

3. THE BENEFITS OF CALIFORNIA'S BEACHES

3.1 Overview

This chapter discusses the benefits of beaches and beach nourishment to the State of California, the nation and local communities. The first part provides an overview of the recreational needs of California and the role beaches play in fulfilling that need. The second section discusses the fiscal impact of beaches for the state, local communities and the nation. Part three is a discussion of the recreational value of beach nourishment projects to residents of California as well as to visitors from other states and countries. Part four presents a case study of overcrowding at north San Diego County's beaches. Part five discusses environmental and public safety benefits of beaches.

California's beaches provide a wide range of economic, environmental and public safety benefits to the state's citizens, visitors and some wildlife species. As this chapter demonstrates, the recreational needs of Californians are growing rapidly and beach visits provide an important recreational outlet. Almost two-thirds of California's residents visit one of the state's beaches at least once a year. These visits generate \$61 billion in spending and \$15 billion in total tax receipts, of which \$4.6 billion go directly to the State of California. Unfortunately, California's beaches are eroding, largely due to human influence, degrading and reducing available recreational opportunities while the population continues to grow more rapidly than it does in the rest of the nation. A case study of north San Diego County (Section 3.5) concludes that a significant loss of recreational opportunity will occur if beaches are not sustained at their historical widths. Our analysis indicates that north San Diego County alone will lose 49 million visitors over the next ten years if it fails to maintain historical beach widths. This loss will severely limit the opportunities for outdoor recreation and further stress a system that is already operating at capacity during peak season. There are few comparable alternatives to the beach in north San Diego County, where existing freshwater recreational facilities and parks are already crowded (Dirksen et al., 1999). The loss in tax revenue from diminished tourism substantially exceeds the cost of maintaining these beaches.

3.2 Beach Recreation and Tourism in California

3.2.1 The Need for Recreation

The long-term benefits of outdoor recreation have been well documented by the medical community and by psychologists.¹ Beaches provide an important venue for outdoor recreation for Californians as well as for many people who reside outside of California. Table 3.1 presents estimates of participation in various outdoor activities by residents of California and for all U.S. residents.² Nationally, 24.8%, almost one in four, of residents of the U.S. attend beaches at least once a year, compared to only 15.7% who say they attend at least one picnic, 13.1% who attend zoos, and 5.1% who go bird watching. This result is quite striking when one considers that many Americans have limited access to beaches. According to a survey completed for the State of California in 1997, 63.8% of Californians go to the beach at least once a year (King and Potepan, 1997). An earlier study by the State Department of Parks and Recreation indicated a similar level of attendance.³

Table 3.1 How Many People Go to the Beach?

Percentage of Californians who go to the beach every year	63.8
Percentage of Americans who go to the beach every year	24.8
Percentage of Americans who go to picnics every year	15.7
Percentage of Americans who go bird watching every year	5.1
Percentage of Americans who go to the zoo every year	13.6

Source: King and Potepan (1997); U.S. Dept. of Commerce (2001)

Nationally, spending on recreation is increasing as well. Table 3.2 presents the share of income that Americans devote to recreation over time. As one can see, recreation has become an increasingly important focus of spending for the average American. Economists believe that the increase is largely due to the “income effect”—as Americans become wealthier and as food, shelter and other necessities become more secure, people have more resources to devote to activities they enjoy. Indeed, if one accounts for the increase in real income, **Americans spend over ten times as much on recreation in inflation-adjusted dollars today as they did in 1919.**

¹ See, for example: Marano, H., 1999; Bishop, 1998; and American Recreation Coalition, 1999.

² Unfortunately, the census does not keep data on all forms of outdoor recreation.

³ See California Department of Parks and Recreation website.

Table 3.2 How Much Do People Spend on Recreation?

Year	Percentage of Household Budget Devoted to Recreation
1919	3.60%
1935	4.00%
1950	5.30%
1972	6.70%
1991	8.00%
2000	8.50%

Source: Costa, 1997, 1999

3.2.2 Population Projections for California

In addition to the increased demand for recreation due to higher income levels, California's population is expected to grow substantially over the next 20 years. The California Department of Finance's Demographic Division has detailed projections of population at the state and county level. As presented in Table 3.3, the Finance Department projects California's population will grow by 32.8% over the next twenty years. The rate of increase is even larger in some areas. For example, San Diego County is projected to grow by 39.3%, and other southern California counties are projected to grow by over 50%.

Table 3.3 Population Projections (in millions)

Year	California	Los Angeles	San Diego
2000	34.5	9.7	2.8
2005	37.5	10.2	3.1
2010	40.3	10.6	3.4
2020	45.8	11.6	3.9
% Increase 2000-2020	32.8%	19.6%	39.3%

Source: California Dept. of Finance, 1998

3.2.3 Attendance at California's Beaches

Given that over two-thirds of Californians visit the beach at least once a year and millions go regularly, it should not be surprising that the attendance at California's beaches is enormous. Unfortunately, attendance estimates are imperfect and sometimes not available. Most local beaches with lifeguards and/or parking keep attendance records based on lifeguard counts or parking figures. A number of beaches in the state, including many Los Angeles beaches, Huntington Beach and the larger San Diego County beaches, have attendance of several million

visitors a year per beach. The largest of these beaches have attendance of 6-8 million visitors per year. Some of these estimates will be presented later in the report.

Table 3.4 California Beach User Origin Profile

Location	Percentage from Other US States	Percentage from Other Countries	Total Percentage of Visitors from Out of State
Seal Beach- Path	22.2	5.1	27.3
Seal Beach-East	10.5	10.8	21.3
Seal Beach-Cab	8.4	17.1	25.5
Ventura Point	5.9	6.7	12.6
Ventura State Beach	3.8	2.8	6.6
Ventura City Beach	1.9	4.1	6.0
Ventura Harbor	2.6	-	2.6
Seal Beach Pier	20.6	23.3	43.9
Carpenteria	48.3	1.0	49.4
Ventura Boardwalk	11.7	2.7	14.5
Laguna Main	70.0	6.9	76.9
Corona	17.4	0.5	17.9
Huntington State Beach	5.3	0.5	5.8
Huntington City Beach	7.5	4.2	11.7
Seal Pier	12.0	3.4	15.4
Seal Beach	12.6	1.5	14.1
Venice Beach	10.1	13.3	23.4
Venice Walk	17.7	10.4	28.1
Mission Beach Boardwalk	49.0	6.6	55.6
Mission Beach	48.4	4.2	52.6
La Jolla Shores	22.8	-	22.8
Carlsbad	40.7	-	40.7
Coronado	53.1	6.0	59.1
Silver Strand	16.4	4.2	20.6
Imperial Beach	-	21.5	21.5
San Clemente	24.6	-	24.6
Manhattan	25.2	10.9	36.1
Venice Beach	24.3	27.6	52.9
Venice Boardwalk	25.3	28.6	53.9
Santa Monica	18.0	40.5	58.5
Pismo	7.8	5.1	12.9
La Selva	3.7	0.7	4.4
Santa Cruz	15.3	3.1	18.4
Carmel	8.5	6.2	14.7
Total			28.4

