1986 data (CDF 1988)

*** \$13.26 figure is a weighted average calculated to 1994 dollars by CDF (1995).

Sources: CDF 1988:61, CDF 1988:71, DPR 1995, CDF 1995, CDF 1992, BLM 1995, NPS 1995.

III. VALUES LOST DURING FIRE ESCAPES

In order to appraise the market values lost due to wildfires we calculated the average acres burned each year in California by wildfire and assessed the RVDs and market values which are lost. How much state revenue would be lost if Yosemite National Park, arguably the state's largest local and international attraction to recreationists, were to be charred to ashes?

The 1993 Green Meadow Fire may serve to illustrate just how high the cost of lost recreation values from a single wildfire can be. This fire burned 38,000 acres of land in the Santa Monica Mountains National Recreation Area (NRA). This NRA is composed of National Park Service lands, four State Parks, and privately owned lands. The fire burned numerous bridges along trails, signs, recreation structures, and a pumphouse which provided water to the five campground sites. The total cost of repairing or replacing these facilities, removing hazard trees, and cleaning up campground facilities and recreation trails was \$458,549.00. An additional \$33,614.00 in lost campground revenues resulted from closure of recreation facilities. The total cost of recreation values lost as a result of this five-day fire was \$492,163.00 (CDF 1995: Case Study #1). The cost of lost recreation values from a devastating fire at Yosemite could well exceed ten times this figure.

Figures showing the average number of acres burned annually by wildfire were collected from a variety of sources including consultation with the Fire Management Officers or other key officials for each land-owning agency in California, and review of published statistics. These figures were determined by averaging the acreage burned during the past 5 to 23 years, depending on available data. Our research has shown that some 557,000 acres in California are burned each average year by wildfire (these figures do not include controlled-burns) (see Table 1).

Wildfire does not totally destroy the recreation value of lands that are burnt. For example, consider the interest

that was generated after the huge Yellowstone fires of 1988. Also, if a person avoids recreating on a given area because it has burned, he or she may be able to enjoy a similar recreation experience on another, unburnt area. Of course, once an area has burns in a severe fire, it may take years for it to return to its former condition. To what degree these values are affected by wildfire is a complicated issue we explored in this assessment. For some recreation use, such as winter sports (e.g. skiing), wildfires do not seem to cause a significant decrease in recreation use of an area. The recreation use is sometimes improved by opening-up new areas for expanded skiing opportunities. However, overall, state-wide recreation use is significantly degraded by wildfires, particularly due to the direct cost of replacing recreation facilities and lost revenues during time of closure, and this effect is realized in millions of lost recreation dollars annually.

The 1987 Case Fire provides an example of how unique values are also at risk. This fire resulted in significant damage to a prehistoric archaeological site, an ancient Indian village on a ridgetop. The site was bulldozed by fire fighters during the construction of a fuelbreak on the ridgetop. The bulldozer crew knew of the site's location and attempted to avoid it but a change in the fire behavior put the lives of the crew in jeopardy. The dozer operators were forced to make a wide clearing to escape from the flames. In doing so, the archaeological site was badly damaged. CDF was required to conduct a rehabilitation and data recovery project at the site which cost a total of \$12,310.00 (CDF 1995: Case Study #2). While the actual cost of this damage is low when compared to the Green Meadow Fire, it is important to emphasize that losses of resources associated with California's unique cultural heritage can not adequately be expressed in terms of commodity market values. These types of losses are irreplaceable.

Economist Mike Skinner (personal communication) provided relevant information concerning the trends of wildfire incidents and affects to RVDs on USFS lands in California. It seems that wildfires almost never occur in the red fir and alpine zones, so RVDs in these areas are not often at risk. Another important pattern he observed is that most RVDs on USFS lands are associated with water - riparian areas, reservoirs, lakes, streams, etc. In some zones, these areas are not as vulnerable to wildfire damage when compared to nearby dryer areas. Most of the wildfire acreage on USFS lands occurs in the lower elevation pine and mixed conifer forest, an area which contains many reservoirs and has many RVDs. It is in this zone that wildfires do cause significant losses of RVDs.

It seems then that RVD losses can range from very high to practically nil depending upon the location of the fire, the type of recreation use threatened, the presence or absence of recreation facilities, and other important factors. We believe it is safe to assume that at least a fifteen percent loss of statewide recreation values can be attributed to wildfires. By multiplying recreation value in dollars per acre with the average number of burned acres, we calculated the market recreation values potentially at risk. This figure was multiplied by 0.15 (fifteen percent) to determine the estimated real market loss.

Conclusion. This study has shown that recreation use in California is a significant component to the state's economy. Total recreation use in California exceeds 104 million Recreation Visitor Days per year, not including recreation use on private/other lands. Recreation market values range from \$6.74 on BLM lands to \$83.80 on state lands (the highest in California) with a state-wide average market value of \$14.03 per RVD. Our estimated total recreation value of 1.3 billion dollars annually is probably too low. By including the total expenditures by recreationists, the actual figure is closer to five billion dollars per year (Goldman and Gates:1986).

