An Economic and Spatial Baseline of Coastal Recreation in the North Central Coast of California

Report to The California Sea Grant College Program

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EXECUTIVE SUMMARY

Coastal recreation provides significant economic and social benefits to coastal communities and to the state of California as a whole. These benefits include, for example, the financial impact of direct expenditures (e.g., hotel stays, dining, shopping), non-market benefits of coastal recreation, and associated enhanced human well-being. To understand the impact recently established marine protected areas (MPA) might have on future coastal recreation use patterns in the region it is necessary to establish a baseline of how many people use the coast, what they do, and the economic contributions of these different types of uses—especially in a geospatial context.

This study is a part of a larger baseline marine protected areas monitoring effort, entitled the North Central Coast (NCC) MPA Baseline Program, tasked with characterizing the ecological and socioeconomic conditions within the NCC region. The NCC study region extends from Alder creek in the north to Pigeon Point in the south. To investigate coastal recreation patterns in the NCC region, we utilized a standing internet panel hosted by Knowledge Networks (KN) designed to be demographically representative based on 2010 U.S. Census statistics. Through this sample methodology we surveyed 5,079 individuals in select NCC region counties to establish a baseline characterization of coastal visitation and recreation statistics and a spatial baseline of coastal recreation use patterns in the North Central Coast region. We focused on estimating spatial use and trip expenditure patterns among recreational users of the coast; we did not estimate non-market economic values.

Coastal trips to San Francisco County were most popular among respondents, constituting approximately 37.4 percent of total coastal trips. The county of San Mateo followed closely behind at 30.2 percent of total reported visits. Mendocino County had the fewest coastal visitors, at approximately 6.9 percent of survey respondents. The top five most popular coastal activities among survey respondents were scenic enjoyment (77.1 percent of study population participate in this activity in the last 12 months), beach going (65.2 percent), photography (41 percent), biking or hiking (39.3 percent), and watching birds and/or other marine life from shore (38.6 percent). Spatial data sets and maps are provided for coastal recreation overall and the top eight most popular coastal recreation activities, which include: scenic enjoyment; beach going; photography, biking or hiking; watching birds and/or other marine life from shore; sitting in the car watching the scene, beachcombing; and swimming or body surfing in the ocean. These maps display the extent and intensity of use for each specific activity.

This study also estimated the total number of coastal visitation trips and direct trip expenditures per year among the study population. Given that survey respondents took an average of 3.2 coastal trips per year, we estimated a total of 22.2 million trips per year among the study population. With respondents spending an average of $54.48 per trip, we estimated that the study population's total annual coastal visitation trip expenditures were approximately $1.2 billion. This is a higher bound estimate of coastal recreation trip expenditures as some coastal trips may not have had a coastal recreation component. With an estimated 86.9 percent of survey respondents indicating their last trip was for primarily coastal recreation purposes we further estimate the lower bound of coastal recreation trip expenditures of approximately $1.05 billion. This is a lower bound estimate as some coastal trips where the primary purpose was not recreation (e.g., work or school related) may have included a coastal recreation component.

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The North Central Coast MPA Baseline Program

This study is a part of a larger baseline marine protected areas monitoring effort, entitled the North Central Coast (NCC) MPA Baseline Program, tasked with characterizing the ecological and socioeconomic conditions within the NCC region. Specifically, this study addresses the Baseline Program objectives by describing human use patterns across the study region and establishing initial data points for long-term tracking of conditions and trends in the North Central Coast. This study is also a part of a four-part study conducted by Ecotrust to provide baseline estimates of the quantity, spatial distribution, and economic value of human uses—specifically human use in four specific sectors: coastal recreational, commercial fishing, commercial passenger fishing vessels, and the recreational abalone fishery in the NCC region.

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1. INTRODUCTION

Coastal recreation provides significant economic and social benefits to coastal communities and to the state of California as a whole. These benefits include, for example, the financial impact of direct expenditures (e.g., hotel stays, dining, shopping), non-market benefits of coastal recreation, and associated enhanced human well-being. To understand the impact recently established marine protected areas (MPA) might have on future coastal recreation use patterns in the region it is necessary to establish a baseline of how many people use the coast, what they do, and the economic contributions of these different types of uses—especially in a geospatial context.

This study is designed to establish a baseline characterization of coastal recreation participation rates and trip expenditures and provide a spatial baseline of coastal recreation use patterns in the North Central Coast region. A customized, web-based survey instrument, which utilizes Ecotrust's Open OceanMap survey and mapping technology, was used to collect spatially explicit data on coastal recreation. This survey utilized a standing internet panel hosted by Knowledge Networks (KN) designed to be demographically representative based on 2010 U.S. Census statistics. Knowledge Networks is a leader in deploying custom online surveys for various academic, governmental, and commercial applications. Ecotrust employed KN's services because the company specializes in probability sampling and providing statistically representative survey data through a peer-reviewed data collection methodology that reaches across the U.S. population, including many difficult-to-survey populations such as cell phone–only households, non-internet connected households, African Americans, Latinos, and young adults. It should be emphasized that respondents could not self-select for this survey and all respondents were sampled through Knowledge Network's methods.

Utilizing KN's services, Ecotrust in partnership with NaturalEquity designed this coastal recreation study to collect spatially explicit data on coastal recreation use patterns, characteristics, and associated trip expenditures. This would have been difficult to achieve using traditional mail or intercept survey methods. The advantage of deploying Ecotrust's survey tool in combination with KN's services was that all data collected constituted a weighted representative sample (based on U.S. Census data of household characteristics) of the larger study population. We extrapolated from this sample to the larger study population to estimate:

- Proportion of population that visits the coast each year and participation rates for specific coastal recreation activities;
- Spatial patterns of use for overall and specific coastal recreation activities;
- Direct financial impact of coastal recreation in the region; and
- Average per person and total number of coastal visitation trips taken each year.

The goal of this report was to focus on estimating general spatial use patterns and trip expenditures among recreational users of the coast. It should be emphasized that we did not estimate non-market economic values and that trip expenditures are but a portion of the overall economic value of coastal recreation. Furthermore, in this study we do not account for the secondary economic effects of coastal recreation such as the value (e.g., jobs and wages) of coastal recreation to support industries such as the local tourism economy. Indeed, additional valuation methods to investigate the full economic value of coastal recreation and their associated social and cultural value to the health of local economies and people are important to understand and account for in future monitoring efforts.

It is difficult to discern the effects MPAs will have on coastal recreation patterns and vice versa, however, advancing our understanding of how humans utilize, value, and rely upon coastal and ocean areas will be critical to monitoring how MPAs and other management decisions can best benefit coastal communities into the future.

1.1. Coastal Recreation Survey Methods

The North Central Coast (NCC) region coastal recreation survey was launched in February of 2011 after extensive testing to ensure the mapping component of the survey tool would capture quality spatial data at the appropriate scale and in a user-friendly manner. In an effort to capture seasonal variations in coastal use, we collected data on the respondent's most recent coastal trip, and deployed the survey in four survey "waves" over a one-year period.

Data collection was completed in December 2011, and the data were then subsequently analyzed and synthesized. In the survey, respondents were asked to recount details of their coastal visitation trips over the previous 12 months and of their last trip, including information about the number of trips taken, participation in recreational activities, the location of activities, and expenditures made. This section describes the survey and analysis methods, and the results are presented in the following section. The survey questions regarding coastal visitation and recreation use can be found in Appendix A.

Our study population ("sample frame") was defined as the total resident population over the age of 18 years of California counties within our study area (see Figure 1). We chose this study population as the primary goal of this study was to investigate coastal recreation which is commonly defined as day trips to the coast (outside of daily routine) that does not typically involve an overnight stay (although some coastal recreation trip by residents we captured did involve lodging, see trip expenditure section below). We differentiate this from coastal tourism which is often defined as involving overnight stays. However, establishing clear distinction between the two categories is somewhat difficult as they undoubtedly overlap making isolation difficult in survey efforts. Furthermore, the value of coastal real estate also may overlap with the value of coastal recreation in the case of coastal resident who may often recreate on the coast but do not incur any trip expenditures. One may argue that the value of this type of coastal use is captured in coastal real estate values where the individual resides.

The results of this study were designed to largely encompass trip expenditures of coastal recreation. It should be noted; however, the results provided here also encompass some coastal tourism and visitation expenditures and conversely do not capture the value of coastal recreation stored in coastal real estate values.

These counties below were chosen as our study population as they are within a reasonable one-day's trip to the North Central Coast:

- Alameda
- Contra Costa
- Lake
- Marin
- Mendocino
- Napa
- Sacramento
- San Francisco
- San Mateo
- Santa Clara
- Santa Cruz
- Solano
- Sonoma

Table 1 displays the study population (6.9 million), the total population of the study area (9 million), and the population of the state of California (37.3 million).

Table 1. Number of survey respondents and 2010 population data

Area	Population
Study population (>18 yrs)	6,943,138
Study area total population	8,984,415
California state population	37,253,956

Source: Current study and data from the U.S. Census Bureau (2010)

Survey data were collected over four successive waves distributed across a calendar year to capture the seasonal variation in coastal use patterns. Table 2 displays the dates over which each wave was conducted and the respective number of respondents. Overall, the survey was completed by 5,079 respondents, however, there were more respondents in the first wave of the survey as we used this wave of the survey to determine an optimal sample size in each wave given the variance on the data collected and subsequently chose to reduce the sample size in subsequent survey waves. Table 3 displays the median survey length, ten minutes, and the total number of respondents that completed the mapping portion of the survey (3,018 which is approximately 60 percent of total respondents).

Table 2. Survey wave information

Survey wave	Wave dates	Respondents	%
Wave 1	Jan. 26–Feb. 23, 2011	1,996	39%
Wave 2	May 3–May 31, 2011	1,020	20%
Wave 3	Aug. 10–Sep. 7, 2011	1,028	20%
Wave 4	Nov. 1–Nov. 30, 2011	1,035	20%
TOTAL		**5,079**	**100%**

Source: Current study

Table 3. Survey length and completion

Total number of respondents	5,079
Median survey length (min)	10
# of respondents that completed the mapping portion	3,018