Local beach communities do not track attendance numbers by residency. While many lifeguard stations keep track of the residency of beachgoers requiring medical attention, these figures do not provide a random sample of visitors, since a disproportionately high number of those needing assistance are surfers, who tend to be local. The best way to get an estimate of attendance by out-of-state and out-of-country visitors is a random sample of beachgoers.

Several surveys have been conducted by the California Department of Boating and Waterways. Table 3.4 above presents the results of the most comprehensive survey of beach goers, mostly in southern California. The salient details from the survey are:

- The survey indicates that 28.4% of visitors were from out of state, with roughly one-third of these from other countries.
- Adjusting for the fact that smaller beaches have fewer non-local visitors, we estimate that between 20% and 25% of all visitors to California's beaches reside out of state, with one-third of these from out of the country.⁴
- Beaches with local lodging and other facilities attract more foreign and out-of-state visitors.
- In general, San Diego beaches attract a higher percentage of out-of-state visitors than beaches in other counties in California, largely due to the proximity to Arizona and New Mexico.

Estimates of total beach attendance by state residents were obtained through a telephone survey conducted in 1995 for the California Department of Boating and Waterways, in which 600 residents across the state were randomly sampled (King and Potepan, 1997). According to the survey, California's beaches experienced 566.8 million attendance days in 1995, 15% of which were by out-of-state visitors⁵. Please note that these attendance figures include people attending boardwalks, restaurants, piers and other recreational sites with attached beaches. If one looks strictly at those on the beach, the number will be lower, but still several hundred million visitor days, an enormous number, far larger than other comparable forms of outdoor recreation in California. By comparison, all U.S. National parks experienced 286 million visitor days last year and Yosemite experienced 3.4 million visitor days (American Recreation Coalition, 1999).

Table 3.5 presents the results of the 1995 survey, updated for 2001. We have made two revisions to update the data. First, we have increased the number of visits in proportion to the population increase in California and the rest of the United States. Second, we have adjusted the original estimate of the total proportion of out-of-state visitors from 15% to 20% given the results of survey data collected since 1995, which indicate a higher value is warranted. As we mention above, the true proportion of out-of-state visitors is probably greater than 20%, so our estimate is conservative. Updating these figures, we estimate that California experienced 659.2 million beach attendance days in 2001.

⁴ For this report we have used the more conservative estimate, 20%.

⁵ A beach attendance day, or visitor day, is defined as a trip to the beach to recreate on any given day.

Table 3.5 Estimated Total Attendance at California Beaches including Piers and Boardwalks 1995-2001

Item	Est. 1995 Attendance (millions)	Population in 2001 compared to 1995	Est. 2001 Attendance (millions)
Day Trips	345.8	109%	378.5
CA Overnight trips	136.0	109%	148.9
Out of State Overnight	85.0	106%	89.7
Corrected Out of State			42.2
Total	566.8		659.2

3.3 The Fiscal Impact of Beach Recreation and Tourism in California

3.3.1 Spending on Beach Trips

Given the magnitude of attendance and spending on recreation, it should not be surprising that the economic and fiscal impact of beach recreation and tourism in the State of California is significant. This section presents an overview of beach spending followed by estimates of the local, state and federal tax revenues generated by this spending.

Table 3.6 updates an earlier study and provides an estimate of spending per household and per individual on day trips and overnight trips to the beach by Californians. As one can see, day visitors spent, on average, \$102.61 last year per household, or \$34.56 per person, per day on fuel, food (including restaurants), rentals, sporting goods and other items. As one would expect, spending on overnight trips is considerably higher, reflecting not only higher food costs and hotel bills, but also the fact that overnight visitors tend to come from farther away and, since they are likely to be on vacation or a weekend trip, are likely to spend more money. Including all expenses, in 2001, we estimate that households spent an average of \$505 per day, or \$170 per person per day on overnight beach trips in the last year.

Table 3.6 Estimated Spending per Household on Trips to the Beach--per Trip

Category	2001 Overnight Spending per Trip per Household	2001 Day Spending per Trip per Household
Gas & Auto	\$ 62.96	\$ 19.72
Beach Related Lodging	\$ 201.20	
Parking & Entrance Fees	\$ 6.08	\$ 6.08
Food & Drinks from stores	\$ 70.54	\$ 26.89
Restaurants	\$ 111.33	\$ 32.90
Equip Rental	\$ 26.93	\$ 7.48
Beach Sporting Goods	\$ 6.92	\$ 6.95
Incidentals	\$ 19.38	\$ 8.67
Subtotal Subject to Fuel Tax	\$ 56.66	\$ 17.75
Subtotal Subject to State Sales Tax	\$ 227.52	\$ 75.72
TOTAL	\$ 505.34	\$ 202.16
Mean Expenditure per Person 2001	\$ 170.21	\$ 68.13

To account for the total spending at beaches, one also must account for out-of-state spending. While reliable data on the precise amount spent by people from out of state are scanty, several surveys indicate that visitors from out of state spend, on average, about the same as visitors on overnight visits within the state,⁶ and we will assume that out-of-state visitors spend the same amount per visitor per day. Table 3.7 presents the overall estimate of total beach spending in the state. We estimate that total spending on beach tourism was just over \$61 billion in 2001. Of this total, \$22.4 billion, or 36%, were spent by visitors and tourists from out of state (including foreign visitors).

