Overcrowding and the Demand for Beaches

in Southern California

A Report prepared for the Department of Boating and Waterways

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Executive Summary

- California's beaches are reaching their maximum capacity. Our results indicate that beach visitors will reduce their attendance by 25% as beaches become more crowded due to erosion and population growth in California.

- Even controlling for crowding, the width of a beach is important to many visitors, especially at narrow, eroding beaches like Carlsbad State beach. Our survey indicates that people would be 29% less likely to visit a beach that is half as wide; please note that this estimate is significantly higher at narrow beaches.

- Applying the results of this survey to north San Diego County, we find that a failure to maintain current beach width will reduce attendance by 4.4 million over ten years resulting in a loss of $257 million in spending, $18.9 million in state tax revenues and $29 million in state and local tax revenues.

- If beach width is increased in relation to population, attendance will increase by 6.4 million, local business revenues will increase by $373 million resulting in an increase of $29 million in state taxes and $42 million in state and local taxes over the next ten years.

- Other overcrowded beaches in southern and northern California can also expect a similar substantial loss in business revenues and state and local taxes due to beach erosion.

- The time it takes to get to the beach is an important concern for people. Our survey estimates that people would attend 35% more often if it took half as much time to reach the beach.

- Parking is a concern at a few beaches, particularly on weekends.

- Many people expressed concern about the quality and availability of restrooms at state beaches, but these factors do not significantly effect people's decisions to attend a beach.

Introduction

This report presents the results from a survey of beach goers in San Diego, Santa Barbara, and Ventura counties conducted at the end of July and the beginning of August 2000. The purpose of the survey was to estimate which factors influence individual's decisions to attend a beach in Southern California. We surveyed all visitors, including local, in-state and out-of-state visitors. Using these estimates, the report also provides projections of the benefits derived from one specific beach nourishment project in North San Diego County.

The most important factor examined was people's willingness to visit beaches as they become more crowded and as the sand recedes due to erosion. A number of beaches in Southern California will erode over the next twenty to forty years unless the shoreline is protected or nourished. During the same period, California's population is expected to increase significantly. As one can see in Table 1 below, according to the state's own projections, California's population will grow by 69% from 2000 to 2040. Over the same time period, San Diego County will grow slightly faster than the state average, by just over 75%. Thus even were California's beaches to retain their current width, one would expect substantially more crowding.

Table 1: Population Projections (millions) for California and San Diego County			
Year	2000	2020	2040
State	34.7	45.4	58.7
San Diego County	2.9	3.9	5.1
State of California, Department of Finance, *County Population Projections with Age, Sex, and Race/Ethnic Detail*. Sacramento California, December 1998.			

In addition to the formal survey (to be discussed below) the surveyors collected a great deal of informal data from discussions with various beach goers. While this data cannot be presented in a formal quantitative manner, comments that were made frequently at specific beaches will also be presented, as a way of presenting logical interpretations of the data.

Methodology

Given that the respondents were mostly on summer vacation, the survey instrument was kept deliberately simple. A list of seven or eight questions was given to each respondent. Respondents had a choice: they could read off a laminated sheet of paper or have the questions read to them. The questions asked where they live (by zip code), how often they attended and how their attendance was likely to change depending upon the time it took to get to the beach, the level of overcrowding, beach width, and, in some cases, the

availability of restroom facilities. Respondents were allowed to give answers to these questions in days or percentage terms (e.g., if a respondent went to a beach in California fourteen days per year, but would only attend half as much if the beach were twice as crowded, then he could respond 50% less or seven fewer days or he would now go a total of seven days). Most people were in groups; the surveyors asked if members of the group had the same preferences and lived in the same area. If they did not, individual groups were surveyed separately or eliminated from the sample.

A short survey was developed and pre-tested at Mission Beach on a Saturday in July. In the pre-test, respondents were asked not only to respond to the question, but to give the surveyors feedback on the wording of questions and suggest other important issues that might be surveyed. After analyzing the results from the pre-test, the instrument was refined and questions were added and subtracted. A couple of minor changes were also made after the first few days of surveying.

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 of Friday. The time of day and date of the response was 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 and through San Francisco State University. Dr King conducted the survey, assisted by Kim Sterrett as well as two research assistants. The data was compiled, entered in *Excel* and analyzed using an econometric software package: *Stata*. The results of the survey are presented below.