Source: Current study

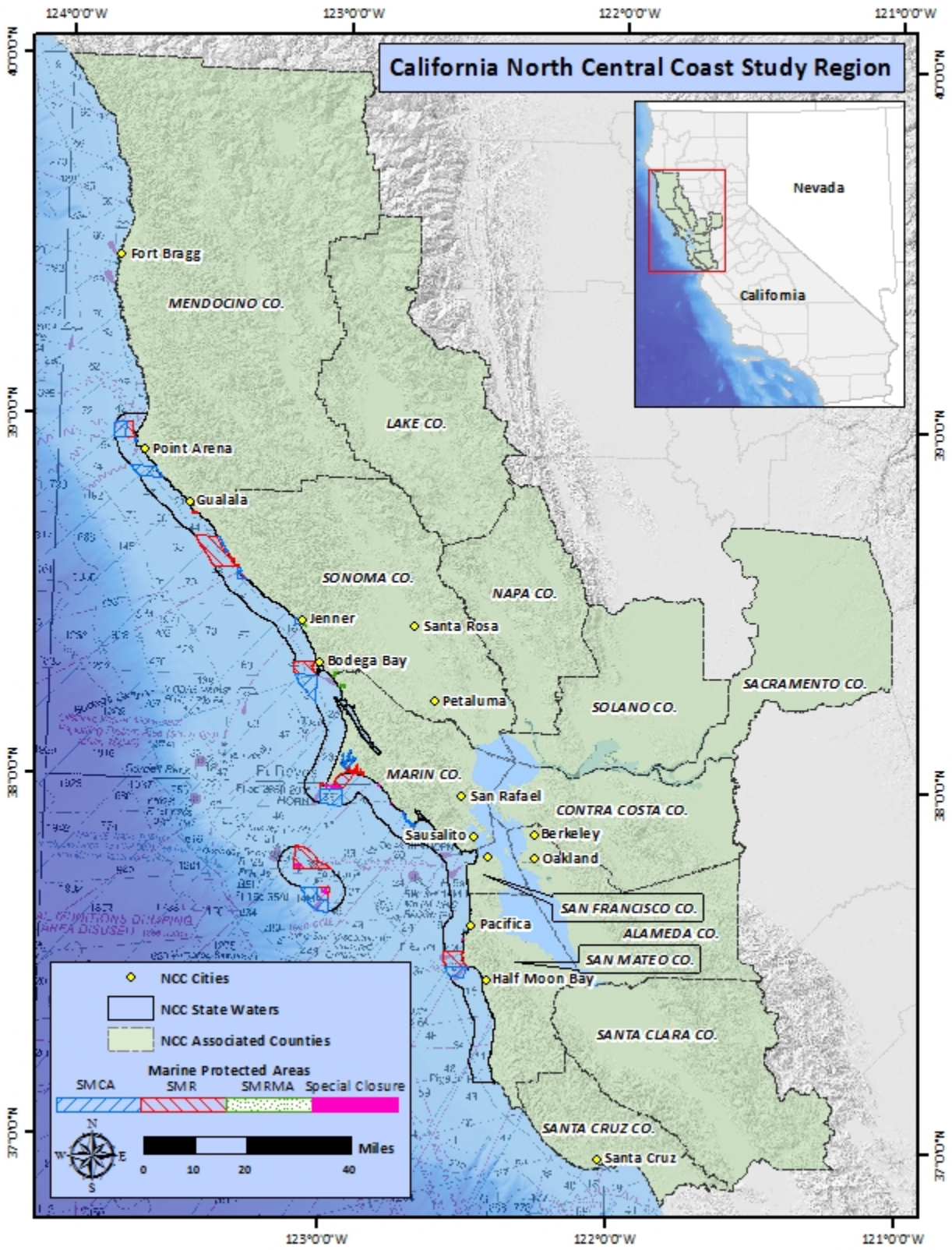
We incorporated verbatim the US Census Bureau demographic survey questions into our survey. We then compared our findings to US Census demographic findings as an indication of how representative our survey sample is of the sample frame, see Table 4. Our survey aimed to be representative of the study area population, and while our data are relatively well matched with 2010 Census findings, there are two exceptions: 1) females are overrepresented; and, 2) Hispanic people are underrepresented.

Table 4. Demographics of survey and study populations

Demographics	Survey respondents	Study area population
Male	34.1%	49.5%
Female	65.9%	50.5%
White, Non-Hispanic	63.8%	44.4%
Black, Non-Hispanic	3.5%	6.7%
Other, Non-Hispanic	21.8%	21.1%
Hispanic	8.4%	23.4%
2+ Races, Non-Hispanic	2.6%	3.6%

Source: Current study and data from the U.S. Census Bureau (2010)

Figure 1. North Central Coast Study Region



1.2. Coastal Recreation Data Analysis Methods

To analyze the survey data, Knowledge Networks provided a post-stratification survey-weighting methodology to more closely align our survey sample representation with the study population's demographics. Once the survey was complete, Knowledge Networks applied data weights informed by demographic data to adjust each respondent's contribution to overall survey results. A data weight is effectively a multiplier that adjusts a given respondent's contribution to compensate for a variety of both planned and unexpected disproportionate effects. The aim of post-stratification survey-weighting is to adjust the weight given to individual sample data based on demographic characteristics so as to better reflect the population they are intended to represent.[1]

Once all respondents completed the survey, Knowledge Networks provided the post-stratification survey weights, and Ecotrust used the statistical software R to apply the weights and analyze the data, determining the weighted means as well as confidence intervals[2] as presented in the results below.

To analyze data gathered regarding trip expenditures respondents made on their last trip, we took the following steps to ensure we utilized the best data possible to convey results:

- Respondents who did not indicate they had purchased an item were given a zero value expenditures for that item.
- If respondents indicated that they purchased an item but refused to provide a cost or answer for how many people the expenditure was made for, the entire cost-per-person estimate was assumed to be invalid and was removed from the sample.
- We provide two tables to present analysis results on trip expenditures:
    - The first table (Table 9) displays the average per-person expenditures made by respondents on their last trip. These expenditures are averaged across all respondents who indicated any expenditures, providing an average total trip expenditure estimate which can be scaled up to the larger study population.
    - The second table (Table 10) presents cost-per-person, averaged only across respondents who indicated expenditure for a given item. These values are not weighted and cannot be up scaled but provide information as to how much people on average are spending on expenditure items.

In addition to survey questions, respondents were asked to map the location where they conducted specific coastal recreation activities on their last trip. Details on this component of the survey effort and results are discussed in section 3.

[1] More details about Knowledge Network's post-stratification survey-weighting methods can be found on the KN website: http://www.knowledgenetworks.com/accuracy/summer2007/disogra.html

[2] Confidence intervals (CI) are statistical measures of variability which indicate the range of values in which the true value is likely to be given a specified probably, in this report confidence intervals are reported at 95 percent probability.

2. ESTABLISHING A COASTAL RECREATION ECONOMIC BASELINE

2.1. Trips and Activities

Table 5 displays the percentage of survey respondents who visited the NCC in the last twelve months, the average number of trips made annually over all respondents, and the primary reason and average number of nights spent per trip for respondents' last trip. Overall, 62.2 percent of respondents visited the NCC over the last twelve months. Across all respondents, that is including those who had not visited the NCC at all in the last twelve months, the average number of trips per year was 3.2. The primary reason for respondents' most recent trip to the coast was overwhelmingly for recreation (86.9 percent), followed by "other" primary reasons (9.7 percent). The most popular "other" fill-in response was to visit friends and family. On average, respondents spent approximately one night at the coast on their most recent coastal trip.

Table 5. NCC coastal visitation summary statistics

		Average % of total sample	95% Confidence Interval	
			Low	High
Last 12 months	Respondents who visited the NCC	62.2%	60.9%	63.6%
	Average # of trips over all respondents	3.20	2.81	3.59
Last Trip	Primary reason: Recreation	86.9%	85.8%	88.1%
	Primary reason: Work	3.0%	2.4%	3.5%
	Primary reason: School	0.3%	0.1%	0.5%
	Primary reason: Other	9.7%	8.7%	10.7%
	Average number of nights per trip	1.09	1.05	1.13

Source: Current study

Table 6 displays the distribution of coastal trips reported by survey respondents over the last 12 months, including confidence intervals. Coastal trips to San Francisco County were most popular among respondents, constituting approximately 37.4 percent of total coastal trips. The county of San Mateo followed closely behind at 30.2 percent of total reported visits. Mendocino County had the fewest coastal visitors, at approximately 6.9 percent of survey respondents.

Table 6. Distribution of coastal trips reported in the last 12 months

	Average % of total sample	95% Confidence Interval	
County		**Low**	**High**
Mendocino	6.9%	4.7%	8.3%
Sonoma	9.1%	10.6%	8.1%
Marin	16.4%	14.8%	17.4%
San Francisco	37.4%	40.4%	35.6%
San Mateo	30.2%	29.5%	30.6%

Source: Current study

Table 7 displays the activity participation rates of survey respondents over the last 12 months. The top five most popular activities among survey respondents were scenic enjoyment (77.1 percent), beach going (65.2 percent), photography (41 percent), biking or hiking (39.3 percent), and watching birds and/or other marine life from shore (38.6 percent). The confidence intervals for each of these participation rates are also displayed in Table 7. Approximately 15.2 percent of survey respondents indicated that they also participated in "other" activities. The most popular activities people indicated as "other" activities were dinning, shopping, and camping.

Table 7. Activity participation in each activity in the last 12 months

Activity	Average % of total sample	95% Confidence Interval	
		Low	High
Scenic enjoyment	77.1%	75.6%	78.5%
Beach going (dog-walking, kite-flying, jogging, etc.)	65.2%	63.6%	66.8%
Photography	41.0%	39.4%	42.7%
Biking or hiking	39.3%	37.6%	40.9%
Watching birds and/or other marine life from shore	38.6%	37.0%	40.2%
Sitting in your car watching the scene	36.6%	35.0%	38.2%
Collection of non-living resources/beachcombing (agates, fossils, driftwood)	15.1%	13.9%	16.4%
Swimming or body surfing in the ocean	11.8%	10.7%	12.9%
Fishing (hook and line) from pier/shore	7.2%	6.4%	8.1%
Kayaking in the ocean or estuary/slough	5.0%	4.2%	5.7%
Fishing (hook and line) from a boat	4.8%	4.1%	5.5%
Collecting/picking/harvesting sea life from shore (clamming, seaweed, mussels, etc.)	4.3%	3.6%	5.0%
Surfing (board, boogie, stand-up paddle, kayak)	3.7%	3.0%	4.3%
Sailboating	2.7%	2.1%	3.2%
Powerboating	2.4%	1.9%	2.9%
Trap/net from pier or shore (crabbing)	2.4%	1.9%	2.9%
Free-diving/snorkeling (from shore, from boat)	2.4%	1.9%	2.9%
Scuba diving (from shore, from boat)	1.9%	1.4%	2.4%
Skimboarding	1.7%	1.2%	2.1%
Diving (picking or spear fishing) from a shore	1.4%	1.0%	1.8%
Using a personal water craft (jet skis)	1.3%	0.9%	1.6%
Trap/net from boat (crabbing)	0.9%	0.6%	1.2%
Diving (picking or spear fishing) from a boat	0.6%	0.4%	0.9%
Kiteboarding	0.6%	0.3%	0.8%
Windsurfing	0.6%	0.3%	0.8%
Surfing (tow-in)	0.4%	0.2%	0.7%
Hang gliding/parasailing	0.3%	0.1%	0.5%

Source: Current study

When asked specifically about coastal activities conducted on their most recent "last" trip, participant activity rates differed slightly, see Table 8. The top five activities respondents participated in on their last trip were scenic enjoyment (69.3 percent), beach going (44.5 percent), photography (37.7 percent), watching birds and/or other marine life from shore (28.3 percent), and scenery-watching from a car (27.3 percent). Approximately 14.3 percent of survey respondents indicated that they also participated in "other" activities. Again, the most popular activities people indicated as "other" activities were dinning, shopping, and camping. Table 8 also displays the confidence intervals for each activity participation rate.