Table 3.7 Estimated Total State Spending on Beach Tourism by Type of Trip 2001

Type of Trip	Number of Days (millions)	Avg. Spending per day	Total Spending (\$ millions)
Day Trips	378.53	\$ 35.95	\$ 13,608.23
Overnight Trips-in State	148.85	\$ 170.21	\$ 25,335.97
Overnight Trips-out of State	131.85	\$ 170.21	\$ 22,441.48
Total	659.23		\$ 61,385.69

⁶ For example, see King, 1999. *The Fiscal Impact of Beaches in California*

3.3.2 The Fiscal Impact for the State of California

Given the estimates of spending by California residents as well as out-of-state residents, it is possible to provide reasonable estimates of the total taxes derived from this spending. Tables 3.8 and 3.9 present the estimated tax paid to the State of California by California residents and by out-of-state visitors respectively. The table breaks down these estimates into spending on day trips and spending on overnight trips, and into taxes generated by the Personal Income Tax, state proceeds from sales taxes, state taxes on fuel, and other state taxes. Where possible, we have used applicable tax rates applied directly to the relevant spending categories. For example, our spending survey estimates divide spending into categories that are subject to sales taxes and categories (food purchased at grocery and convenience stores) that are not subject to sales tax. In other cases, we have used average rates of taxes per dollar obtained from the California Statistical Abstract (CA Dept. of Finance, 2000).

Table 3.8 Estimated Tax Derived from Beach Spending by State Residents

Tax	Estimated on:	Rate	Day Trips	Overnight Trips	Total
CA Personal Income	Income	3.0%	\$ 410,968,627	\$ 765,146,263	\$1,176,114,890
State Sales Tax	Non-Exempt Sales	4.8%	\$ 458,937,647	\$ 541,556,337	\$1,000,493,984
State Fuel Tax	\$0.18 per gallon	9.0%	\$ 208,205,960	\$ 255,386,567	\$ 463,592,527
Other State Taxes	Income	1.7%	\$ 231,339,955	\$ 430,711,472	\$ 662,051,428
Total			\$1,309,452,189	\$1,992,800,640	\$3,302,252,829

Table 3.9 Estimated Tax Derived from Beach Spending by Out-of-State Visitors

Tax	Estimated on:	Rate	Overnight Trips
Personal Income	Income	3.0%	\$508,299,607
State Sales Tax	Non-Exempt Sales	4.8%	\$359,765,036
State Fuel Tax	\$0.18 per gallon	9.0%	\$169,657,617
Other State Taxes	Income	1.7%	\$286,128,918
Total			\$1,323,851,180

Finally, Table 3.10 presents the estimate of total state tax derived from both state residents and out-of state visitors. Overall, we estimate that beach spending generates \$4.6 billion in state tax revenues.

Table 3.10 Taxes From Beach Spending by Residents and Out-of-State Visitors

Est. State Tax from Out-of-State Visitors	\$1,323,851,180
Est. Tax paid by Residents	\$3,302,252,829
Total Tax Derived from Beach Spending	\$4,626,104,009

3.3.3 *The Fiscal Impact for the Federal Government and Local Government*

One common issue with regard to investment in beach nourishment is the benefits derived from beaches by various governments, from local city government to the state and federal government. The tables below present estimates of federal and local taxes generated by beach spending and comparisons of these estimates with our estimates of state taxes presented above. For these calculations, we have relied on average taxation levels per dollar, collected from the State of California's *Statistical Abstract* (CA Dept. of Finance, 2000) and from averages calculated for the federal government by the U.S. Office of Management and Budget (Economic Report of the President, 2001). The estimates of total federal taxes generated are presented in Table 3.11, broken down by category. We have also provided a subtotal for federal taxes excluding taxes on social insurance (the Social Security and Medicare taxes). **Overall, we estimate that spending on beach recreation and tourism in the State of California generates \$13.6 billion dollars in federal taxes; excluding social insurance, our estimate is \$8.1 billion.**

Table 3.11 Estimated Federal Tax Revenues Derived from Beach Spending in California

Tax	Total Spending in California	Avg. % of Total U.S. Spending	Est. Tax Revenues
Federal Income Tax	\$ 61,385,685,438	10.4%	\$ 6,384,111,286
Federal Corporate Taxes	\$ 61,385,685,438	2.1%	\$ 1,289,099,394
Federal Excise Taxes	\$ 61,385,685,438	0.7%	\$ 429,699,798
Subtotal Excluding Social Insurance	\$ 61,385,685,438	13.2%	\$ 8,102,910,478
Other	\$ 61,385,685,438	9.0%	\$ 5,524,711,689
Total Federal Tax Receipts		22.2%	\$13,627,622,167

Finally, Tables 3.12 and 3.13 present our estimate for local tax revenue generated compared to state and federal revenue. Our estimates for local revenue are based on averages for the state and should be considered only an approximation, but they do provide an indication of how tax revenues are distributed. If one includes federal programs for social insurance, then spending on beach recreation and tourism in the state of California generates \$20.7 billion in revenues, of which 65.8% goes to the federal government, 22.4% goes to the state and only 5.9% goes to the local and county governments. Excluding social insurance, the estimates are: 53.4%, 30.5%, and 8.1%. In sum, the federal government collects the largest share of taxes. The reason for this result is twofold: (1) the federal share of taxes from dollars spent in the state of California is

significantly greater than the state's share or the local share; (2) a portion (estimated as 25%) of spending by out-of-state visitors occurs outside of California and hence is not collected by the state, but this spending *does* generate tax revenue for the federal government.

Table 3.12 Estimated Taxes Derived from Beach Spending for Federal, California State, County and City Governments Excluding Social Insurance

Government	Estimated Tax Generated	Percentage of Total Taxes Generated
Federal (Excluding Social Insurance)	\$8,102,910,477.86	53.4%
California State	\$4,626,104,009.45	30.5%
County	\$1,227,713,708.77	8.1%
City	\$1,227,713,708.77	8.1%
Total	\$15,184,441,904.85	100.0%

Table 3.13 Estimated Taxes Derived from Beach Spending for Federal, California State, County and City Governments Including Social Insurance

Government	Estimated Tax Generated	Percentage of Total Taxes Generated
Federal	\$13,627,622,167	65.8%
California State	\$ 4,626,104,009	22.3%
County	\$ 1,227,713,708	5.9%
City	\$ 1,227,713,708	5.9%
Total	\$20,709,153,594	100.0%

Although the tables above present estimates for taxes generated by city and county governments, the city and county where the tourists visit a California beach may not collect these revenues. In one recent study of Huntington Beach, it was estimated that 50% of all spending on beach-related activities occurred away from the City of Huntington Beach (King, 1999a). Given that the proportion of out-of-state visitors at Huntington Beach is lower than at many other beaches, we believe that this estimate is not excessively high, and may even be an underestimate. If we apply this 50% figure, then **only about 3% of all tax revenue generated by beach spending reaches city governments**, which provide police, lifeguard and other services for beach visitors as well as maintain beach infrastructure such as restrooms, parking lots, lifeguard structures and beach maintenance vehicles.