Results of the Survey

Table two presents the overall results of the survey for the most significant questions:

1. If this beach were twice as crowded as it is now, would you go as often or more often? If more often, how many days?

2. If this beach were half as wide as it is now, but just as crowded, would you go as often or more often? If more often, how many days?

3. If this beach were half as crowded as it is now, would you go as often or less often? If less often, how many days?

4. If parking were easy, would you go as often or more often? If more often, how many 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 days?

6. If restroom facilities were easy to access, would you go as often or more often? If more often, how many days?

Table 2: Overall Summary of 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 ½ as Crowded…?	6.13
If Parking were easier….?	17.18
If it took half the time….?	34.38
If restrooms…	2.49

The weighted[1] 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 two, 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 or more accessible restrooms would influence their decision to visit, all but a small percentage (2.5%) say it wouldn't.

The average number of beach days was twenty-nine, a relatively high number, but the distribution was skewed—a small number of people (almost all locals) visited the beach from one hundred to two hundred days per year. In this case, the median number of days visited, twelve, gives a better impression of the sample.

Do survey responses vary depending on the level of crowding?

One natural response to the above result would be to ask if people located at beaches that are more crowded are more sensitive to crowding, parking, or other issues than people at

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[1] For each party, the first question is "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.

less crowded beaches, or if people who attend on weekends (when beaches are more crowded) are more sensitive to crowding. To answer this question, we stratified the sample by including a dummy variable for level of crowding and whether the survey was conducted on a weekday (Monday through Friday) or on a weekend. For the level of crowding the sample was divided into three segments, roughly equal in size:

1. Crowded, implying roughly five to seven square meters per person[2]; in this case there is little space between beach blankets;

2. Moderately crowded, roughly seven to twelve square meters per person;

3. Relatively uncrowded, implying more than twelve square meters per person.

Tables three through five present the results for each of these groups. As one can see the results are surprisingly uniform and statistically insignificant. While at first this result seems puzzling, our conversations with beach goers indicate the likely reason for this result: beachgoers who are particularly sensitive to crowding tend to go to less crowded beaches. In addition, a very small number of respondents (all teenagers at either Mission beach or Laguna beach) indicated that they went to the beach for the crowd.

Table 3: Overall Summary of Data for Crowded Beaches	
Question	**Weighted Means for All Beaches**
If it was twice as crowded…?	-25.05
If it was half as wide…?	-30.30
If it was ½ as Crowded…?	6.35
If Parking were easier….?	18.83
If it took half the time….?	39.36
If restrooms…	3.00

Table 4: Overall Summary of Data for Moderately Crowded Beaches	
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 ½ as Crowded…?	6.13
If Parking were easier….?	17.18
If it took half the time….?	34.38
If restrooms…	2.49

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[2] No precise measurement was taken but the qualitative distinction between these three groups was clear.

Table 5: Overall Summary of Data for Relatively Uncrowded Beaches	
Question	**Weighted Means for All Beaches**
If it was twice as crowded…?	-26.73
If it was half as wide…?	-31.04
If it was ½ as Crowded…?	6.59
If Parking were easier….?	18.62
If it took half the time….?	35.98
If restrooms…	2.65

When the sample was divided between weekend and non-weekend attendance, the results are similar. Although one can detect a slight difference—weekend goers are more sensitive to parking and crowding, the results are, again, statistically insignificant.

Table 6: Overall Summary of Data for Weekends	
Question	**Weighted Means for All Beaches**
If it was twice as crowded…?	-25.31
If it was half as wide…?	-30.61
If it was ½ as Crowded…?	6.71
If Parking were easier….?	19.44
If it took half the time….?	38.92
If restrooms…	3.20

Table 7: Overall Summary of Data for Weekdays	
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 ½ as Crowded…?	6.13
If Parking were easier….?	17.18
If it took half the time….?	34.38
If restrooms…	2.49

Are people who go to the beach less often more sensitive to crowding?

Yet another way of observing this data is to ask if people who go to the beach less often are more sensitive to overcrowding. Given that California's beaches are already crowded, particularly on weekends, it seems logical that people who go less often do so

partly because they are more sensitive to crowds.[3] To examine this issue we divide the sample at the median number of beach days (twelve). The following tables report the weighted means below and above the median number of beach days.