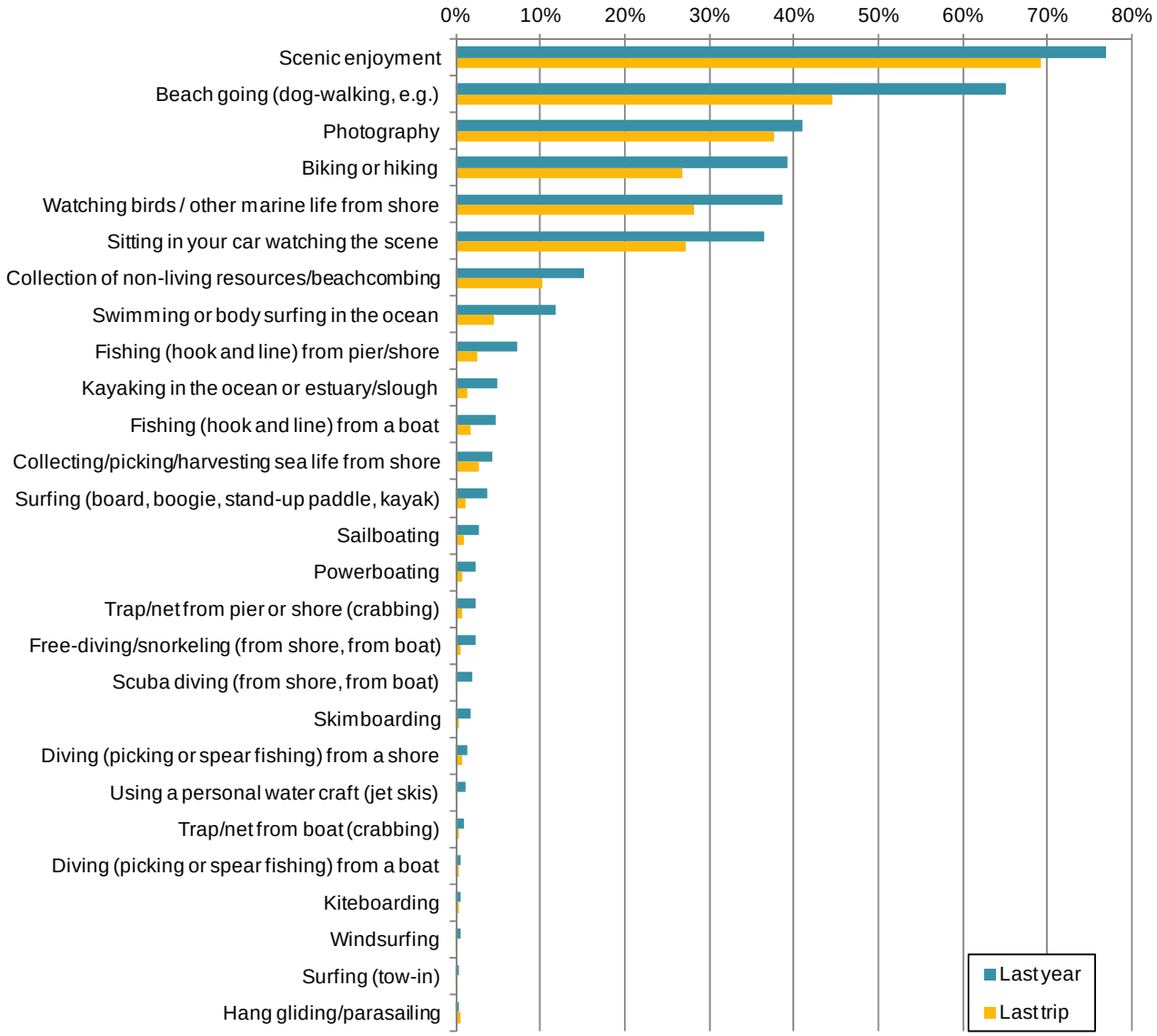
Table 8. Participation in each activity for the last trip

Activity	Average % of total sample	95% Confidence Interval	
		Low	High
Scenic enjoyment	69.3%	67.8%	70.9%
Beach going (dog-walking, kite-flying, jogging, etc.)	44.5%	42.8%	46.2%
Photography	37.7%	36.1%	39.3%
Watching birds and/or other marine life from shore	28.3%	26.8%	29.8%
Sitting in your car watching the scene	27.3%	25.8%	28.8%
Biking or hiking	26.8%	25.3%	28.3%
Collection of non-living resources/beachcombing (agates, fossils, driftwood)	10.3%	9.3%	11.3%
Swimming or body surfing in the ocean	4.4%	3.7%	5.1%
Collecting/picking/harvesting sea life from shore (clamming, seaweed, mussels, etc.)	2.8%	2.2%	3.3%
Fishing (hook and line) from pier/shore	2.5%	1.9%	3.0%
Fishing (hook and line) from a boat	1.7%	1.3%	2.2%
Kayaking in the ocean or estuary/slough	1.3%	0.9%	1.7%
Surfing (board, boogie, stand up paddle, kayak)	1.2%	0.8%	1.5%
Sailboating	1.0%	0.7%	1.4%
Trap/net from pier or shore (crabbing)	0.8%	0.5%	1.2%
Powerboating	0.7%	0.5%	1.0%
Diving (picking or spear fishing) from a shore	0.7%	0.4%	1.0%
Free-diving/snorkeling (from shore, from boat)	0.7%	0.4%	0.9%
Hang gliding/parasailing	0.5%	0.3%	0.8%
Skim-boarding	0.4%	0.2%	0.6%
Trap/net from boat (crabbing)	0.4%	0.2%	0.6%
Kiteboarding	0.4%	0.2%	0.6%
Diving (picking or spear fishing) from a boat	0.3%	0.1%	0.5%
Scuba diving (from shore, from boat)	0.3%	0.1%	0.4%
Using a personal water craft (jet skis)	0.3%	0.1%	0.4%
Windsurfing	0.2%	0.0%	0.3%
Surfing (tow-in)	0.1%	0.0%	0.3%

Source: Current study

Figure 2 shows reported activity participation rates comparing trips over the last twelve months to the most recent trip

Figure 2. Activity participation rates, last year and last trip



Source: Current study

2.2. Trip Expenditures

Table 9 displays the average expenditures made for each item across all respondents on their last trip. Averaged across all respondents (including those without dining expenses), the highest expense was food and beverage purchases at a restaurant or bar at approximately $18.46. These were also the most prevalent type of expenditures made, with 59.7 percent of respondents reporting such expenditures. The next largest average expenditure per respondent was lodging, at approximately $17.99 per trip, though only 18 percent of respondents reported these. Adding together the average expenditures per item across all items, we estimate a total trip expenditures figure at approximately $54.48 per person, per trip.

Table 9. Average trip expenditures per person by item across all respondents, last trip

Item	Average expenditures ($)	95% Confidence Interval		% of observations
		Low ($)	High ($)	
Food and beverages at a restaurant or bar	$18.46	$17.54	$19.39	59.7%
Lodging (if you stayed overnight)	$17.99	$16.14	$19.83	18.0%
Food and beverages from a store	$6.24	$5.74	$6.74	46.9%
Souvenirs (T-shirts, posters, gifts, etc.)	$3.28	$2.90	$3.66	14.3%
Parking	$2.51	$1.82	$3.20	25.3%
Museum, aquarium, or other entrance fee	$1.67	$1.44	$1.90	9.4%
Car rental	$0.84	$0.53	$1.15	1.6%
Sundries (sunscreen, surf wax, motion sickness pills, batteries, film and processing, etc.)	$0.54	$0.43	$0.65	5.8%
Boat rental	$0.49	$0.30	$0.69	1.1%
Charter fee (whale watching, etc.)	$0.44	$0.20	$0.68	0.7%
Bike rental	$0.34	$0.22	$0.47	1.3%
Lessons, clinics, camps	$0.30	$0.05	$0.54	0.6%
Kayak rental	$0.28	$0.14	$0.41	0.7%
Dive equipment rental and airfills	$0.28	$0.10	$0.45	0.4%
Boat fuel	$0.24	$0.12	$0.35	0.8%
Bait and tackle	$0.20	$0.14	$0.27	1.7%
One-day fishing license fee	$0.15	$0.09	$0.21	1.0%
Surfboard or bodyboard rental	$0.14	$0.05	$0.23	0.4%
Ramp fees	$0.06	$0.03	$0.10	0.8%
Hang glide rental	$0.02	$0.00	$0.06	0.1%
Total Expenditures	**$54.48**	**$47.98**	**$60.99**	

Source: Current study

Table 10 displays the average expenditure for each item across only respondents who indicated expenses for that item. In other words, among all respondents who spent money on lodging expenses, the average expenditure amount was approximately $99.42 per person per last trip. Lodging expenses in fact were the highest per person per trip average expenditure out of all items. This was followed by expenditures on dive equipment rental and airfills ($69.91) and on charter fees ($65.89). It is important to explicitly note that the average expenditures per item presented in Table 10 should not be added together. For example, only 0.4 percent of total respondents indicated expenses on dive equipment rentals. Because some of the sample sizes used to estimate the average expenditures presented in Table 10 were small, these amounts have not been weighted and are therefore not upscale-able to the population of the entire study area.

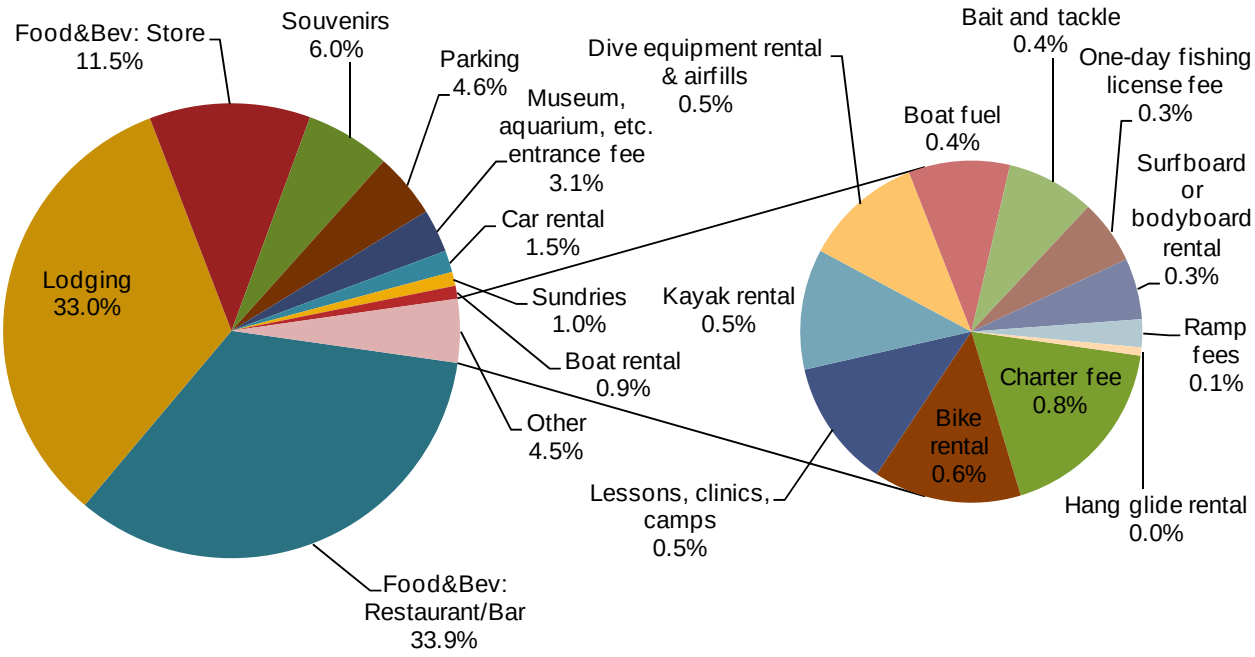
Table 10. Average expenditures per item per person across respondents reporting expenditures for a certain item, last trip

Item	Average expenditures ($)	95% Confidence Interval		% of observations
		Low	High	
Lodging (if you stayed overnight)	$99.42	$92.33	$106.52	18.0%
Dive equipment rental and airfills	$69.91	$44.73	$95.08	0.4%
Charter fee (whale watching, etc.)	$65.89	$44.88	$86.89	0.7%
Car rental	$53.14	$38.80	$67.47	1.6%
Lessons, clinics, camps	$48.10	$8.91	$87.29	0.6%
Boat rental	$43.25	$33.20	$53.30	1.1%
Kayak rental	$37.27	$27.50	$47.03	0.7%
Surfboard or bodyboard rental	$36.93	$22.20	$51.67	0.4%
Food and beverages at a restaurant or bar	$30.94	$29.69	$32.19	59.7%
Boat fuel	$28.59	$19.34	$37.85	0.8%
Bike rental	$27.41	$21.71	$33.11	1.3%
Hang glide rental	$23.77	$0.00	$57.65	0.1%
Souvenirs (T-shirts, posters, gifts, etc.)	$22.89	$21.09	$24.69	14.3%
Museum, aquarium, or other entrance fee	$17.70	$16.18	$19.23	9.4%
One-day fishing license fee	$15.60	$11.90	$19.31	1.0%
Food and beverages from a store	$13.29	$12.36	$14.22	46.9%
Bait and tackle	$12.13	$9.22	$15.04	1.7%
Parking	$9.92	$7.28	$12.55	25.3%
Sundries (sunscreen, surf wax, motion sickness pills, batteries, film and processing, etc.)	$9.32	$8.04	$10.61	5.8%
Ramp fees	$8.56	$4.82	$12.31	0.8%

Source: Current study

Figure 3 displays the relative average expenditures made per person per trip for all items as displayed in Table 9. Expenditures on food and beverages and lodging combined make up 78.4 percent of the total average trip expenditure per person.