3.3.4 Valuing the Benefits of Beach Nourishment Projects

During the spring of 2000, the Department of Boating and Waterways commissioned a study of the economic benefits of specific beach projects across the state. The projects included repairs of existing protection structures, nourishment projects, and the creation of barrier structures designed to impede sand loss and reduce beach erosion. For each individual site, a survey sheet was created and individuals likely to be familiar with the site, such as state and municipal officials, park rangers, academics and consultants who had conducted recent surveys, were contacted by telephone or (in a few cases) on-site interviews.

The survey sheet was designed to collect: (1) attendance records and the methodology by which these estimates were obtained for the last several years; (2) the percentage of visitors who were local, on day trips, or from out of town staying overnight in local hotels or campgrounds; (3) the recreational activities and amenities available and a breakdown of the proportion of people engaged in these activities; (4) an assessment of the coastal protection issue (usually erosion) and an estimate of the rate of erosion and recent damages to state and municipal property; and (5) an assessment of public infrastructure (e.g., parking lots, bathrooms, lifeguard stations, stairways, public roads and sewer lines) threatened by erosion and the likelihood that these facilities would be damaged by various storm events.

Economic Value

Public properties, like beaches, are entities to which it is typically difficult to assign economic values. Unlike private property, most public property never changes hands and therefore has no market value. In addition, beaches, parks and wildlife refuges typically have open access (though a small parking fee may be assessed) so that one has difficulty determining the precise benefit to society of these goods. The study was limited in that it only considered direct recreational value.⁷

In assessing the recreational value of each site, the standard methodology employed is to assess a dollar value for each visit. This technique is employed by all branches of the federal government involved in valuing recreational activity, including the U.S. Army Corps of Engineers, the National Park Service, and the National Oceanic and Atmospheric Administration (NOAA), and is considered a standard tool for economists wishing to assess the value of a recreational site.

⁷ For beaches, parks and the other recreational sites, recreational value comprises most, but not all, of the value. Thus, it should be understood that the benefit estimates were probably too low and that the total benefits, which include non-use benefits, are somewhat higher. At some sites, where threatened wildlife such as the snowy plover exist, we have mentioned this, but we have not attempted to assess an economic value since doing so would require substantially more time and resources than were available for this project. Similarly, many citizens of California may wish to preserve beaches even if they never visit beaches themselves. It should also be mentioned that beaches give direct values to casual passers-by who may not visit the beach but visit nearby sites, or even just drive by. These values are also likely to be significant. Again, our estimates should be seen as lower bounds.

For each site, a value per visitor was developed. The value varies depending upon a number of factors: the type of activity, the quality of the site and the level of amenities, and the level of crowding at the site. Numerous studies of this type have been conducted. The most credible values were derived for the American Trader Case, which involved litigation from an oil spill off of Huntington Beach.⁸ Correcting for inflation, the value of a beach day was estimated at \$14.11 (2000 dollars). Please note that this value is conservative; it is actually slightly lower than the figure used by the Department of the Interior (\$14.57 in 2000 dollars) and significantly lower than the value determined by some other studies conducted by professional economists.⁹ Please note that this value also takes into account the crowded nature of many Southern California beaches.

Using the \$14.11 value as a baseline, we adjusted the values for each beach. The adjustment was made using a standard methodology employed by the Department of the Interior, NOAA and most state and local agencies.¹⁰

One must also adjust these beach values for the types of activities available at a site. Surfing, windsurfing and camping are all considered higher-value activities, because of the higher expense involved, and the scarcity of available sites for these activities. Surfing received a slightly higher value; wind surfing received a bit higher value, and camping received the highest value. The National Park Service estimates the value of camping overnight in a National Park at \$40 per person per day. In all cases, we used a lower number than \$40, adjusted for the quality of the site. Note also that we used much lower values per visitor for casual hiking and jogging.

Other Issues

For some sites, the loss of infrastructure is an issue. We relied primarily on estimates from local officials and engineering studies from the Army Corps of Engineers or local engineering-consulting firms for these values.

⁸ See "The American trader Oil Spill: A View from the Beaches," by Chapman, Haneman, and Ruud, 1998.

⁹ See, for example, "Recreational Use Value for Three Southern California Beaches," by Leeworthy and Wiley (1993) NOAA Strategic Environmental Assessments Division.

¹⁰ The National Parks Service, in "Benefit Estimation," describes this "benefits transfer" technique in more detail. This "benefits transfer" technique is widely used and accepted by resource economists. Using this technique, one ranks each site on a scale of 1-5 or 1-10 for various levels of amenities, such desirability and aesthetics of the location, number of recreational facilities available, level of overcrowding, etc. In most cases in this report, the key factors were the width and quality of the beach, accessibility of the beach, and other recreational facilities available. Note that the \$14.11 value used as a base is applied to beaches that are often crowded. It is difficult to find a beach in California with a high level of amenities that is not crowded on weekends. If such a beach did exist, it would likely command a higher valuation. In a number of cases where the beach had already eroded or where the amenity level was low, we assigned substantially lower values, from \$4 to \$10 a day per visitor. We also paid attention to the number of out-of-town visitors on day trips or overnight stays, who almost always place a significantly higher value on their beach trips than do locals.

Some of the values used and data obtained are from studies that are a few years old. To value these numbers properly, one must adjust for changes in the cost of living. The most widely used method for cost-of-living adjustments uses the U.S. Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) data. The BLS now has data for specific metropolitan regions in California going back to 1990, which we used when possible. If these data were not available or appropriate, we used the more general BLS index.¹¹

The Department of Boating and Waterways asked for an assessment of the value of beach projects over a 50-year period. This sort of evaluation requires that one discount future benefits. We used a real discount rate of 3.5%.¹² In many cases, however the benefits of the project will not last for 50 years. In the case of nourishment, we have assumed that the benefits diminish rather quickly (most of it disappears within 5 years). Even with these rapid rates of diminishment, many of the projects generate sufficient benefits to justify the costs. For groins, revetments and seawalls, we assumed that the projects would need to be rebuilt at a cost equal to 50% of their initial value (in 2000 dollars) paid in 2025.