Wildfires consume an average of 556,000 acres each year which results in significant market losses. If our estimate that at least 15 percent of the recreation values lost is correct, the actual recreation values lost in California exceeds 1.17 million dollars each year.

IV. REFERENCES CITED

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RECREATION AND UNIQUE RESOURCES IN CALIFORNIA: AN ASSESSMENT OF VALUES AT RISK FROM ESCAPED WILDFIRES

by:
California Department of Forestry
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DANIEL G. FOSTER, editor
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This writing includes a discussion of recreation and unique values in California. It describes how these resources are affected by wildfire, and provides an economic analysis of these values at risk. Part one identifies the recreation and unique values and part two assesses their commodity and non-commodity market values. Part three provides a calculation of the net loss of these market values per acre for fires that escape CDF's initial attack. Part four lists the sources of information used during this research and includes two case studies which assess the fiscal impact of damages to recreation and unique resources which resulted from recent wildfires. The entire state of California was included in this assessment.

I. RECREATION AND UNIQUE AREAS IN CALIFORNIA

Beyond the obvious value of timberland, always at risk from fire, but typically insured against such losses, are less tangible financial values inherent in California's timberlands. National, State and County Parks whose principal feature are beautiful forests are an important draw for out-of-state and out-of-country tourism. Such parks, such as Yosemite, often exert a powerful draw on the imagination, and contribute to the world perception of California as the place that "has it all", not just beautiful beaches, shimmering deserts, snow-capped mountains, and fertile valleys, but some of the world's most spectacular hunting, fishing, hiking, and camping country as well. Recreation visits to state parks, national forests, and national parks exceed all other states in the nation (U.S. Department of Commerce, 1986). California's timberlands are a principal reason why people from all over the world visit not just our wooded regions, but our state as a whole. Visitation figures are important as a means of gauging just how many people visit California's wild lands and forests, and just how much money those facilities generate themselves, but this is only a part of the picture, for many tourists attracted by recreation opportunities make a significant contribution to the state economy which is not reflected in an analysis of recreation values. They got here by purchasing airline tickets, stayed in hotels, and probably did many other things besides recreation. Of course not all recreation use comes from outside the state; Californians love to recreate on their lands as well.

For purposes of this discussion, recreation is defined in terms of Recreation Visitor Days (RVDs). One RVD represents 12 hours of participation in any activity.

Forest and rangeland recreation on state and federal lands was 104.8 million RVDs in 1986 (see Table 2). This figure does not include RVDs on private and other non-federal, non-state lands since few data are available to quantify this recreation use (see page 4 of this report). National forest use amounted to almost 55 million RVDs, national parks 19.9 million RVDs, state parks 15.3 million, Bureau of Land Management lands about 8.7 million, and other federal lands, such as the Army Corps of Engineers and Bureau of Reclamation 5.4 million RVDs (CDF 1988:71). These numbers reflect those types of recreation normally occurring on forests and rangelands, and do not include coastal or urban recreation. The assumption here is that recreation values on forest and rangelands are at greater risk to damage by wildfire.

National Forest Recreation. National forest recreation in the state is estimated to represent one quarter of nationwide national forest recreational use, although the 20 million acres of national forest land represent only 11 percent of the national total. Recreation on national forests is distributed among the 21 units administered in the state. The figures used here average annual figures for the decade 1985 to 1995. The average annual total for all forests for this period is 65.4 million RVDs, which is significantly above the 55 million RVDs the Forest Service reported as actual use in 1985 (CDF 1988:71).

The San Bernardino National Forest, with 7.5 million RVDs, supports the most recreational use of any national forest in the state, probably due to close proximity and easy access from major population centers. Together, the

San Bernardino, Angeles, Los Padres, and Cleveland National Forests account for nearly 22 million RVDs, one third of national forest recreation use in California. The Shasta-Trinity Forest supports the most RVDs of any forest in the northern half of the state, with 5.5 million. Three units in the central Sierra, the El Dorado, Tahoe, and Lake Tahoe Basin Management Unit (LTBMU), account for about 13 million, nearly 20 percent of total use. Forest Service estimates are based on recorded campground registrations and wilderness permits, as well as observed use levels for trails, picnic areas, and other facilities. The density of use is also high on southern California and central Sierra Nevada forests. The LTBMU, a relatively small unit, has a density of more than 24 RVDs per acre. High use appears to be a function of good access, as well as proximity to large population centers.

Recreation on national forests can be characterized as developed, dispersed, and wildlife oriented. Developed recreation takes place at specific sites and is dependent on the availability of facilities such as boat ramps, campsites, picnic tables, or ski resorts. Dispersed recreation generally requires access routes such as roads and trails, but can occur anywhere. Wildlife-oriented recreation also occurs throughout forests and rangelands with the specific goal of interaction with fish or wildlife.

Wildlife-oriented recreation tends to be a major component of use on forests such as the Klamath, Six Rivers, and Modoc which are all popular deer hunting and fishing areas. Dispersed recreation is high on the Shasta-Trinity and makes up more than half the use on most of the Southern California forests. Statewide, dispersed recreation makes up 49 percent of all national forest recreation, developed is 43 percent, and wildlife-oriented is 8 percent.