Table 8: Respondents below the Median Number of Beach Days	
Question	**Weighted Means for All Beaches**
If it was twice as crowded…?	-26.44
If it was half as wide…?	-31.6
If it was ½ as Crowded…?	7.09
If Parking were easier….?	19.9
If it took half the time….?	38.77
If restrooms…	2.87

Table 9: Respondents above the Median Number of Beach Days	
Question	**Weighted Means for All Beaches**
If it was twice as crowded…?	-20.37
If it was half as wide…?	-29.55
If it was ½ as Crowded…?	6.64
If Parking were easier….?	34.42
If it took half the time….?	55.38
If restrooms…	0

As one can see, on three questions, if the beach was twice as crowded, if parking were easier, and if restrooms were available, there are noticeable differences. These differences were statistically significant.[4]

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[3] This issue is important for another critical reason. If people who are more sensitive to crowding go less often, our sample will contain selection bias— it will over-represent people who are insensitive to crowding and under-represent people who are more sensitive. Our data indicates that the selection bias, if it exists, is small. Since no statistically significant difference between these groups was found for most responses, it should be noted, but ignored.   Thus it is reasonable to conclude our results may err on the conservative side—possibly underestimating the effect of crowding, but only slightly (by a percentage point or two).

[4] To test the effect we chose the answer to the question: "If this beach were twice as crowded as it is now, would you go as often or more often? If more often, how many days?" as the dependent variable and chose the level of crowding, whether it was a weekend or not, and the number of days a visitor attended as independent variables. The number of days and whether it was a weekend or not had a small but statistically significant influence.

Differences between Beaches

Finally, one might expect different responses to survey questions asked at different beaches. While some of these differences may be due to demographics or selection bias, or simply due to a small sample, it is instructive to point out where differences appear to exist. The tables below are for beaches surveyed with a sample size greater than twenty responses.

Mission Beach: Despite the crowding at Mission Beach, the visitors sensitivity to crowding and beach width were close to the overall mean. Parking is, however, a serious issue restraining access[5] as is accessibility. Respondents at Carlsbad were asked an additional question: "If there were wide sandy beaches in Solana Beach, Encinitas, and Carlsbad, would you go there more often? If so, how many days a year? How many fewer days a year would you go to beaches in San Diego?"

The responses were converted to percentage terms; overall, widening of Beaches in North San Diego County would, we estimate, shift 12% of current attendance away from Mission beach.

Question	Weighted Means for Mission Beach
If it was twice as crowded…?	-20
If it was half as wide…?	-30
If it was ½ as Crowded…?	6.6
If Parking were easier….?	34
If it took half the time….?	55
If beaches available in Carlsbad, would you go there?	12.7

Imperial Beach: Visitors here are somewhat less sensitive to crowding, but slightly more sensitive to beach width. Few would go to North San Diego County.

Question	Weighted Means for Imperial Beach
If it was twice as crowded…?	-9.7
If it was half as wide…?	-35
If it was ½ as Crowded…?	.14
If Parking were easier….?	18
If it took half the time….?	23
If beaches available in Carlsbad, would you go there?	2.2

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[5] Given the level of crowding at Mission beach, however, adding more parking may not be desirable, though it would increase attendance.

Oceanside Beach: Visitors to Oceanside were somewhat more sensitive to crowding, parking and the time it took to get to the beach than average. Although surveys were taken on a weekend and a weekday, the weekend component is larger, which may account for some of the difference. In addition, the beach has a large number of day-trippers, which were the most sensitive to crowding.

Question	Weighted Means for Oceanside Beach
If it was twice as crowded…?	-36
If it was half as wide…?	-32
If it was ½ as Crowded…?	8.1
If Parking were easier….?	22
If it took half the time….?	54
If restrooms…	6

Carlsbad City and State Beaches: Much of the beach here has already eroded, so it is not surprising that visitors here are more sensitive to crowding and beach width than anyone else in this sample.

Question	Weighted Means for Carlsbad City Beach
If it was twice as crowded…?	-40
If it was half as wide…?	-37
If it was ½ as Crowded…?	6.6
If Parking were easier….?	12.3
If it took half the time….?	17
If restrooms…	10.5

Question	Weighted Means for Carlsbad State Beach
If it was twice as crowded…?	-47
If it was half as wide…?	-50
If it was ½ as Crowded…?	16
If Parking were easier….?	6.5
If it took half the time….?	66
If restrooms…	4.2

La Jolla: The survey was conducted on a crowded, sunny Friday afternoon and indicate that parking and access are serious concerns at this beach.