Benefit/Cost Ratios

The benefit/cost ratios are shown in Table 3.14 below. **The results clearly show that beach restoration is a good investment, even if one considers only recreational value and damages to public infrastructure.** In general, any benefit/cost ratio above 1 represents a sound investment. As one can see in the table, in some cases these ratios are quite high, with a number well over 10:1.

¹¹ These data can be obtained at: www.bls.gov.

¹² The appropriate discount rate must take into account several criteria: (1) the rate at which a government agency may borrow; (2) the inflation rate; and (3) the likelihood that the amenity will increase in value at a higher rate than inflation. The state of California does not regularly issue bonds, but the U.S. government now issues inflation-adjusted bonds that serve as a good proxy for the “real” interest rate appropriate for discounting. The 2001 rate for long-term bonds is 3.8%. We have adjusted this number upward to account for slightly higher state borrowing costs; we use 4% for discounting losses to public infrastructure. For unique recreational sites like beaches, we believe that this methodology seriously underestimates the future value of these resources. Numerous studies indicate that individuals value natural (and man-made) recreational facilities at much higher rates as their income rises. Economists have found that the demand for recreational activities like beach visits increases roughly twice as fast as income. Thus, if real income increases by 2%, the value of a beach visit will increase by 4%. To incorporate some of this effect, we believe that it is appropriate to use a discount rate of 3.5% for recreational activities.

Table 3.14 Shoreline Protection Survey 2000

Location	Conceptual Project	Project Cost	Net Project Benefit	Benefit/Cost Ratio
Venice Beach	Groin repair (3)	\$ 2,000,000	\$130,270,671.81	65.14
Leo Carrillo State Beach	Retention structure/dune construction	\$ 170,000	\$ 8,310,900.24	48.89
Dockweiler Beach	Groin repair (2)	\$ 1,350,000	\$ 42,520,220.65	31.50
Topanga Beach	Seawall	\$ 630,000	\$ 8,798,226.74	13.97
East Beach	Groin repair (1)	\$ 1,500,000	\$ 17,379,719.00	11.59
Will Rogers Beach	Groin repair (6)	\$ 3,900,000	\$ 43,060,455.73	11.04
Pierpont Beach	Groin repair/beach nourishment	\$ 820,000	\$ 13,432,299.80	16.38
Hueneme Beach	Seawall	\$ 850,000	\$ 12,382,432.29	14.57
El Granada	Revetment	\$ 1,000,000	\$ 13,843,292.42	13.84
Beach Boulevard	Repair Rock toe	\$ 824,000	\$ 10,328,642.06	12.53
Carpinteria State Beach	Cobble berm	\$ 6,500,000	\$ 44,106,263.96	6.79
Pismo Beach	Beach nourishment/ retention structure	\$ 4,000,000	\$ 26,059,465.66	6.51
San Buenaventura	Groin repair	\$ 3,800,000	\$ 14,945,698.65	3.93
Beach Accessway	Revetment	\$ 50,000	\$ 187,382.83	3.75
El Capitan State Beach	Beach nourishment/retention	\$ 3,600,000	\$ 10,301,836.33	2.86
Ashby Interchange	Revetment	\$ 275,000	\$ 735,491.87	2.67
The Hook	Shotcrete retention wall	\$ 2,000,000	\$ 4,896,221.99	2.45
Refugio State Beach	Beach nourishment/retention	\$ 2,600,000	\$ 5,518,840.89	2.12
Coyote Point	Beach nourishment/retention	\$ 5,500,000	\$ 8,579,945.00	1.56
Twin Lakes Beach	Seawall	\$ 5,000,000	\$ 7,632,443.97	1.53
Surfers Point	Cobble berm/retention	\$ 7,700,000	\$ 10,820,353.53	1.41
Carlsbad State Beach	Beach nourishment	\$21,000,000	\$ 28,516,254.31	1.36
Hobson	Nourishment/retention	\$12,300,000	\$ 12,752,134.73	1.04
La Conchita	Nourishment/ retention	\$12,300,000	\$ 12,608,042.81	1.03
Dan Blocker Beach	Beach nourishment/retention	\$ 5,700,000	\$ 5,748,354.79	1.01
Leadbetter Beach	Seawall	\$ 2,360,000	\$ 1,474,537.15	0.62
Isla Vista	Beach nourishment/retention	\$13,700,000	\$ 6,781,239.88	0.49
Cayucos Beach	Seawall	\$ 820,000	\$ 372,877.80	0.45
Emeryville Marina	Revetment/ promenade	\$ 180,000	\$ 180,000	0.28

3.4 CASE STUDY: The Economic Impact of Beach Erosion on North San Diego County

Southern California beaches are crowded in summertime, particularly beaches with adequate facilities and good highway access. During the summer of 2000, a survey of beach goers was conducted, commissioned by the California Department of Boating and Waterways. The purpose of the survey was to estimate the factors that influence an individual's decision to attend a beach in Southern California. In particular, the survey attempted to assess the influence of crowding on the decision to go to a beach. All types of visitors were surveyed, including local, in-state and out-of-state visitors. Using these estimates, we projected the benefits derived from one specific beach nourishment project in north San Diego County. The main results of this study are contained in this section.

The most important factor examined was people's willingness to visit beaches as they become more crowded and as the sand depletes due to erosion. Given that most of the respondents were on summer vacation, the survey was simple. A number of beaches in San Diego, Santa Barbara, and Ventura were selected for study. Every attempt was made to get a representative sample; surveyors moved in a zigzag pattern across the beach, making sure that the overall demographics of the sample (in terms of age, ethnicity, and size of group) corresponded to the overall pattern of that beach. Roughly half of the responses were on weekend periods and half during the weekday, with a heavier concentration on Friday. The time of day and date of the response were recorded along with the responses.

The survey was given by groups of two, who introduced themselves and gave a brief summary of the purpose of the study and pointed out that the survey was conducted for the State of California through San Francisco State University (King, 2001). The results of the survey are presented below.

3.4.1 Beach Usage Survey

Table 3.15 presents the overall results of the survey for the most significant questions, which are listed below.