Snow recreation may be either developed or dispersed. Because national forests encompass nearly all the state's snow zone, opportunities for winter recreation on these lands are important. There are 42 developed downhill ski areas, operated by private concessionaires who lease national forest land. Twenty sites serve as loci for cross-country skiing and other winter sports, although cross country skiing and snowmobiling may occur dispersed throughout the forests. There are no comprehensive data for the amount of snow recreation occurring on national forests (CDF 1988:72).

However, the Tahoe and Inyo National Forests, both with major ski resorts, indicate in their management plans that there were nearly 498,000 and 988,000 RVDs, respectively, of primarily downhill skiing in 1982. Mammoth Mountain Ski Area on the Inyo ranks first nationwide in the number of annual skier visits and provides more than 50 percent of skiing on the state's national forests. Over the last 10 years, skier use on the Inyo has increased about out 12 percent annually, with more than 80 percent of the skiers coming from Southern California.

California is expected to experience the greatest increases in recreational use of any Forest Service region in the United States in the next century (U.S. Forest Service, 1981). Based on draft forest plans, statewide national forest recreation use on national forests statewide will increase 55 percent from 65.4 million RVDs to 102 million RVDs over the next 40 years. These numbers are based on projected changes in population as well as on investments to be made in recreation facilities. The Mendocino National Forest projects the largest percent change at 94 percent, increasing use from 1.2 million RVDs to almost 2.4 million by 2025. The Tahoe projects the largest absolute change, increasing from more than 5 million RVDs of current use to more than 9 million. The least amount of change is on the Six Rivers, increasing 86,000 RVDs over the five decades, less than 14 percent change. The Tahoe National Forest projects snow recreation to increase to 830,000 RVDs over the period, while the Inyo estimates that within 30 years alpine skiing will reach nearly 2.2 million RVDs.

Wilderness Use. One form of dispersed recreation on national forests is wilderness use. Wilderness areas are usually designated for preservation of natural resources, but also may be used for some forms of recreation, such as hiking, camping, or cross-country skiing. More than 3.8 million acres of national forest are classified by law as wilderness. The area of each forest in wilderness varies significantly ranging from nearly 45 percent of the Sierra National Forest to less than 2 percent of the Plumas. About 1.8 million acres of national forest land were added to the wilderness system as a result of Congressional action in 1984. Wilderness recreation makes up about 5 percent of all national forest recreation in the state.

There are 46 national forest wilderness areas in California. Wilderness areas within close proximity to urban areas tend to receive the highest use, such as Desolation Wilderness near Sacramento and the San Francisco Bay Area, and Cucamonga, San Geronio, and San Jacinto Wildernesses near Los Angeles. Use of wilderness has varied over time and location within the state. Total use peaked in 1977 at more than 3 million RVDs and reached a low in 1983 of about 1.7 million RVDs. The level and pattern of use of the John Muir Wilderness are significant components of total wilderness use. There are also about 1.9 million acres of national park, 400,000 acres of state park, and 20,000 acres of BLM land in wilderness. Wilderness use figures are not available for these lands (CDF 1988:76).

National Park Recreation. Sixteen of the 20 units administered by the National Park Service (NPS) in the state provide recreation opportunities. Use amounted to nearly 19.9 million RVDs in 1986, accounting for 17 percent of national park use nationwide, although only 6 percent of national park land is in California (USDI National Park Service, 1986).

Yosemite, the third most visited park in the nation, after the Blue Ridge Parkway and Yellowstone, accounted for 33 percent of national park use in the state. Golden Gate National Recreation Area accounted for 19 percent, while Sequoia and Kings Canyon each accounted for 14 percent (USDI National Park Service, 1986). National park visitation estimates are based on entrance and registration records. These estimates do not identify type of recreation.

Nationwide, national park use has generally been on the rise over the last 10 years, with some fall off in use in the last 1970s. Within the state, use of parks dropped significantly in the late 1970s, and somewhat in 1983. However, use reached a record high in 1986, exceeding 1985 visits by nearly 7 percent. Closer examination of recreation in individual parks shows that, with the exception of Golden Gate National Recreation Area (GGNRA), and Yosemite, Sequoia, and Kings Canyon National Parks, use in most parks amounts to less than 1 million RVDs and has remained relatively constant over the last 10 years. Recreation at GGNRA has risen from less than 1 million RVDs in 1976, to almost 4 million RVDs in 1986. Yosemite use has dropped from nearly 9 million RVDs to about 6 over the same period. Use at Sequoia and Kings Canyon has averaged between 2 and 3 million RVDs for the last decade.

The National Park Service projects that use of parks nationally will continue to increase. There are no specific projections for California, but based on past trends, the state appears to be following the national pattern. Because non-resident use of national parks is high, recreation visits may be significantly influenced by a large number of variables that have little to do with availability or condition of park land. This includes factors such as the price of fuel, value of the American dollar, terrorism abroad. Use of California national parks may be less susceptible to external factors, relative to other areas, because of high levels of resident use.