Figure 3. Average expenditure per trip for coastal recreation trip



Source: Current study

Table 11 displays the estimated total number of trips and direct expenditures per year among the study population. Given that survey respondents took an average of 3.2 coastal trips per year (average across all survey respondents), we estimated a total of 22.2 million trips per year among the study population. With respondents spending an average of $54.48 per trip, we estimated that the study population's total annual coastal visitation trip expenditures were approximately $1.2 billion (22.2 million trips x $54.48 per trip = $1.2 billion). This is a higher bound estimate of coastal recreation trip expenditures as some coastal trips may not have had a coastal recreation component. With an estimated 86.9 percent of survey respondents indicating their last trip was for primarily coastal recreation purposes, we estimate the lower bound of coastal recreation trip expenditure at approximately $1.05 billion. This is a lower bound estimate as some coastal trips where the primary purpose was not recreation (e.g., work or school related) may have included a coastal recreation component.

Table 11. Estimated number of trips and direct expenditures

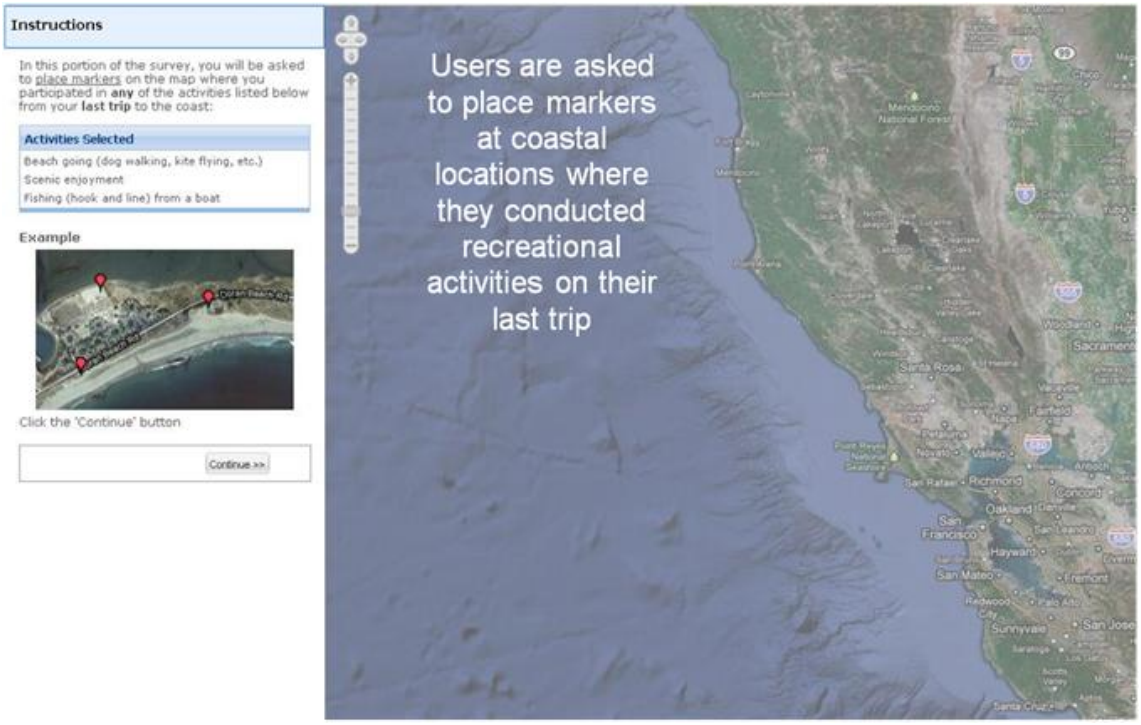
Study population (>18 yrs)	6,943,138
Average # of trips/year	3.20
Estimated number of trips for total study population	22,197,663
Average expenditure/trip	$54.48
Total estimated annual coastal visitation expenditures	**$1,209,258,380**
Percent of coastal trips where recreation was the primary purpose	86.9%
Total estimated annual coastal recreation trip expenditures	**$1,050,845,532**

Source: Current study

3. ESTABLISHING A COASTAL RECREATION SPATIAL BASELINE

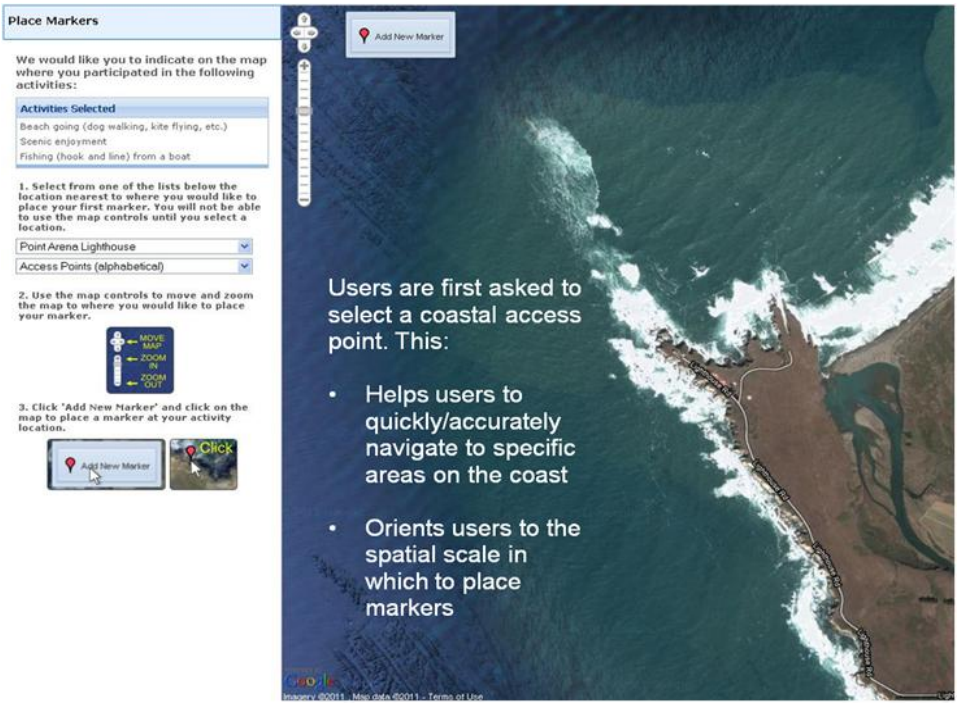
In addition to survey questions, respondents were asked to map the location of where they conducted specific coastal recreation activities on their last trip. To map locations, Ecotrust developed a sophisticated mapping tool utilizing Open OceanMap survey technology together with Google Maps (displayed in the screenshots below). The mapping tool was designed to be user-friendly and easily navigable. It required each respondent to zoom to a particular spatial scale in order to ensure that accurate and quality data were collected.

Figure 4. Screenshot of coastal recreation survey: Map interface



Source: Ecotrust

Figure 5. Screenshot of coastal recreation survey: Map navigation

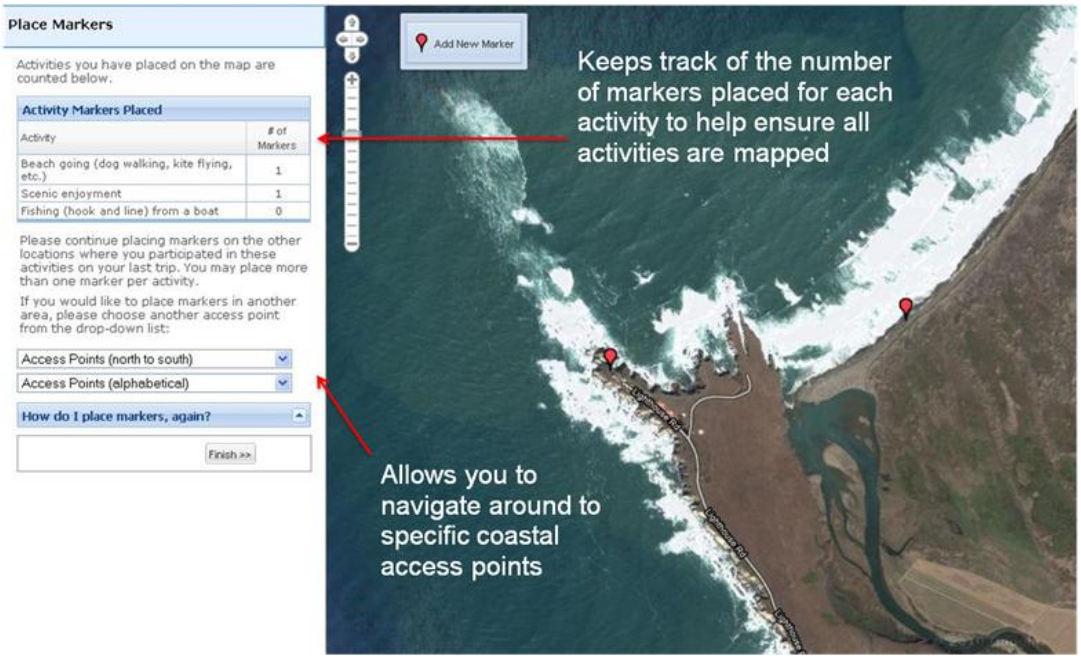


Source: Ecotrust

Figure 6. Screenshot of coastal recreation survey: Placing activity markers

Source: Ecotrust

Figure 7. Screenshot of coastal recreation survey: Tracking activity markers



Source: Ecotrust

As noted above the data were collected in four waves to capture seasonal variations in coastal recreation use patterns. The spatial data are a combined set across all four survey waves. The survey respondents provided information by placing a point or marker on a map and then indicated which activity or activities they conducted at each specific location on their last trip (Figure 6). There were a total of twenty-seven activities mapped, but only eight activities had a large enough sample (>100 point markers) to create a robust map product. Appendix B of this report contains maps depicting the spatial patterns of use (distribution and intensity of use) across the region for coastal recreation overall and for those select coastal recreation activities. Table 12 indicates the number of makers placed per activity per survey wave for all activities.