Question	Weighted Means for La Jolla Beach
If it was twice as crowded…?	-31
If it was half as wide…?	-29
If it was ½ as Crowded…?	19
If Parking were easier….?	48
If it took half the time….?	77
If beaches available in Carlsbad, would you go there?	13.3

Coronado Beach: Coronado is relatively uncrowded, and visitors seem slightly less sensitive to crowding.

Question	Weighted Means for Coronado Beach
If it was twice as crowded…?	-21
If it was half as wide…?	-25
If it was ½ as Crowded…?	1
If Parking were easier….?	9.3
If it took half the time….?	46
If beaches available in Carlsbad, would you go there?	15.6

Del Mar Beach: Results here were fairly typical, with somewhat more sensitivity to crowding.

Question	Weighted Means for Del Mar Beach
If it was twice as crowded…?	-39
If it was half as wide…?	-37
If it was ½ as Crowded…?	8.4
If Parking were easier….?	17
If it took half the time….?	10
If beaches available in Carlsbad, would you go there?	3

Part II: The Economic Impact of Beach Erosion in North San Diego County

The second part of this report will examine one area where beach erosion is particularly severe: North San Diego County, specifically, the beaches between Oceanside and Del Mar. Some of these beaches, for example Carlsbad City and State beach, are already seriously eroded to the point where at high tide 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.

Table A: Attendance at Major North San Diego County Beaches			
Beach	**Annual Attendance (thousands)**	**% Day Use**	**% Overnight Use**
Carlsbad City and State	1200	70	30
Beacons (Encinitas)	438	90	10
Stone Steps (Encinitas)	292	90	10
Moonlight (Encinitas)	2,263	70	30
San Elijo (Solano)	325	90	10
Cardiff (Solano)	175	90	10
Del Mar	1,560	70	30
Torrey Pines State	700	70	30
Torrey Pines City	750	75	25
Total (or Avg. %)	**7703**	**73.7**	**26.3**

Table A 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.

To compute the economic impact, one needs information on spending patterns for beach-goers. The data used was obtained from a telephone survey conducted through the Public Research Institute at San Francisco State University in 1995. The data has been updated for inflation and changes in income. Our data indicates that the average household spends $505 on an overnight trip and $106 per household on day trips. Keep in mind this data is for households, whose average size is just under 3.[6]

Using these figures for spending and adjusting attendance (which is for individuals, not households) Table B estimates the expenditures at each beach in 2001 dollars. As one can see, the total expenditures are just over half a billion dollars per year: $562 million.

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[6] According to the *California Statistical Abstract*, the average household size in California when the survey was conducted was 2.96.

Table B: 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	1200	70	30	$30,936,150.00	$62,763,228.00	$93,699,378.00
Beacons (Encinitas)	438	90	10	$14,517,893.25	$7,636,192.74	$22,154,085.99
Stone Steps (Encinitas)	292	90	10	$9,678,595.50	$5,090,795.16	$14,769,390.66
Moonlight (Encinitas)	2,263	70	30	$58,340,422.88	$118,360,987.47	$176,701,410.35
San Elijo (Solano)	325	90	10	$10,772,409.38	$5,666,124.75	$16,438,534.13
Cardiff (Solano)	175	90	10	$5,800,528.13	$3,050,990.25	$8,851,518.38
Del Mar	1,560	70	30	$40,216,995.00	$81,592,196.40	$121,809,191.40
Torrey Pines State	700	70	30	$18,046,087.50	$36,611,883.00	$54,657,970.50
Torrey Pines City	750	75	25	$20,716,171.88	$32,689,181.25	$53,405,353.13
Total (or Avg. %)	7703	73.7	26.3	$209,025,253.50	$353,461,579.02	$562,486,832.52

To estimate the future attendance at these beaches, we must take several factors into account. First, California and San Diego County will experience substantial population increase in the next ten years. The California Department of Finance projects 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%.[7] Since visitors to San Diego come from all over the state (and from other states), but are more likely to be local, we will use an average population increase of 1.49%.

The second factor we must account for is erosion and the effects of crowding. Fortunately, we can use our survey data, coupled with a reasonable set of scenarios for erosion. 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 almost unnoticeable 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 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:

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[7] State of California, Department of Finance, County Population Projections with Age, Sex, and Race/Ethnic Detail. Sacramento California, December 1998.