Other Federal Recreation. In 1985, BLM statewide recreation use was 8.5 million RVDs (Bureau of Land Management, 1985). This represents 42 percent of national BLM recreation. Nearly one third of this was camping, and another third was off-road vehicle (ORV) use. ORV use has been restricted to designated areas in parts of the California desert, because of damage to sensitive sites.

The Bureau of Reclamation (BOR) and the Army Corps of Engineers (Corps) provide recreation at many of their water projects. BOR has 42 administrative units in the state, most of which are managed by other public agencies and offer some recreational opportunities. The five sites managed by BOR supported about 2.7 million RVDs in 1986 (California Department of Parks and Recreation, 1987). The Corps has 23 recreation sites, but again, most are managed by the Corps for recreation also provided about 2.7 million RVDs in 1986 (California Department of Parks and Recreation, 1987). Recreation at these sites includes picnicking and water-based activities. There are hunting and camping opportunities available on military lands as well.

State Park Recreation. The state park system contains nearly 300 units and covers almost 1.3 million acres. Anza-Borrego State Park and Wilderness in San Diego County account for nearly half of the total state park acreage. Average size of the other parks is 5,000 acres. Approximately half of the 300 units are estimated to support some form of wildland recreation. This does not include state beaches or historical sites located in predominantly urban areas, but it does include parks that are located next to water bodies in forest and rangeland areas. Examples of these include Folsom Lake State Recreation Area and D.L. Bliss State Park on the shores of Lake Tahoe.

The California Department of Parks and Recreation conducts total counts of recreation use on some parks and samples use on others. It is estimated that 127 state parks, for which use data are maintained, support some type of forest and range recreation. This amounted to 15.3 million RVDs of use in 1986. This is about half of total state park use and represents an increase of nearly 6 percent over 1985. Fifty-nine percent of recreation on forest and range parks was day use, the remainder overnight camping.

Recreation use statistics on a regional basis indicate that state parks support high amounts of recreation in the coastal and southern areas of the state, where the population is larger and there are fewer national forests. The highest use parks in each region are indicated on the map. Folsom Lake, outside of Sacramento, supports nearly 1 million RVDs. Lake Perris in Riverside County supports more than 900,000 RVDs, and Big Basin Redwood State Park in Santa Cruz County more than 500,000 RVDs of recreation annually.

Regional Recreation. The Central Sierra Region is the most heavily used recreation area in the state. This is a function of the large number of recreation opportunities on national forests and parks (including Lake Tahoe) and the close proximity of major population centers. Southern California also supports high number of RVDs, particularly on national forests. Southern California has less national forest acreage (about 1.8 million acres) than any other region except the North Coast Region (0.9 million acres). Yet the amount of national forest use is higher than anywhere else in the state and 30 times greater than the North Coast. Recreation use in the San Joaquin Region, encompassing the southern Sierra Nevada, is also high, most likely because of relatively easy access from Southern California.

Recreation on Other Lands. Recreation on lands other than those owned by the state or federal government is more difficult to measure because there is little coordinated record-keeping and few available records. These other lands include private recreation facilities, such as campgrounds and hunting clubs, public utility lands, and county, city and regional parks.

Recently, the Department of Parks and Recreation compiled survey data on more than 7,700 local public recreation facilities throughout the state. More than 400 million visits were recorded. Activities ranged from jogging in city parks to overnight camping in regional parks. These data are not directly comparable to the statistics presented earlier because they include facilities that are not on forests and rangelands and the measurement units are visits rather than RVDs. Nonetheless, they provide an indication of the amount of recreation taking place in all local parks.

Estimates of recreation on private and other non-federal, non-state lands are much more difficult to find. According to the Rand McNally Campgrounds and Trailer Park Directory (Rand McNally & Company, 1985), 358 of the more than 1,400 campgrounds in the state are located on private lands. It is not possible to separate out those campgrounds that are in predominantly coastal or urban settings, but an indication of the recreation opportunities on private lands is provided. More private campgrounds exist in regions of the state where there are fewer national forests and, in general, larger populations (aside from the North Coast). The large number of private campgrounds in the Southern California Region reflects the importance of all ownerships in supplying recreational opportunities to the large regional population.

Commercial hunting clubs represent another type of private recreation opportunity. In 1985, there were 49 commercial hunting club licenses issued in 25 different counties. Regionally, the Sacramento and San Joaquin Valleys dominate the commercial hunting club market because of extensive acreage of water fowl habitat. Hunting clubs often utilize agricultural lands as well as wildlands, and in some instances, constitute an exclusive use of rural land.

Wildlife-Oriented Recreation. In 1986-87, more than 2.5 million fishing licenses were sold, worth more than \$37 million. The popularity of fishing, as judged from the sale of licenses, continues to remain high. The 1976-77 drought caused a significant drop in license sales.

Hunting is also a popular recreational activity. More than 450,000 hunting licenses, worth about \$7.8 million, were sold in the 1986-87 season. About 289,000 deer tags were sold. Deer hunting increased dramatically in popularity following World War II, but appears to have slowly declined over the last 20 years. Crowding, declining quality of experience, increasing costs, and changing values have all affected the popularity of the sport. Nearly 50 percent of the deer are harvested in nine counties, primarily in the northern third of the state, although hunting takes place in every county except San Francisco. An average of more than 2,000 deer are annually harvested in Mendocino and Siskiyou Counties. Deer kill estimates are based on the number of deer tags returned.