To create the spatial data, Ecotrust utilized a kernel density analysis in ArcGIS. The kernel analysis is a nonparametric statistical method for estimating probability densities from a set of point data. Conceptually, a smooth raster surface is fitted over each point. The surface value is highest at the location of the point and diminishes with increasing distance (i.e., search radius), eventually reaching zero. Based on previous experience conducting a similar analysis in Oregon and after conducting several tests, the kernel density analysis on all activities was given a search radius of one mile.

Weights given to the markers placed by individual respondents were also used and incorporated into the kernel density analysis. As discussed above, these weights were created by Knowledge Networks to align respondent demographics with study population demographics. The resulting dataset is a smooth raster surface depicting the intensity use or density of an activity. Table 12 displays the total number of activity markers that respondents placed for each activity in the mapping survey.

Table 12. Number of markers placed for each activity in mapping survey

	Number of activity markers placed				
Activity name	**Wave 1**	**Wave 2**	**Wave 3**	**Wave 4**	**TOTAL**
Scenic enjoyment	1,802	827	736	830	**4,195**
Photography	984	438	413	470	**2,305**
Beach going (dog-walking, kite-flying, etc.)	979	448	386	395	**2,208**
Watching birds and/or marine life from shore	637	319	283	339	**1,578**
Biking or hiking	634	300	233	314	**1,481**
Sitting in your car watching the scene	481	260	166	256	**1,163**
Collection of non-living resources/beachcombing	184	99	64	98	**445**
Swimming or body surfing in the ocean	56	38	23	20	**137**
Collecting/harvesting sea life from shore (clamming, seaweed, mussels, etc.)	34	13	7	11	**65**
Fishing (hook and line) from pier/shore	15	9	8	20	**52**
Surfing (board, boogie, stand up paddle)	18	10	11	7	**46**
Kayaking in the ocean or estuary/slough	14	8	6	13	**41**
Sailboating	7	12	12	5	**36**
Fishing (hook and line) from a boat	10	6	8	9	**33**
Powerboating	7	6	7	9	**29**
Trap/Net from pier/shore (e.g. crabbing, smelt)	10	7	3	3	**23**
Diving (picking or spear fishing) from shore	6	6	1	5	**18**
Free-diving/snorkeling (from shore, from boat)	5	6	4	2	**17**
Skimboarding	7	5	1	1	**14**
Using a personal water craft (PWC)	7	5	1		**13**
Trap/Net from boat (e.g. crabbing)	6	4	-	2	**12**
Hang gliding/parasailing	3	7	1	-	**11**
Diving (picking or spear fishing) from a boat	2	4	2	-	**8**
Kiteboarding	2	4	1	1	**8**
Scuba diving (from shore, from boat)	1	4	1	2	**8**
Windsurfing	2	4	-	-	**6**
Surfing (tow-in)	-	3	-	-	**3**
Total number of activity markers	**5,913**	**2,852**	**2,378**	**2,812**	**13,955**

Source: Current study

4. CONCLUSION

As stated above, the goal of this report was to focus on estimating general spatial use patterns and trip expenditures among recreational users of the coast. It should be emphasized that we did not estimate non-market economic values and that trip expenditures are but a portion of the overall economic value of coastal recreation. Furthermore, in this study we do not account for the secondary economic effects of coastal recreation such as the value (e.g., jobs and wages) of coastal recreation to support industries such as the local tourism economy. Indeed, additional valuation methods to investigate the full economic value of coastal recreation and their associated social and cultural value to the health of local economies and people are important to understand and account for in future monitoring efforts.

Coastal recreation generates significant economic revenues to coastal economies but also provides residents and visitors with non-market benefits and values that contribute to local and regional well-being. Despite this tremendous value of coastal resources, the question of how valuable these coastal recreation uses are and the value of the environmental attributes which draw people to these areas remain largely unanswered—especially in spatially explicit terms. In future studies we will build upon this current survey effort to collect and analyze this type of information. This information is critical to supporting coastal and ocean management by providing quantitative and spatial information that can be integrated in cost-benefit analyses, ecosystem-based impact assessments, or a long term monitoring program to inform coastal management/policy actions.

It is difficult to discern the effects MPAs will have on coastal recreation patterns and vice versa, however, advancing our understanding of how humans utilize, value, and rely upon coastal and ocean areas and environmental attributes will be critical to monitoring how MPAs and other management decisions can best benefit coastal communities into the future.

Appendix A. Coastal Recreation Survey Questions

The following is an exact copy of the survey text.

We are conducting a survey of coastal recreation that is practiced in North Central California coastal waters, estuaries and upland coastal areas. We want to hear from you even if you have not been to the coast recently.

SCREENER1. Do you currently live in California?

SCREENER2. Do you live in one of the following counties?
Alameda
Contra Costa
Lake
Marin
Mendocino
Napa
Sacramento
San Francisco
San Mateo
Santa Clara
Santa Cruz
Solano
Sonoma

Q1. We are interested in knowing about your coastal activity outside of San Francisco Bay. Have you been to the North Central California coast (dark blue area) at least once in the last 12 months? [Figure: Map of study region, with shaded area distinguishing West of Golden Gate Bridge.]

These questions are about your visits to the North Central California coast in the last year.

Q2a. Please estimate how many visits you have made to the North Central California coast in the last 12 months.

Q3. We are interested in knowing what you do when you go to the coast. For each of these activities, please indicate if you have participated in that activity during the last year (choose all that apply).
a. Beach going (dog walking, kite flying, jogging, etc.)
b. Biking or hiking
c. Collection of non-living resources/beachcombing (agates, fossils, driftwood)
d. Photography
e. Scenic enjoyment
f. Sitting in your car watching the scene
g. Watching birds and/or other marine life from shore
h. Fishing (hook and line) from pier/shore
i. Fishing (hook and line) from a boat
j. Diving (picking or spear fishing) from a boat
k. Diving (picking or spear fishing) from a shore
l. Trap/net from pier or shore (crabbing)
m. Trap/net from boat (crabbing)
n. Collecting/picking/harvesting sea life from shore (clamming, seaweed, mussels, etc.)
o. Hang gliding/parasailing
p. Kite boarding
q. Skim boarding
r. Surfing (board, boogie, stand up paddle, kayak)
s. Surfing (tow-in)
t. Swimming or body surfing in the ocean
u. Windsurfing
v. Free diving/snorkeling (from shore, from boat)
w. Kayaking in the ocean or estuary/slough
x. Power boating
y. Sail boating
z. SCUBA diving (from shore, from boat)
aa. Using a personal water craft (jet skis)
bb. Other, please list:

Q4. Please share with us the locations you visited on the North Central California coast during the last 12 months. For each of the coastal areas on the map below, please indicate how many times you visited each of these coastal areas in the last 12 months. If you did not visit a particular coastal area, please choose 'zero'. Your best estimate of the location is fine. [MAP OF COASTAL COUNTIES AND TEXT BOX TO ENTER IN # OF VISITS]

Q5. For how long have you been visiting this area(s) and enjoying one or more of the activities you identified?
Just the last year
One to three years
About four to ten years
More than ten years
All my life

The following questions relate specifically to your last trip to the North Central California coast.

Q6. When did you last visit one of the coastal areas on the previously shown map? Your best estimate is fine. [Respondent presented with calendar to indicate date]

Q7. On your last trip, did you start your trip from your home?
Yes
No

Q8. What mode(s) of transportation did you use to get to the coast? (Choose all that apply)
Bus
Bike
Walking
Drove personal car
Drove a rented car
Rode with someone else – carpooled
Other, please specify:

Q9. How would you describe the car that you used to get to the coast?
Compact car, small sedan or light pick-up truck
Large sedan
Wagon
Mini-van
Cross-over
Sport utility vehicle
Standard pickup truck
Hybrid sedan
Other, please specify:

Q10. Approximately how many people (including yourself) went on that trip?

Q11. Please estimate how many of these people (including yourself) permanently reside in California.

Q12. Was recreation the primary reason for your trip to the coast or ocean?
Yes
No

Q13. What was the primary reason for your trip to the coast or ocean?
Work
School
Other, please specify:

Q14. Did you participate in any of the following activities during your last trip to the coast?
a. Beach going (dog walking, kite flying, jogging, etc.)
b. Biking or hiking
c. Collection of non-living resources/beachcombing (agates, fossils, driftwood)
d. Photography
e. Scenic enjoyment
f. Sitting in your car watching the scene
g. Watching birds and/or other marine life from shore
h. Fishing (hook and line) from pier/shore
i. Fishing (hook and line) from a boat
j. Diving (picking or spear fishing) from a boat
k. Diving (picking or spear fishing) from a shore
l. Trap/net from pier or shore (crabbing)
m. Trap/net from boat (crabbing)
n. Collecting/picking/harvesting sea life from shore (clamming, seaweed, mussels, etc.)
o. Hang gliding/parasailing
p. Kite boarding
q. Skim boarding
r. Surfing (board, boogie, stand up paddle, kayak)
s. Surfing (tow-in)
t. Swimming or body surfing in the ocean
u. Windsurfing
v. Free diving/snorkeling (from shore, from boat)
w. Kayaking in the ocean or estuary/slough
x. Power boating
y. Sail boating
z. SCUBA diving (from shore, from boat)
aa. Using a personal water craft (jet skis)
bb. Other, please list:

Q15. [GO TO ECOTRUST MAPPING PORTION OF SURVEY TO MAP LOCATION OF ACTIVITIES]

Q16. To help us improve future surveys, was the mapping portion of this survey easy to understand and use?
Strongly Agree
Somewhat Agree
Neither Agree nor Disagree
Somewhat Disagree
Strongly Disagree

Q17. How many nights did you spend at the coast during your last trip to the coast?

Q18. During your last trip to the coast, please indicate if your party spent money on the following items.
a. Parking
b. Food and beverages from a store
c. Food and beverages at a restaurant or bar
d. Souvenirs (t-shirts, posters, gifts, etc.)
e. Sundries (sunscreen, surf wax, motion sickness pills, batteries, film and processing etc.)
f. Boat rental