1. If this beach were twice as crowded as it is now, would you go as often or less often?
2. If this beach were half as wide as it is now, but just as crowded, would you go as often or less often?
3. If this beach were half as crowded as it is now, would you go as often or more often? If more often, how many more days?
4. If parking were easier, would you go as often or more often? If more often, how many more days?

5. If it took you half as much time to get to the beach, would you go as often or more often? If more often, how many more days?
6. If restroom facilities were easy to access, would you go as often or more often? If more often, how many more days?

Table 3.15 Summary of Beach Usage Survey Data

Question	Weighted Means for All Beaches (%)
If it was twice as crowded...?	-24.78
If it was half as wide...?	-29.02
If it was half as crowded...?	6.13
If parking were easier....?	17.18
If it took half the time....?	34.38
If restrooms...	2.49

Source: King (2001)

The weighted¹³ means are presented in percentage terms relative to current attendance. Please note that these are averages for the entire sample and some answers vary significantly depending upon the beach or the user. These differences will be discussed below.

As one can see from table 3.15, crowding and beach width are important considerations for beach attendance. **If beaches were twice as crowded as they are now, the average visitor would decrease his or her attendance by about 25%. Beach width appears to be even more important; if the average beach were half as wide, visitors would decrease their attendance by 29%.** Time is the most important factor; if people could access the beach in half as much time, their visitation would increase by 35%. Finally, parking is a factor for some; if parking were easy, attendance would increase by 17%, but as we will see later, responses here vary considerably, depending upon local parking. Restroom access does not appear to be a factor, except perhaps at one beach (discussed below). Conversations with beach goers indicate they are mostly dissatisfied with the cleanliness and availability of bathrooms, but when asked if cleaner

¹³ For each party, the first question was “How many people are in your group?” Although people were asked if everyone in the group had the same preferences, clearly all individuals differ. It is reasonable to conclude that the answers for large groups should be weighted higher than small groups, but not proportionately so, since the error term for responses in large groups will be higher (commonly referred to as heteroskedasticity). Thus, each observation was multiplied by the square root of n, where n represents the number in each group. The unweighted averages are presented in the appendix and do not differ significantly.

or more accessible restrooms would influence their decision to visit, all but a small percentage (2.5%) say it wouldn't.

3.4.2 The Economic Impact of Beach Erosion in North San Diego County

Beach erosion is particularly severe in north San Diego County, especially at the beaches between Oceanside and Del Mar. Some of these beaches are already eroded to the point where, at high tide, no beach, or at best only a few yards of beach, are left. Although the exact rate of erosion depends upon storms and other natural events, it is clear that the beach is eroding and within ten years there will be a substantial loss. This section will quantify the loss in terms of attendance and tax dollars lost. Sustaining current beach widths yields substantial benefits.

Table 3.16 Attendance at Major North San Diego County Beaches

Beach	Annual Attendance (thousands)	% Day Visitors	% Overnight Visitors
Carlsbad City and State	1,200	70	30
Beacons (Encinitas)	438	90	10
Stone Steps (Encinitas)	292	90	10
Moonlight (Encinitas)	2,263	70	30
San Elijo (Solana)	325	90	10
Cardiff (Solana)	175	90	10
Del Mar	1,560	70	30
Torrey Pines State	700	70	30
Torrey Pines City	750	75	25
Total (or Avg. %)	7,703	73.7	26.3

Table 3.16 gives the official attendance numbers for the most recent full year (2000) at major north San Diego county beaches, including the breakdown between day-use and overnight visitors. The information was obtained from city officials and from the California Department of Parks and Recreation. Overall, the area receives close to eight million beach visitors annually; just over 25% of visitors stay overnight at local hotels and condominiums.

Using the figures for spending for day trips and overnight trips presented in the preceding section, Table 3.17 estimates the expenditures at each beach in 2001 dollars. The total estimated expenditures are just over half a billion dollars per year: \$562 million.

Table 3.17 Expenditures at Major North San Diego County Beaches

Beach	Annual Attendance (thousands)	% Day Use	% Overnight Use	Estimated Expenditures Day Trips	Estimated Expenditures Overnight Trips	Total Expenditures
Carlsbad City and State	1,200	70	30	\$ 30,936,150	\$ 62,763,228	\$ 93,699,378
Beacons (Encinitas)	438	90	10	\$ 14,517,893	\$ 7,636,192	\$ 22,154,085
Stone Steps (Encinitas)	292	90	10	\$ 9,678,595	\$ 5,090,795	\$ 14,769,390
Moonlight (Encinitas)	2,263	70	30	\$ 58,340,422	\$118,360,987	\$176,701,410
San Elijo (Solana)	325	90	10	\$ 10,772,409	\$ 5,666,124	\$ 16,438,534
Cardiff (Solana)	175	90	10	\$ 5,800,528	\$ 3,050,990	\$ 8,851,518
Del Mar	1,560	70	30	\$ 40,216,995	\$ 81,592,196	\$121,809,191
Torrey Pines State	700	70	30	\$ 18,046,087	\$ 36,611,883	\$ 54,657,970
Torrey Pines City	750	75	25	\$ 20,716,171	\$ 32,689,181	\$ 53,405,353
Total (or Avg. %)	7,703	73.7	26.3	\$209,025,253	\$353,461,579	\$562,486,832

To estimate the future attendance at these beaches, we adjusted for future population increases using projections from the California Department of Finance, which projects that the population of San Diego will grow by 1.56% per year over the next ten years while the state population will grow at a slightly slower rate: 1.42%.¹⁴ Since visitors to San Diego come from all over the state (and from other states), but are more likely to be local, we used an average population increase of 1.49%.

The second factor accounted for was erosion and the effects of crowding. We assume that, without maintenance, the beaches in north San Diego will erode at 3% per year. It should be noted that this is not a forecast, but a scenario based on interviews with a number of coastal engineers, geologists and other consultants familiar with the area. It should also be stressed that erosion does not occur in a uniform manner, but can be severe at one beach (e.g., Carlsbad) and subtler at another beach. Please note that these differences will only exacerbate our estimates and we believe that this scenario is both plausible and credible given our current limited knowledge of erosion at these beaches.