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.

As one would expect, both 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 other beaches (and by a statistically significant amount). This result is not surprising, given the narrow width of these beaches already.

For our calculations, we chose a weighted average of north San Diego County and other beaches we visited in southern California.

- 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 (–0.33: if the beach becomes half as wide (a 50% decrease) people will reduce their visits by 16.5%.

	Table C: Estimated Attendance with Differing Beach Widths		
Year	Attendance if Width grows with Population	Attendance with Erosion	Attendance if Width Maintained
2001	7,818,928	7,706,308.18	7,784,150
2002	7,936,601	7,709,976.88	7,866,521
2003	8,056,045	7,714,004.41	7,950,131
2004	8,177,286	7,718,389.13	8,035,000
2005	8,300,352	7,723,129.41	8,121,146
2006	8,425,270	7,728,223.65	8,208,589
2007	8,552,068	7,733,670.29	8,297,348
2008	8,680,775	7,739,467.76	8,387,442
2009	8,811,418	7,745,614.56	8,478,893
2010	8,944,027	7,752,109.17	8,571,719
Total	83,702,770	77,270,893.43	81,700,939
Increase	6,431,876	-	4,430,045

Using these estimates of elasticity, table C presents our best estimates for attendance at beaches in north San Diego County given three different scenarios. In the first scenario, the width of beaches grows at exactly the same rate (about 1.5% per year) as the population. While this scenario is obviously unlikely, it is instructive in that it indicates how attendance would grow *if crowding levels were the same as today*. 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 third scenario assumes that the current beach width will be maintained; given increases in

population this implies more crowding. *Our estimates indicate that maintaining beach width will increase attendance by 4.4 million over ten years. If beach width is increased in relation to population, attendance will increase by 6.4 million, an increase of close to ten per cent.*

Naturally, differences in attendance will be reflected in differences in spending. Table D presents estimates of spending under the three beach width scenarios. As one can see the differences are substantial. We estimate that maintaining current beach width would generate over $300 million in increased spending and allowing the beach width to grow at the same rate as the population would generate close to a half a billion dollars in increased revenue. *Discounting these numbers in 2001, we estimate a gain of $257 million from maintaining current width and $373 million from allowing width to grow with the population.*

Table D: Estimated Spending with Differing Beach Widths					
Year	Spending if Width grows with Population		Spending with Erosion		Spending if Width Maintained
Year	Spending Width grow pop rate		Spending Erosion		Spending same width
2001	$	557,236,609.44	$	549,210,452.01	$ 554,758,032.33
2002	$	565,622,872.90	$	549,471,911.26	$ 560,628,416.75
2003	$	574,135,347.41	$	549,758,944.00	$ 566,587,148.91
2004	$	582,775,932.41	$	550,071,432.59	$ 572,635,558.41
2005	$	591,546,555.92	$	550,409,261.25	$ 578,774,994.87
2006	$	600,449,174.99	$	550,772,316.03	$ 585,006,828.22
2007	$	609,485,776.13	$	551,160,484.82	$ 591,332,449.01
2008	$	618,658,375.72	$	551,573,657.29	$ 597,753,268.73
2009	$	627,969,020.51	$	552,011,724.94	$ 604,270,720.08
2010	$	637,419,788.03	$	552,474,581.01	$ 610,886,257.34
Total Spending	$	5,965,299,453.45	$	5,506,914,765.19	$ 5,822,633,674.64
Present Value		$5,070,032,747.60		$4,696,758,916.18	$4,953,882,549.80
Change in PV		$373,273,831.42			$257,123,633.63

Finally, we estimate the increase in state tax revenues generated by these increases in spending as well as increases in state and local revenues. Tables E and F present these calculations for each year through 2010.[8]

Summarizing, **maintaining current width will generate a present value of $18.9 million in tax revenue for the state and allowing beach width to grow at the same rate as the population will increase the present value of tax revenues by $27.5 million. If state and local taxes are calculated, these numbers increase to $29 million and $42 million respectively.**

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[8] We used tax revenues generated per $1000 in spending from the *California Statistical Abstract* to calculate these numbers.