A survey sponsored in the mid-1980's by the Department of Parks and Recreation indicates that more people may participate in nonconsumptive types of wildlife recreation, such as birdwatching or wildlife photography, than consumptive types (CDF 1988:84). Interviews with a random sample of 2526 people statewide, over the age of 18, were conducted in mid-1987. Of this sample, 857 people, or nearly 34 percent, said that they spent some or most of their leisure time outdoors and participated in at least one nonconsumptive wildlife activity. Another 820 or 32.5 percent, indicated they spent some or most of their leisure time outdoors and participated in at least one nonconsumptive wildlife activity and also fished and/or hunted. Only 72, or about 3 percent stated they spent some or most of their leisure time outdoors, and hunted and/or fished, but did not participate in non-consumptive wildlife activities (California State University, Chico, 1987).

Origin of Recreationists Within California. Another survey sponsored by the Department of Parks and Recreation examined Californians' recreation travel patterns and looked at several activities including camping, lake and

stream fishing, big and small game hunting, downhill and cross-country skiing, hiking and climbing, and nature appreciation. In 1980, 32 percent of the people participating in these activities came from the Los Angeles area, while another 30 percent were from the San Francisco Bay Area. About 10 percent of these participants came from Sacramento and areas north, while the remaining 28 percent were from parts of the state south of Sacramento, outside of Los Angeles and San Francisco.

People from different parts of the state make up varying proportions of statewide participation in specific activities. More than 35 percent of all people camping come from the Los Angeles area, while most anglers and hunters come from the San Francisco Bay Area. Per capita participation rates in various activities indicate that Northern Californians, especially people from the San Francisco area, are more likely to participate in all of these various activities. Los Angeles area residents have the lowest per capita participation rates in all activities except for lake fishing. Nature appreciation is the most popular of all activities.

Non-Resident Recreation. Non-residents constitute a significant portion of recreational use of the state's wildlands. The California Department of Tourism estimates that non-residents accounted for 46 percent of the 48 million trips taken California during 1983-84. Nearly 3 million non-resident trips are estimated to have had outdoor recreation as the primary purpose and consisted of visits to the state's parks and forests (Keye, Donna and Pearlstein, Inc., 1985).

About 21 percent of all international visitors of the U.S. in 1980 spent time in California. Of these visitors, 78 percent listed "pleasure/vacation" as the reason for their visit (Bousseloub, 1982). Among all international visitors to California in 1979, about 44 percent visited "sites of natural wonder or scenic beauty", and 27 percent camped or backpacked (Tourmark Limited, 1980).

Trends in Recreation Participation. Over the last 20 years, recreation in the nation as a whole has changed. More Americans are physically active. The National Park Service sponsored a survey of recreation habits of Americans in 1982-83. They compared the results with data collected in 1960 and 1965. Jogging was an activity that was not popular enough to be asked about two decades ago, but 26 percent of those interviewed in 1983 reported that they had run or jogged in the previous year. Twenty-eight percent of the people interviewed in 1982-83 reported bicycling as compared to 9 percent of those interviewed in 1960. Nineteen percent of the respondents said they camped, up from 8 percent. Eight percent went canoeing or kayaking versus 2 percent in 1960. The one outdoor activity that showed a decline was hunting, dropping from 13 percent in 1960 to 10 percent in 1982-83 (USDI National Park Service, 1986). This is similar to the trend in California.

Participation in camping statewide is projected to increase by more than 26 percent. However, per capita participation in camping is expected to decline by 2 percent. The overall increase is the result of a growing population. Lake and stream fishing are projected to increase by nearly 3.2 percent, with a 2 to 3 percent increase per capita participation. Hunting shows an 11 percent total increase but a more than 20 percent decline in per capita participation, due mostly to declines in small game hunting. Winter sports show the largest increase at more than 50 percent, with a nearly 17 percent increase in per capita participation. A per capita increase is expected in downhill skiing and snowmobiling, with slight decreases in cross-county skiing.

Judging the effect of changing quality of recreation experience on participation rates is difficult. If, for example, campgrounds or trails have been severely burned, will people stop camping or hiking in these areas? Factors that influence recreation quality vary by individual. For some, burned forests degrade an experience; for others, burned forests provide unique recreation experiences. Our research indicates that visitor use in burned areas which are near population centers does not decline after a fire, but does in remote wilderness areas. This is probably due to degradation of the aesthetic quality of a forest. Whether people will substitute other sites or whether they will choose to participate in another type of recreation is not well understood.

Archaeological and Historical Sites. Archaeological and historical sites represent another type of unique resource found in California. These include prehistoric Indian village sites, petroglyphs, pictographs (rock paintings), midden deposits, human burials, caves, hunting blinds, and bedrock milling sites. Historic sites include buildings and structures of historical significance (such as Fort Ross, Bodie, etc.), Gold-Rush-era mining sites, wagon roads and trails, and cemeteries. Many of these historic resources contain irreplaceable values which are at risk from escaped wildfires. Some of these sites are situated on national and state park lands and directly contribute to the recreation use of a park. Most sites, however, have little recreation value as the public is often discouraged from unsupervised visitation due to relic hunting, site vandalism and other impacts. As discussed in chapter two, these sites have unique values other than recreation.