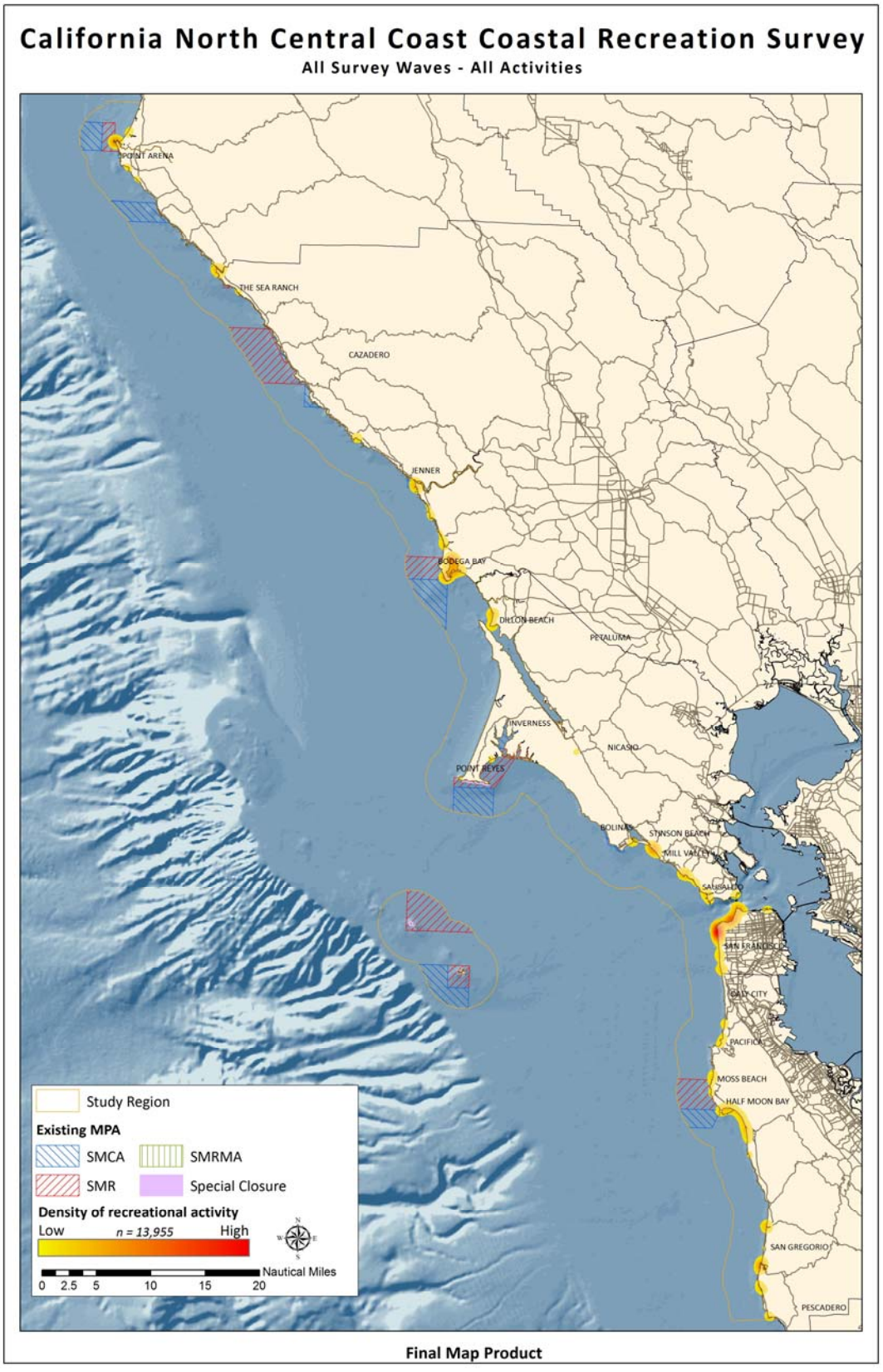
g. Car rental
h. Dive equipment rental and airfills
i. Kayak rental
j. Surfboard or bodyboard rental
k. Bike rental
l. Boat fuel
m. Ramp fees
n. Bait and tackle
o. Lodging (if you stayed overnight)
p. Charter fee (whale watching, etc.)
q. Museum, aquarium, or other entrance fee
r. Lessons, clinics, camps
s. One-day fishing license fee
t. Hang glide rental

Q19. During your last trip to the coast, please estimate how much your party spent on the [above indicated] items and whether the expenditure occurred within 30 miles of the coast.

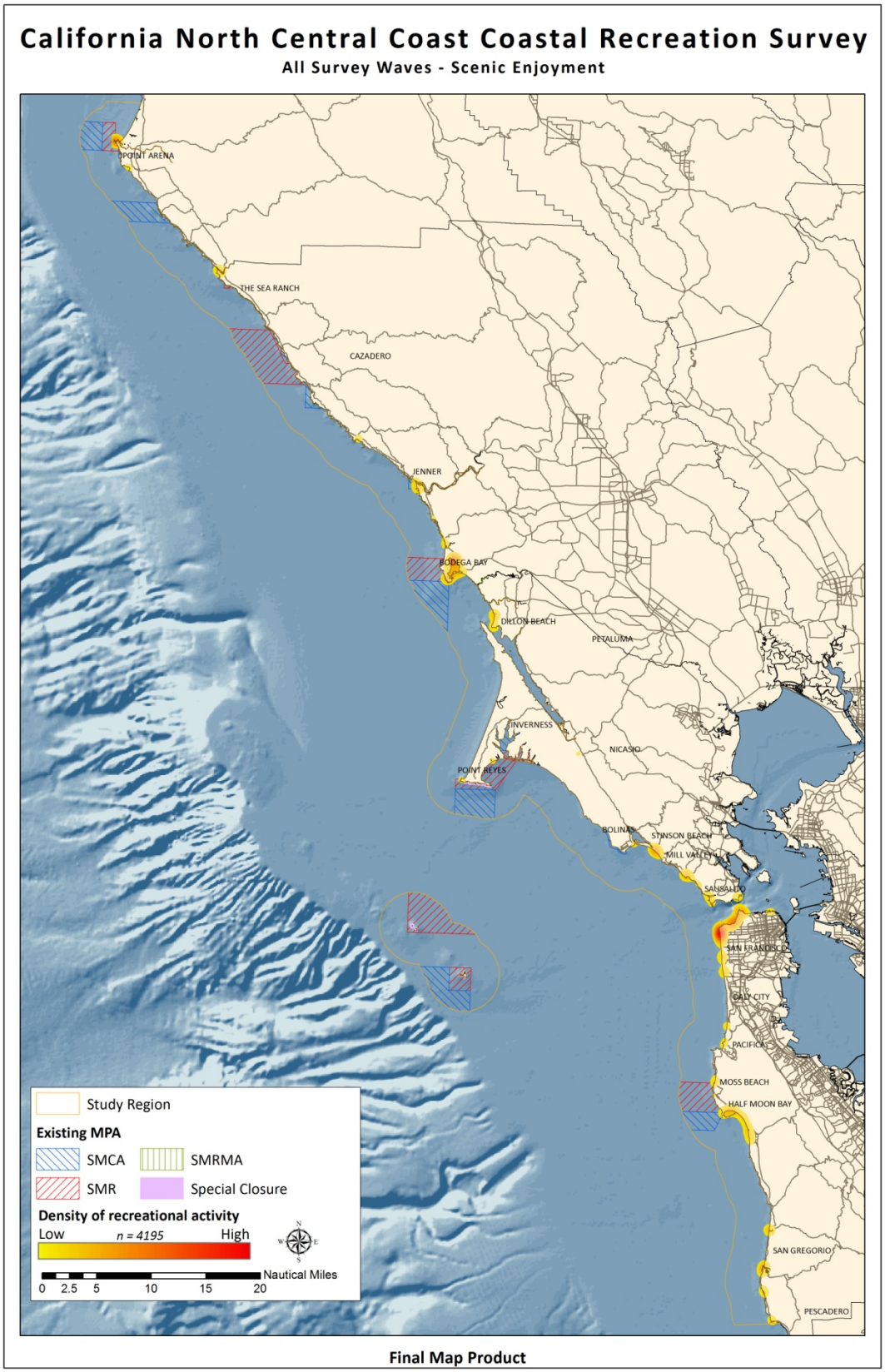
Q20. Please estimate the number of miles driven during your last trip to the coast (roundtrip).

A series of demographic and other questions were also included by Knowledge Networks

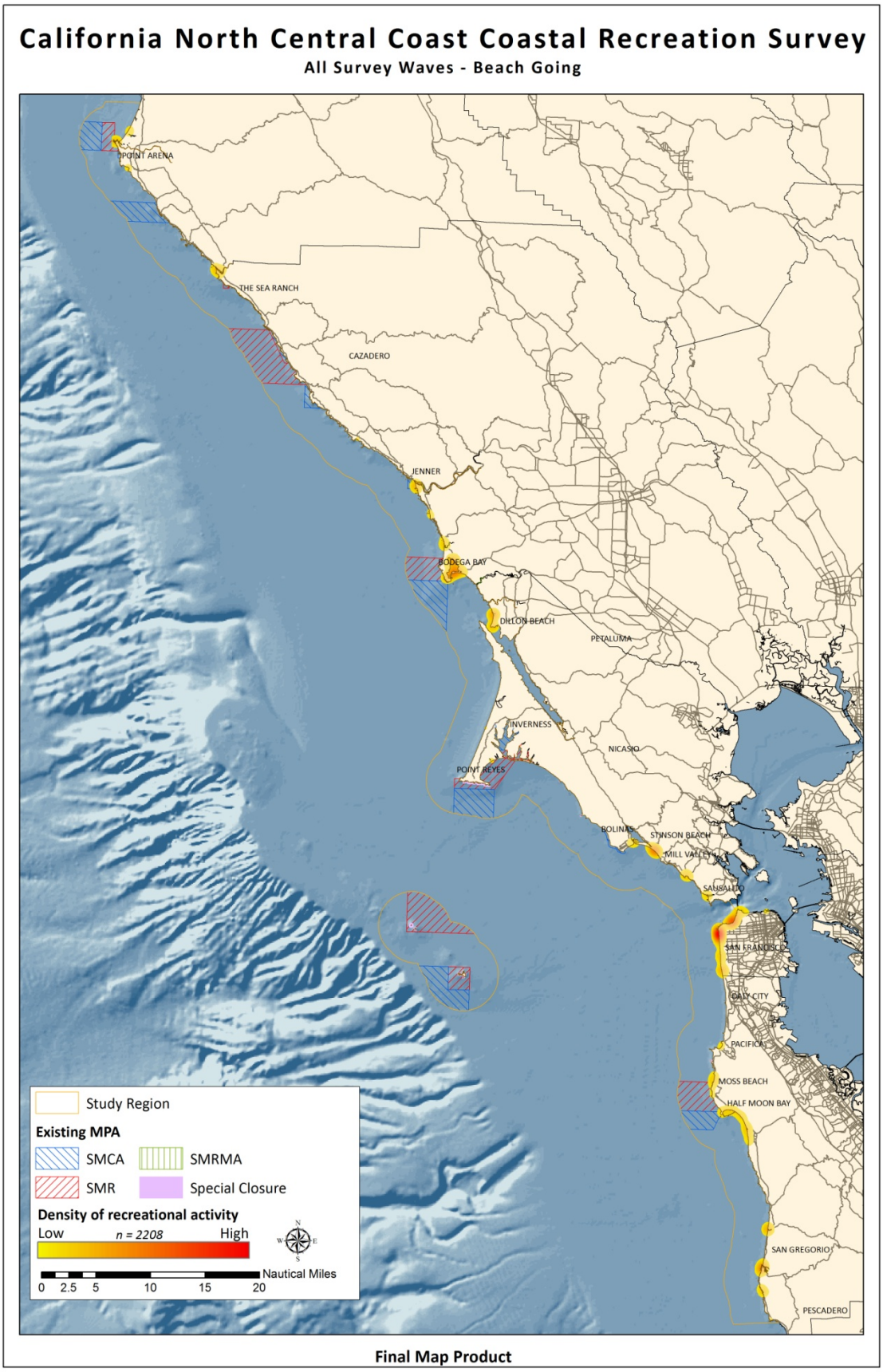
Appendix B. Coastal Recreation Map Products