Even without erosion, beaches in San Diego County will become more crowded due to increases in the population. Further, our survey results indicate two distinct issues: **(1) beach visitors, with very few exceptions, would prefer it if California's beaches were less crowded, and in particular, many said that further crowding would discourage them from visiting; (2) at already-narrow beaches like Carlsbad, many people responded that further erosion would**

¹⁴ California Department of Finance, 1998. *County Population Projections with Age, Sex, and Race/Ethnic Detail*. Sacramento California, December.

deter them from visiting, even if the density of the crowds was maintained. These effects can be analyzed using a concept economists refer to as elasticity. We estimated two elasticities:

1. the elasticity of demand with respect to crowding, which measures the percentage change in visitor demand as the beach becomes more crowded, and
2. the elasticity of demand with respect to beach width, which measures the percentage change in visitor demand as the beach becomes narrower, holding the density of visitors constant.

Both of these elasticities are negative—as beaches become more crowded and narrower, people are less likely to go. Our results also indicate that visitors in north San Diego County are particularly sensitive to both these issues, far more than at the beaches surveyed in other counties (and by a statistically-significant amount). This result is not surprising, given the already-narrow width of these beaches.

- For our calculations, we used the average percentage for all state beaches surveyed in Southern California. Note that respondents at eroded beaches (such as those in north San Diego County) actually had higher values—so our estimate is conservative.
- We estimate that the elasticity of demand with respect to crowding is (-0.3) ; if the beach becomes twice as crowded (a 100% increase) people will reduce their visits by 30%.
- We estimate that the elasticity of demand with respect to beach width is much higher: 0.7. If the beach becomes half as wide (a 50% decrease) people will reduce their visits by 35%.

Using these estimates of elasticity, Table 3.18 presents our best estimates for attendance at beaches in north San Diego County given two different scenarios.

- In the first scenario, the current beach width will be maintained; given increases in population; this implies more crowding.
- Scenario two examines attendance if erosion occurs at a constant rate of 3% a year. While erosion does not occur at a constant rate, the overall estimates are quite reasonable and conservative, given the rapid rate of erosion on some of these beaches.

Our estimates indicate that sustaining beach width will provide the opportunity for an additional 49.7 million beach visits over ten years in north San Diego County alone.

Table 3.18 Estimated Attendance if Width Maintained Versus Width Reduced

Year	Attendance if Width Maintained	Attendance with Erosion
2000	7,703,000	
2001	7,803,832	6,438,162
2002	7,905,984	5,484,777
2003	8,009,474	4,768,140
2004	8,114,318	4,231,490
2005	8,220,534	3,831,700
2006	8,328,141	3,536,003
2007	8,437,156	3,319,504
2008	8,547,599	3,163,287
2009	8,659,487	3,052,982
2010	8,772,839	2,977,672
Total	90,502,365	40,803,718
Attendance Loss		49,698,647

Naturally, differences in attendance will generate differences in spending and taxes. Table 3.19 presents estimates of total spending at beaches in north San Diego County with current beach width sustained and with erosion. We estimate a loss of over \$2.8 billion in spending (undiscounted). The loss in tax revenues estimated are also substantial—over a billion dollars in revenue. The present value of state, local and federal taxes lost is estimated at \$851 million. In other words, sustaining current beach widths in north San Diego County alone will generate a present value of \$851 million in tax revenue over the next ten years for the state. Please note that these figures do not include enhanced property values to owners of private property who may also benefit from beach restoration.¹⁵

¹⁵ We use the attendance numbers presented in Table 3.18. We assume real spending per visitor will increase by 2.5% per year and we discount at a 5% rate. All values are in 2001 dollars.

Table 3.19 Total Spending with Beach Width Sustained Versus with Erosion

Total Spending if Width Maintained	\$6,608,156,828
Total Spending if Beach Erodes	\$3,734,894,441
Loss in Spending	\$2,873,262,386

Table 3.20 Estimated Taxes (2000-2010) With and Without Beach Maintenance

Type of Tax	Width Maintained	Erosion	Reduction in Tax
State Taxes	\$ 498,854,151	\$ 289,058,401	\$ 209,795,750
Federal Taxes	\$1,292,558,814	\$ 748,966,373	\$ 543,592,441
Local Taxes	\$ 232,894,556	\$ 134,949,519	\$ 97,945,037
Total	\$2,024,307,521	\$1,172,974,293	\$ 851,333,228

3.5 Other Benefits Associated with Beach Nourishment

3.5.1 Environmental Benefits

California's beaches provide habitat for numerous species both onshore and offshore. Species dwelling in sandy beach habitats also provide an important source of food for shorebirds, seabirds, marine mammals and fishes. Among the species supported by California beach habitats are two endangered bird species: the least tern and the western snowy plover. Sandy beach habitat is also crucial for one fish species, the California grunion, which lays its eggs in the sand.¹⁶ Dugan found that exposed sandy beaches in Southern California "harbor a high diversity, abundance, and biomass of macroinvertebrate species" and are generally richer, in terms of biodiversity, than similar beaches elsewhere in the world, in particular, in Africa, Australia, Chile, and Oregon.¹⁷

By preserving sandy beaches, beach nourishment projects aid in the preservation of species, such as the snowy plover, grunion, and least tern, that are dependant on this particular type of habitat. The U.S. Department of the Interior has identified 157 current or historical breeding grounds for the snowy plover; of these, 133 are on California beaches.¹⁸ It is not possible to quantify the exact benefit, but there would be a significant benefit from beach nourishment to the snowy plover and some other wildlife dependent upon beaches.

¹⁶ See Dugan, Jennifer, et al., unpublished. *Microfauna Communities of Exposed Sandy Beaches on the Southern California Mainland and Channel Islands*.

¹⁷ *Ibid.*

¹⁸ See "Designation of Critical; Habitat for Pacific Coast Population of the Western Snowy Plover," Department of the Interior, *Federal Register*, December 7, 1999.

Though beach nourishment projects do disturb some species, notably those that reside in the sand or reefs and are relatively immobile (e.g. some small crabs), the limited research on the effects of nourishment indicate that any damage is temporary—the communities revive. Further, several studies in the southern United States indicate that nourishment projects may benefit certain threatened plant and animal species by enlarging and creating habitat.¹⁹ Nourishment projects are designed to minimize any environmental impacts on local species. For example, no project will be conducted when grunion are spawning.