As of 1995, there are over 100,000 recorded archaeological sites in California. 59,000 of these are on federal lands, 33,000 are on private or other lands, 6,000 on state lands, and 12,000 are located on county, city or special district properties (California Office of Historic Preservation 1995). The California Office of Historic Preservation (1995) has estimated that approximately 100,000 additional unrecorded (undiscovered) archaeological sites exist within the state. This latter group is greatly at risk from wildfires since their locations are not known which makes them difficult to protect during fire suppression activities. Archaeological sites include prehistoric sites as well as the ruins of historic buildings and places. In addition, California has 85,000 recorded historic buildings, most of which are situated in wildlands. This figure does not include historic districts in cities. The City of Oakland, for example, has 108,000 historic buildings. Pasadena has a similarly large number. These urban historic buildings are excluded from this assessment. It is primarily the 85,000 structures in rural (wildland) locations that are at risk from escaped wildfires in California.

II. VALUE OF RECREATION AND UNIQUE AREAS IN CALIFORNIA

Economists studying recreation use in the United States have been able to calculate a market value for each RVD within recreation types. Table 1 lists the 1989 market values per RVD in California for winter sports, resorts, wilderness use, camping, picnicking, swimming, mechanized travel, hiking, horseback riding, water travel, and other activities excluding wildlife and fish. These range from \$8.64 per RVD for camping to \$42.62 per RVD for skiing. The CDF Strategic Planning Program provided an inflation factor of 1.17 to convert these values to 1994 dollars, and a weighted average of these 1994 values to be used in this statewide assessment of recreation.

TABLE 1
MARKET VALUE OF RECREATION VISITOR DAYS (RVDs) IN CALIFORNIA

Recreation Type:	1989 Value of one RVD in dollars	1994 Value of one RVD in dollars
Winter Sports	42.62	49.86
Resorts	17.54	20.52
Wilderness	14.07	16.46
Camping, Picnicking, Swimming	8.64	10.10
Mechanized Travel and Viewing Scenery	8.82	10.31
Hiking, Horseback Riding, and Water Travel	11.63	13.60
Other Recreation Activities (except Wildlife and Fish)	56.32	65.89
Weighted Average		13.26

Source for 1989 values: USFS 1990: 18-19

Inflation factor: 1.17 = 1994 dollars (CDF 1995b)

Source for Weighted Average: CDF Strategic Planning Program, Russ Henly

It is difficult to quantify the market value of certain unique areas in California such as its archaeological and historical sites, but these values are extremely important. Because California Indians left no written records, investigation of archaeological sites is the primary source of information about the people who occupied the state for the past 12,000 years. These resources are finite and irreplaceable, and without them, scientists could not produce accurate information about prehistoric California and the cultures that lived here. Unabated destruction of

California's archaeological and historical sites would lead to a degradation in the quality of science and education in our state. In addition to unique scientific values, these resources have aesthetic qualities which can easily be degraded by wildfires, and for Native Americans and other ethnic communities, a spiritual, traditional and religious quality is present which too can be affected by wildfires.

III. VALUES LOST DURING FIRE ESCAPES

This chapter identifies the commodity and non-commodity values of recreation and unique areas which are lost due to un-suppressed wildfires. The scope of this research includes the entire state, not just State Responsibility Area (SRA) lands. Table 2 shows the number of RVDs in California and where this recreation is occurring. Unfortunately, we were unable to quantify recreation use on the 51 million acres of private and other lands since few records are kept. Readers should consider that the recreation dollars lost are actually greater than shown since the total does not include private/other lands recreation. Using the quantification of recreation use as described in chapter one, we multiplied the number of RVDs for each ownership by \$13.26, the weighted average cash value per RVD unit. This produced the total commodity recreation values. The USFS has 729 million dollars of recreation in California each year. NPS has 263 million dollars. The total value of recreation in California excluding private/other lands is over 1.3 billion dollars per year. Our research has shown that recreation values expressed in dollars per acre is highly variable. On State lands, which includes State Parks, Fish and Game reserves, State Lands parcels and State Forests, recreation values exceed 83 dollars per acre. National Park recreation values are also high, exceeding 56 dollars per acre. Bureau of Land Management (BLM) lands, presumably because the recreation use is so dispersed, is valued at \$6.74 per acre. The statewide average is \$14.03 per acre. The figures showing the average number of acres burned annually by wildfire were collected from a variety of sources including personal communication with the Fire Management Officer or other key officials for each land-owning agency in California. These figures were determined by averaging the acreage burned during the past 5 to 23 years, depending on available data. The final calculation in Table 2 provides the total value or recreation dollars lost each year due to escaped wildfires. Five million dollars of recreation value are lost each year on USFS lands in California alone. The total market value of recreation in California lost to escaped wildfires each year is 7.18 million dollars.