Table E: Estimated State Tax with Differing Beach Widths			
Year	State Tax if Width grows with Population	State Tax with Erosion	State Tax if Width Maintained
Year	State Tax Width grow pop rate	State Tax Erosion	State Tax same width
2001	$ 40,995,897.36	$ 40,405,412.95	$ 40,813,548.44
2002	$ 41,612,874.76	$ 40,424,648.51	$ 41,245,432.62
2003	$ 42,239,137.51	$ 40,445,765.51	$ 41,683,816.55
2004	$ 42,874,825.35	$ 40,468,755.30	$ 42,128,798.03
2005	$ 43,520,080.12	$ 40,493,609.35	$ 42,580,476.37
2006	$ 44,175,045.80	$ 40,520,319.29	$ 43,038,952.35
2007	$ 44,839,868.55	$ 40,548,876.87	$ 43,504,328.27
2008	$ 45,514,696.70	$ 40,579,273.97	$ 43,976,707.98
2009	$ 46,199,680.84	$ 40,611,502.60	$ 44,456,196.88
2010	$ 46,894,973.81	$ 40,645,554.93	$ 44,942,901.95
Total Tax	$ 438,867,080.79	$ 405,143,719.28	$ 428,371,159.44
PV	$ 373,002,309.24	$ 345,540,553.46	$ 364,457,139.19
PV Gain	$ 27,461,755.78		$ 18,916,585.73

Table F: Estimated State and Local Tax with Differing Beach Widths			
Year	State/Local Tax if Width grows with Population	State/Local Tax with Erosion	State/Local Tax if Width Maintained
2001	$ 63,179,486.78	$ 62,269,481.05	$ 62,898,465.71
2002	$ 64,130,321.33	$ 62,299,125.30	$ 63,564,049.89
2003	$ 65,095,465.69	$ 62,331,669.07	$ 64,239,650.94
2004	$ 66,075,135.22	$ 62,367,099.03	$ 64,925,419.61
2005	$ 67,069,548.51	$ 62,405,402.04	$ 65,621,508.92
2006	$ 68,078,927.46	$ 62,446,565.19	$ 66,328,074.18
2007	$ 69,103,497.30	$ 62,490,575.77	$ 67,045,273.07
2008	$ 70,143,486.64	$ 62,537,421.26	$ 67,773,265.61
2009	$ 71,199,127.55	$ 62,587,089.37	$ 68,512,214.24
2010	$ 72,270,655.57	$ 62,639,568.00	$ 69,262,283.86
Total Tax	$ 676,345,652.03	$ 624,373,996.08	$ 660,170,206.03
PV	$ 574,840,312.92	$ 532,518,525.92	$ 561,671,203.50
PV Gain	$ 42,321,787.01		$ 29,152,677.58

Conclusion

Our results indicate that overcrowding at California's beaches has become a serious problem. Apart from the annoyance of dealing with crowds, which was expressed to us on many occasions, our estimates show a substantial loss of revenue for local businesses and, ultimately for state and local governments. Our revenue/tax analysis has focused on one area only, admittedly an area in most serious need, but our general conclusion that erosion leads to significant loss of business and tax revenues can be applied to other eroding beaches throughout the state.

The tax revenues generated for state and local governments are substantial. Although we do not attempt to estimate the increase in consumer welfare (people will be better off if beaches are wider and less crowded) other studies, including some conducted by the author also indicate substantial benefits to consumers as well as local businesses.

Appendix: Raw Unadjusted Descriptive Statistics

The overall response for questions asked at all beaches:

Question	Observations	Mean	Standard Deviation	Range
Weekend	219	.35	.48	0-1
Response	219	10.1	7.02	1-31
How Many People in Your group?	218	4.8	3.66	1-30
How Many Beach Days a Year?	218	29.18	43.14	0-250
If it was ½ as Crowded…?	217	10	27.84	-50-167
If it was twice as crowded…?	173	-29.98	35.71	-100-20
If it took half the time….?	215	64.86	101.16	0-1000
If Parking were easier….?	217	33.53	86.41	0-1000
If it was half as wide…?	182	-38.59	35.72	-100-0
If restrooms…	63	14.38	56.72	0-375
Crowding at time	217	2.23	.75	1-3

Questions asked at Mission, Imperial, La Jolla Coronado and Del Mar beaches only:

Question	Observations	Mean	Standard Deviation	Range
If beaches available in Carlsbad, would you go there?	107	18.93	61.84	0-600
	107	-7.85	22.02	-100-20

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