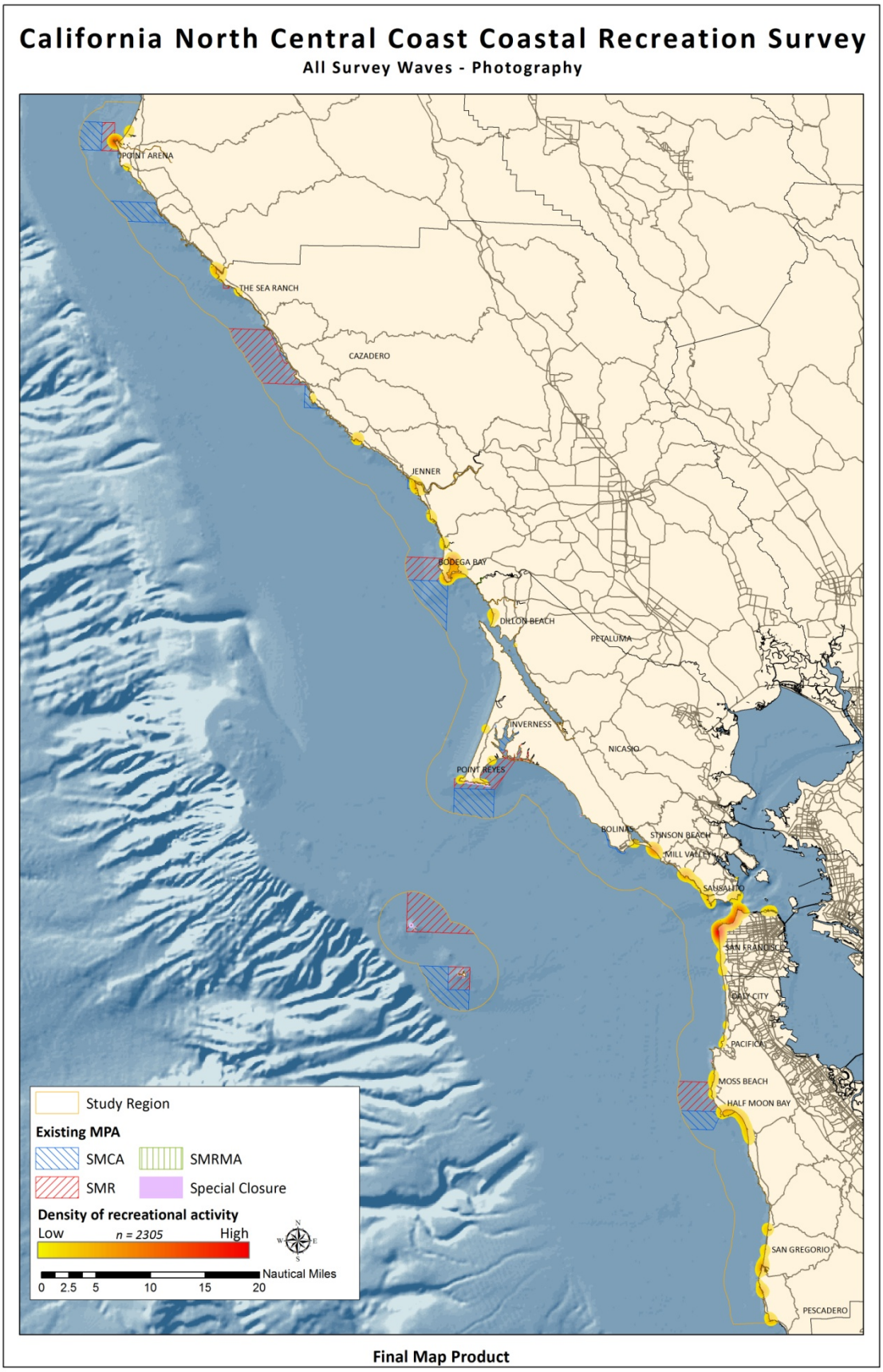
Final Map Product



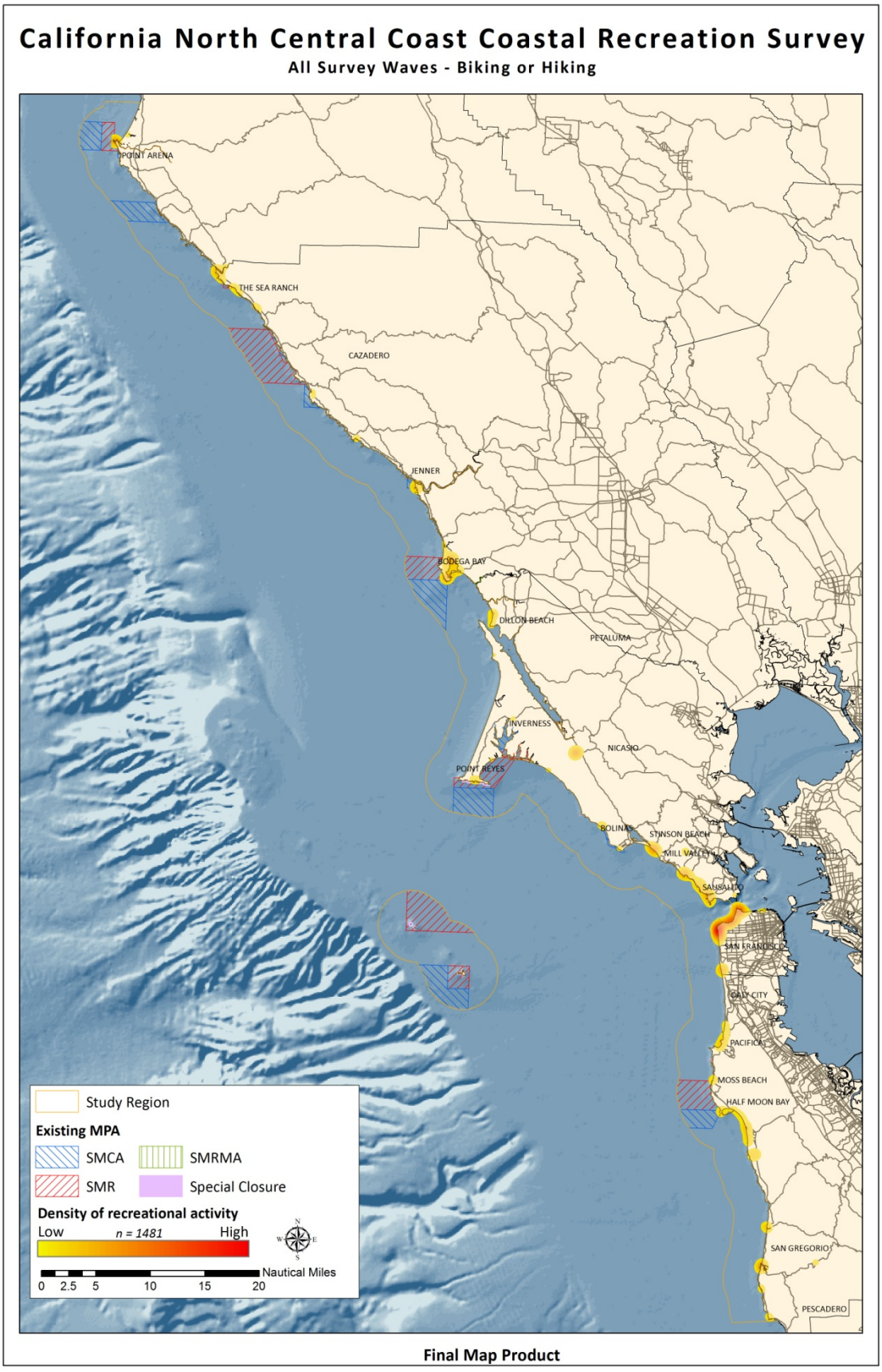
Final Map Product



Final Map Product



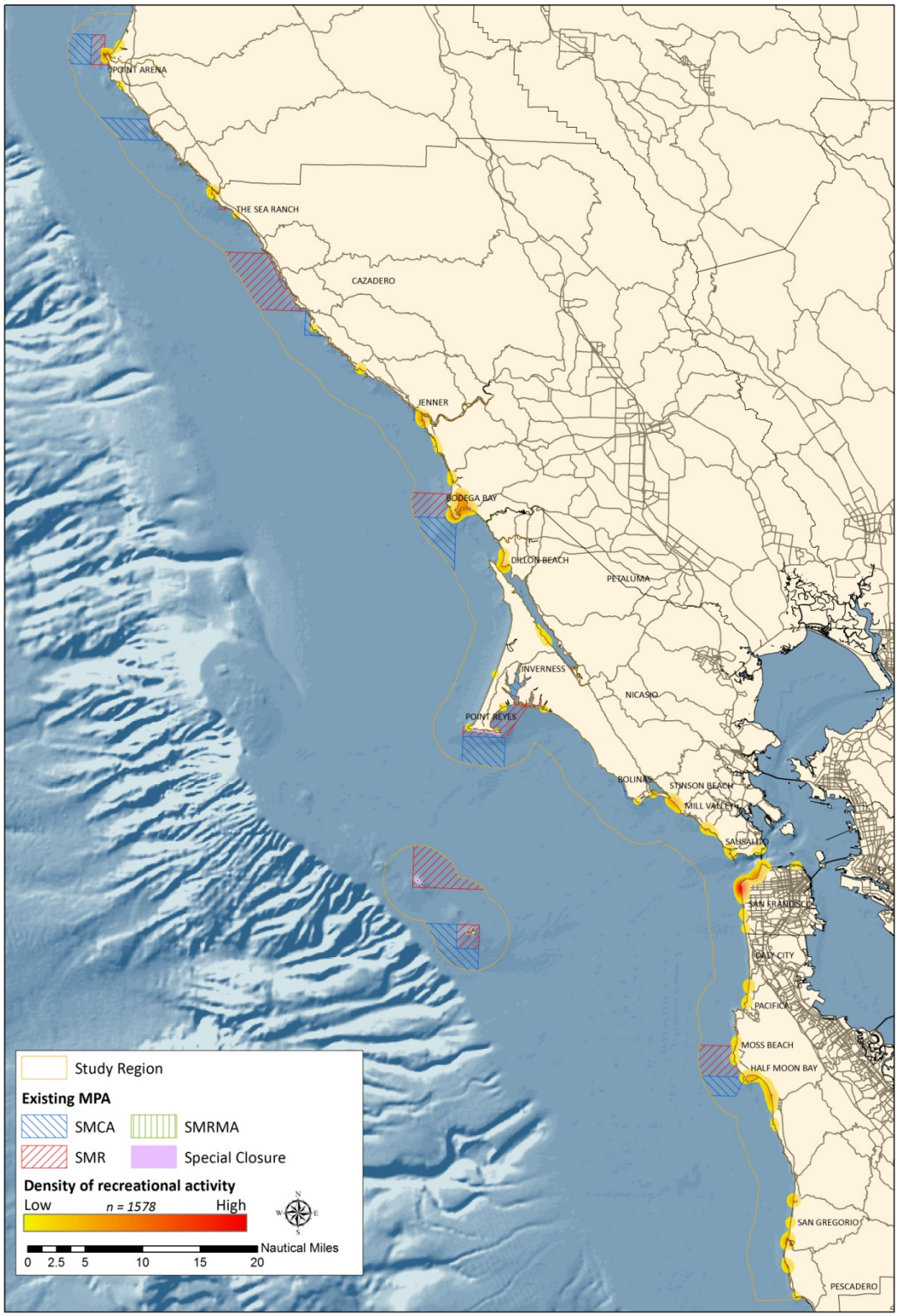
Final Map Product



Final Map Product

California North Central Coast Coastal Recreation Survey

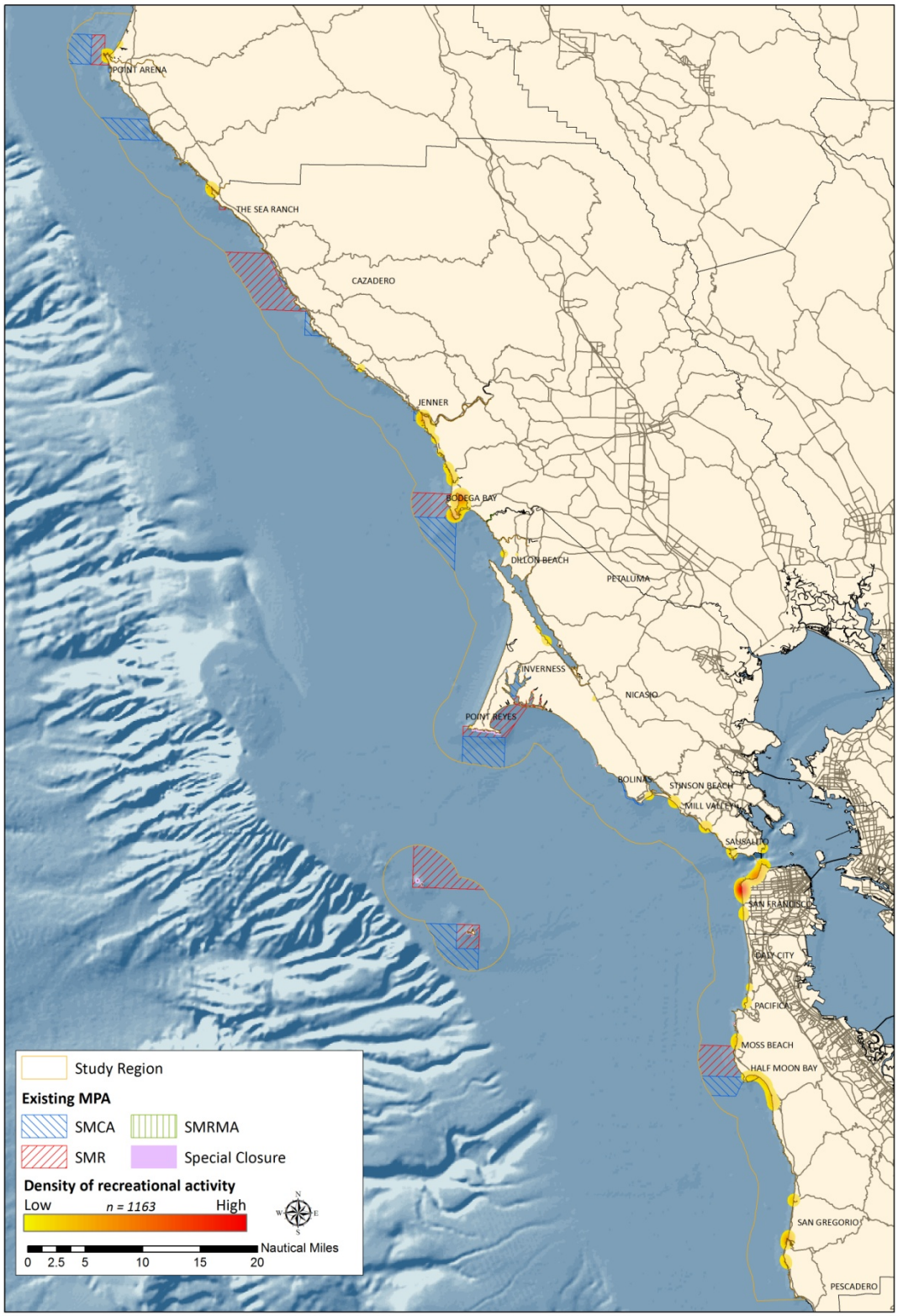
All Survey Waves - Watching Birds and/or Marine life from shore