TABLE 2

RECREATION MARKET VALUES IN CALIFORNIA

Landowner	Acres (million)	RVDs (million)	Dollars per RVD	Total Recreation Value in Dollars (million)	Recreation Values in \$ per acre	Average acres burned by wildfire each year	Recreation \$ lost per average year (million)
National Park Service	4.7	19.9	13.26	263.87	56.14	4,250	0.239
USDA Forest Service	20.4	55	13.26	729.30	35.75	141,000	5.04
Bureau of Land Mgmt	17.1	8.7	13.26	115.36	6.74	104,385	0.703
Other Federal Ownership	3.3	5.4	13.26	71.60	21.69	22,800	0.494
State of California	2.5	15.8	13.26	209.50	83.80	8,500	0.712
Private/Other	51	*	*	*	*	276,000	*
Total in California	99	104.8	13.26	1,389.64	14.03	556,935	7.18

* No data available - see "Recreation on Other Lands" page 3-4.

** \$13.26 figure is weighted average of Table 1 in 1994 dollars

Sources: CDF 1988:61, CDF 1988: 71, DPR 1995, CDF 1995, CDF 1992, BLM 1995, NPS 1995.

In addition to these calculations of RVDs, we examined two wildfires as case studies to quantify the total cost of lost recreation or unique area values. These are the 1993 Green Meadow Fire where we looked at actual lost recreation values, and the 1987 Case Fire where specific costs associated to a damaged archaeological site were examined.

The Green Meadow Fire may be an unusual example but was chosen to demonstrate just how high the cost of lost recreation values can be. This fire burned 38,000 acres of land in the Santa Monica Mountains National Recreation Area (NRA). This NRA is composed of National Park Service lands, four State Parks, and privately owned lands. The fire burned numerous bridges along trails, signs, recreation structures, and a pumphouse which provided water to the five campground sites. The total cost of repairing or replacing these facilities, removing hazard trees, and cleaning up campground facilities and recreation trails was \$458,549.00. An additional \$33,614.00 in lost campground revenues resulted from closure of recreation facilities. The total cost of recreation values lost as a result of this five-day fire was \$492,163.00 (see Case Study #1 for sources and detailed information).

The Case Fire illustrates how unique values are also at risk. This fire resulted in significant damage to a prehistoric archaeological site, an ancient Indian village on a ridgetop. The site was bulldozed by fire fighters during the construction of a fuelbreak on the ridgetop. The bulldozer crew knew of the site's location and attempted to avoid it but a change in the fire behavior put the lives of the crew in jeopardy. The dozer operators were forced to make a wide clearing to escape from the flames. In doing so, the archaeological site was badly damaged. CDF was required to conduct a rehabilitation and data recovery project at the site which cost a total of \$12,310.00 (see Case Study #2 for sources and detailed information).

Conclusion. This study has shown that recreation and unique areas in California have important commodity and non-commodity values. Total recreation use in California exceeds 104 million RVDs per year, a figure which does not include recreation use on private/other lands. Recreation market values range from \$6.74 on BLM lands to \$83.80 on state lands with a state-wide average market value of \$14.03 per RVD. The total market value of recreation in California exceeds 1.3 billion dollars per year. Over seven million dollars of this recreation market value is lost each year to damages from wildfires.

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CASE STUDY #1
COST OF RECREATION VALUES LOST IN A WILDFIRE:
THE 1993 GREEN MEADOW FIRE
WITHIN SANTA MONICA MOUNTAINS NATIONAL RECREATION AREA (NRA)
LOS ANGELES AND VENTURA COUNTIES, CALIFORNIA

Total Acres in NRA: 152,000
 Total Acres Burned in Fire: 38,000
 Date of Fire: October 30, 1993 to November 3, 1993
 Ownership Status: Federal, State and Private lands

CLOSURE TIME OF NRA RECREATION FACILITIES:

NPS Recreation Facilities closed for 12 months
 Leo Carrillo Facilities Closed for 14 days
 Point Mugu Facilities closed for 14 days
 Malibu Creek State Park closed for 14 days
 Thornhill Beach Facilities closed for 3 days

COST OF REPAIRING DAMAGES TO RECREATION FACILITIES:

CLEARING TRAILS THROUGHOUT NRA	\$25,400.00
INSTALLING NEW TRAIL SIGNS ON NPS LANDS	8,300.00
REPLACEMENT OF BRIDGES, OUTHOUSES, PUMPHOUSE AT HOLLOW CREEK CAMPGROUND	250,000.00
HAZARD TREE REMOVAL AT HOLLOW CREEK CAMPGROUND	14,827.00
DAMAGE TO ENTRANCE STATION AT LEO CARRILLO	1,500.00
LABOR AND EQUIPMENT (CLEAN-UP) LEO CARRILLO	9,290.00
DUMPSTER RENTAL (CLEAN-UP) AT LEO CARRILLO	1,213.00
HAZARD TREE REMOVAL AT LEO CARRILLO	2,500.00
PICNIC TABLES AND DUMPSTER ENCLOSURES AT LEO CARRILLO	4,133.00
TREE AND DEBRIS REMOVAL AT POINT MUGU FACILITY	22,040.00
LABOR AND EQUIPMENT (CLEAN-UP)	13,457.00
RESTROOM DAMAGE	8,218.00
REPLACE SIGNS ON STATE PARK LANDS	4,358.00
REPLACE PORTABLE RESTROOMS AT POINT MUGU	6,715.00
REPLACE RECREATION STORAGE SHED AND EQUIPMENT	3,275.00
REPLACE INTERPRETIVE DISPLAY PANEL AT POINT MUGU	1,432.00
WATER SYSTEM DAMAGE AT POINT MUGU	4,292.99
LABOR AND EQUIPMENT (CLEAN-UP) AT MALIBU CREEK	3,619.00
HAZARD ROCK REMOVAL AT MALIBU CREEK	7,262.00
RAMADA AND BRIDGE AT MALIBU LAGOON	55,088.00
BURNED STRUCTURES AND SAFETY TREE PRUNING AT MALIBU LAGOON	11,300.00
LABOR AND EQUIPMENT (CLEAN-UP) AT MALIBU LAGOON	330.00

LOSS OF CAMPGROUND REVENUES:

HAPPY HOLLOW CAMPGROUND (NPS) AT CIRCLE X SITE
 24 sites, \$6 per night, closed 12 months for repairs.
 This facility averages 8 sites filled per night throughout the year

15,330.00

LEO CARRILLO STATE PARK FACILITIES
 28 sites, \$14 each, closed 14 days for repairs.
 This facility averages 16 sites filled each day
 during November

3,136.00

MALIBU CREEK STATE PARK FACILITIES
 65 sites, \$16 each, closed 14 days for repairs.
 This facility averages 23 sites filled in November

5,152.00

CASE STUDY NUMBER 1

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THORNHILL BROOM CAMPGROUND AT POINT MUGU

110 sites, \$14 each, closed 14 days for repairs.

This facility averages 51 sites filled in November 9,996.00

TOTALS:

TOTAL COST TO REPAIR DAMAGES OR REPLACE RECREATION

FACILITIES CAUSED BY THE GREEN MEADOW FIRE THROUGHOUT

THE SANTA MONICA MOUNTAINS NRA 458,549.00

TOTAL LOSS OF CAMPGROUND REVENUES DURING CLOSURE DUE

TO THE GREEN MEADOW FIRE THROUGHOUT THE SANTA

MONICA MOUNTAINS NRA 33,614.00

TOTAL COST OF LOST RECREATION VALUES

..... \$492,163.00

information sources for Case Study #1: Personal communication with Mr. Ishmael Messer, Fire Management Officer at Santa Monica Mountains National Recreation Area and Frank Padilla, State Park Ranger by Dan Foster on January 19, 1995 and Jack Kirchner, Chief of Maintenance, DPR Angeles District by Dan Foster on January 20, 1995

CASE STUDY #2
COST OF ARCHAEOLOGICAL VALUES LOST IN A WILDFIRE:
THE 1987 CASE FIRE
LOCATED ON CASE MOUNTAIN IN TULARE COUNTY, CALIFORNIA

Total Acres Burned in Fire: 4723
 Date of Fire: August 30, 1987 to September 7, 1987
 Ownership Status: Federal, and Private lands
 Number of Archaeological Sites Damaged: 1 (CA-TUL-472)

A prehistoric archaeological site was significantly damaged during efforts to suppress the 1987 Case Fire. This archaeological site (CA-TUL-472) is located on a trending ridgetop adjacent to a complex of granite boulders. The site, which consists of the remains of an ancient Native American village, occupies 1/4 acre of land. A previously undisturbed midden deposit, rich with prehistoric artifacts, was extensively graded by bulldozers to clear a firebreak and trees and brushy debris were piled across the site. Since the BLM had alerted CDF of the presence of this site, the state was required to fund and implement an archaeological data recovery project to mitigate and clean-up damages at the site. An archaeologist was used to supervise an inmate crew to remove the downed trees and brush, an archaeological survey and record was made, test excavations were conducted, archaeological materials were subjected to laboratory analysis, and the investigation was documented in a final report.

SPECIFIC COSTS:

SITE CLEAN-UP AND REHABILITATION (INMATE CREW, FORESTER II, STATE ARCHAEOLOGIST)	\$2,950.00
ARCHAEOLOGICAL SURVEY AND SITE RECORDING	1,100.00
ARCHAEOLOGICAL SITE MAPPING AND TEST EXCAVATIONS	3,240.00
LABORATORY ANALYSIS (RADIOCARBON DATING, OBSIDIAN SOURCING, OBSIDIAN HYDRATION ARTIFACT ILLUSTRATIONS)	2,270.00
PREPARATION OF FINAL REPORT	1,950.00
REPRODUCTION AND DISTRIBUTION	800.00

TOTAL COST:

TOTAL COST OF SITE REHABILITATION AND ARCHAEOLOGICAL DATA RECOVERY AT SITE CA-TUL-492 RESULTING FROM DAMAGES DURING CASE FIRE	\$12,310.00
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information sources for Case Study #2: Foster et al 1991. Specific costs were compiled by CDF Archaeology Office, 1995.