In addition, beaches provide an important form of outdoor recreational activity for humans, particularly in southern California, where parks, lakes and other outdoor recreational opportunities are already stressed. Numerous studies indicate that people who engage in outdoor activity are more likely to be sensitive to environmental issues, compared to people who do not recreate outdoors.²⁰

3.5.2 Public Safety Benefits

Beach nourishment also provides a number of collateral public safety benefits to residents and visitors. Wide beaches can minimize bluff collapse, which can lead to injuries and loss of life, particularly during storms. Nourished beaches provide a buffer against damaging storm waves. California experiences numerous severe storms every decade, and the benefits of beaches in mitigating the effects of storm waves are well documented. Beach nourishment provides a sandy bottom for recreational swimmers and surfers, which reduces foot and other injuries caused by wading on rocky shores. Finally, in areas where erosion has completely worn away sandy beaches, a nourishment project can provide safer access to the water; this is a particular issue for surfers, who often wade in from rocky areas.

¹⁹ See National Research Council, 1995. *Beach Nourishment and Protection*. Washington, D.C. National Academy Press.

²⁰ For example, see American Recreation Coalition, 1999. *Outdoor Recreation in America*. www.funoutdoors.com/research.html.

3.6 Conclusions

Recreation is becoming an increasingly important source of spending for Americans and beaches represent one of the most important forms of outdoor recreation in California. A statewide survey indicates that 67% of all residents go to the beach at least once a year and many go much more often. Including out-of-state attendance, we estimate that, in 2001, California experienced 659 million visitor days. Further, total spending on beach-related leisure, tourism and recreation amounted to \$61.3 billion in 2001; out-of-state and foreign visitors accounted for 36.4% of this spending.

California's beaches generate an enormous amount of tax revenue for the federal government and for the State of California. We estimate that beaches in the state generate \$13.6 billion in federal tax revenues, 66% of the total tax generated, and \$4.6 billion in state taxes, 22% of all taxes generated by beach spending. Although precise estimates of local taxes generated are difficult to estimate, local taxes generated are significantly smaller than state or federal taxes. California city and county taxes are roughly 12% of all taxes. However, the benefits to local communities are smaller than benefits to either the state or federal government, since approximately half of all beach-related spending occurs away from the beach community. If we account for this factor and consider city taxes, only about 3% of all taxes generated go to local communities, who must provide a substantial amount of increased services to beach visitors, such as police and lifeguards.

A large number of beach-related projects provide significant economic benefits to the state (King, 2000). In many cases, the ratio of benefits to costs for these projects was greater than ten to one.

Overcrowding is becoming a serious problem at southern California beaches. In a survey conducted in summer 2000, most people indicated that the beaches were overcrowded, and they would reduce their attendance if the crowds continued. In the case of north San Diego County, where many beaches are already severely eroded and continuing to erode, we estimate that the state will lose \$210 million in tax revenues if beaches erode beyond their current width. If one includes all tax revenues, the loss is estimated at \$851 million.

California's beaches also provide habitat for numerous species both onshore and offshore. Dugan found that exposed sandy beaches in southern California "harbor a high diversity, abundance, and biomass of macroinvertebrate species" and are generally richer, in terms of biodiversity, than similar beaches elsewhere in the world, in particular, in Africa, Australia, Chile, and Oregon. By preserving sandy beaches, beach nourishment projects aid in the preservation of species, such as the snowy plover, grunion, and least tern. In addition, beaches provide an important form of outdoor recreational activity for humans, particularly in southern California, where parks, lakes

and other outdoor recreational opportunities are already stressed. Numerous studies indicate that people who engage in outdoor activity are more likely to be sensitive to environmental issues, compared to people who do not recreate outdoors.

3.7 References

American Recreation Coalition, 1999. Outdoor Recreation in America.

www.funoutdoors.com/research.html

Bishop, Glenn, 1998. "Outdoor Recreation in America". *Journal of Leisure Studies*. Spring. pp. 281-286.

Bureau of Labor Statistics (U.S.), 2000. Consumer Price Index Data. Available at www.bls.gov.

California Department of Finance, 1998. *County Population Projections with Age, Sex, and Race/Ethnic Detail*. Sacramento, California.

http://www.dof.ca.gov/html/Demograp/Proj_age.htm

California Department of Finance, 2000. *California Statistical Abstract*. Sacramento, California: State of California.

California Department of Parks and Recreation. <http://parks.ca.gov/default.asp>.

Chapman, D., Hanemann, M., and Ruud, P., 1998 (unpublished). "The American Trader Oil Spill: A View from the Beaches"

Costa, Dora, 1997. *Less of a Luxury: The Rise of Recreation since 1888*. National Bureau of Economic Research. Working Paper 6054. May 1997. www.nber.org/papers/w6054

Costa, Dora, 1999. *American Living Standards: Evidence from Recreational Expenditures*. National Bureau of Economic Research. Working Paper 7148. May 1999. www.nber.org/papers/w7148

Department of the Interior (U.S.), 1999. "Designation of Critical Habitat for Pacific Coast Population of the Western Snowy Plover," Department of the Interior, *Federal Register*, December 7, 1999.

Dirksen, D., Dirksen, J. and McKinney, J., 1999. *Recreation Lakes of California*. Recreation Sales Publishing. Aptos, CA.

Dugan, Jenifer E.; Hubbard, D. M.; Daniel L. Martin, D. L.; Engle, J. M.; Richards, D. M.; Davis, G. E.; Lafferty, K. D.; and R. F. Ambrose (unpublished). Microfauna

Communities of Exposed Sandy Beaches on the Southern California Mainland and Channel Islands.

Economic Report of the President, 2001. Government Printing Office.

http://w3.access.gpo.gov/usbudget/fy2002/pdf/2001_erp.pdf

King, Philip G. and Potepan, Michael, 1997. *The Economic Value of California's Beaches*. San Francisco State University: Public Research Institute.

King, Philip G., 1999. *The Fiscal Impact of Beaches in California*. San Francisco State University: Public Research Institute.

King, Philip G., 2001. *Overcrowding and the Demand for Beaches in Southern California*, San Francisco State University.

Leeworthy and Wiley, 1993. *Recreational Use Value for Three Southern California Beaches*. NOAA Strategic Environmental Assessments Division.

Marano, Hara, 1999. "The Power of Play". *Psychology Today*. July. p 36.

National Park Service. *Benefits Estimation*. No longer available.

National Research Council, 1995. *Beach Nourishment and Protection*. Washington, D.C. National Academy Press.

U.S. Department of Commerce, 2000. *United States Census 2000*.

U.S. Department of Commerce, 2001. *Statistical Abstract of the U.S.*

U.S. Army Corps of Engineers. Various Reconnaissance Reports.