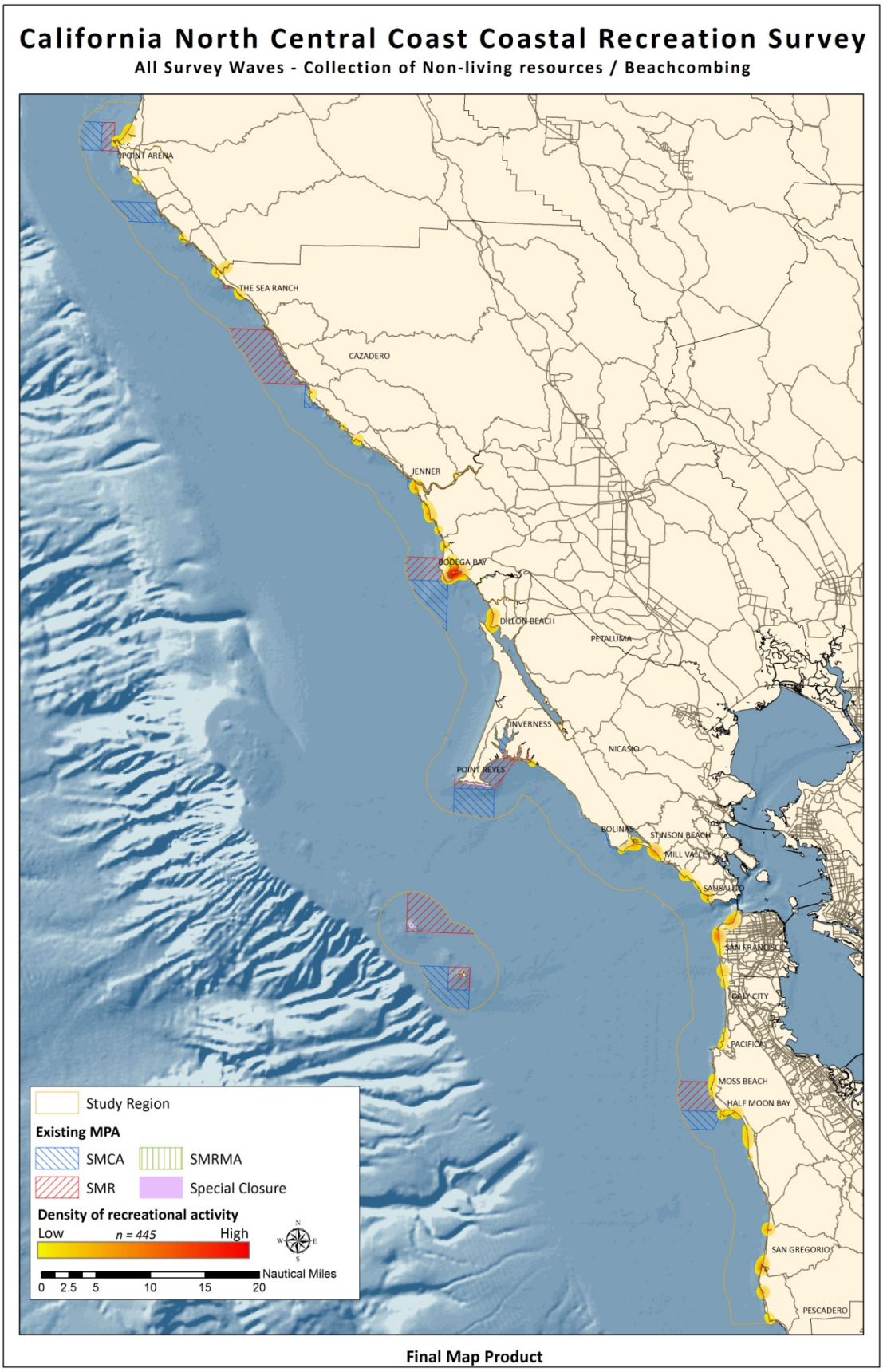
Final Map Product

California North Central Coast Coastal Recreation Survey

All Survey Waves - Sitting in Car watching the Scene



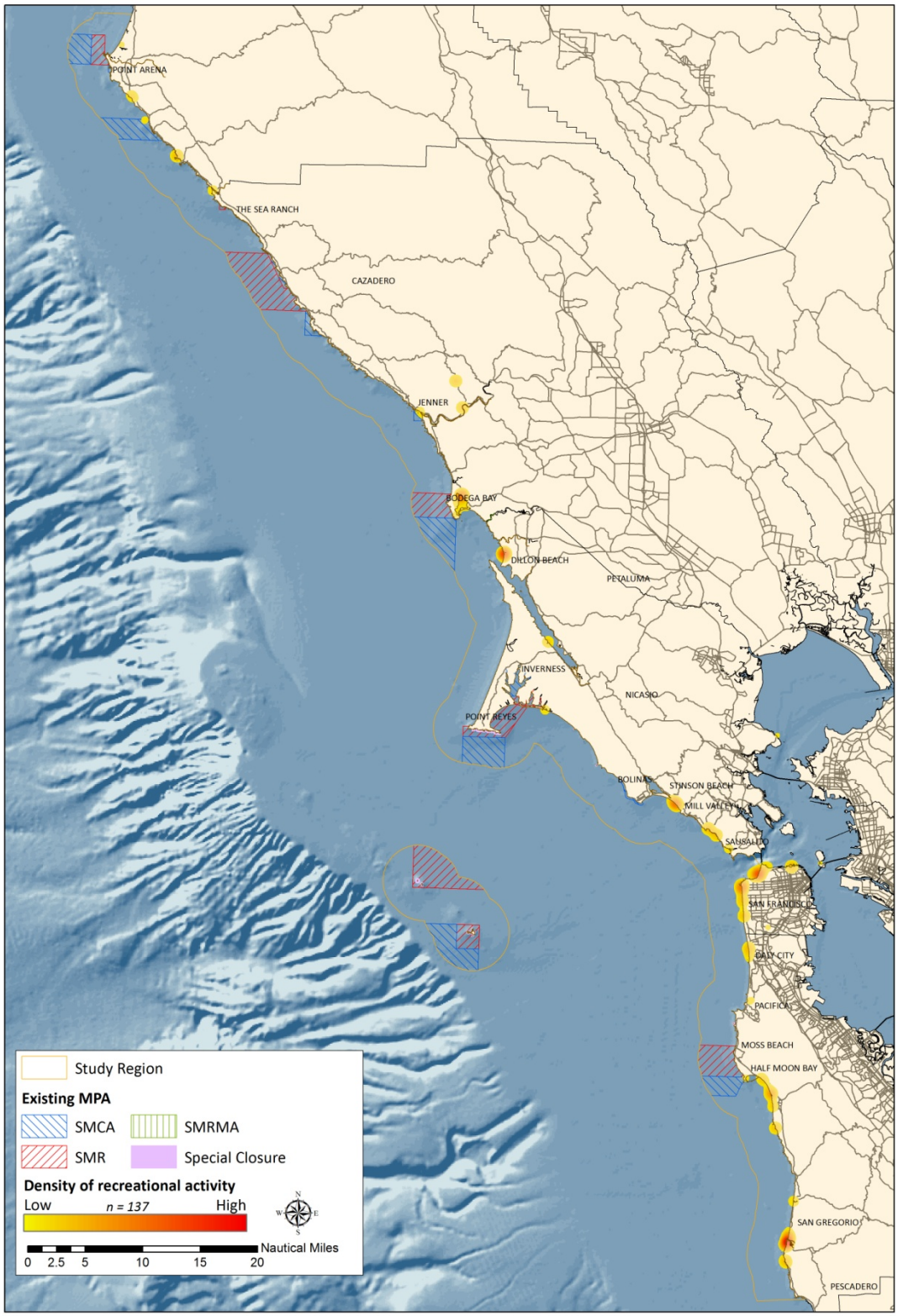
Final Map Product



Final Map Product

California North Central Coast Coastal Recreation Survey

All Survey Waves - Swimming or Body Surfing in the Ocean



Final Map Product