University of California, Santa Barbara
Donald Bren School of Environmental Science and Management

Knowledge, Attitudes, and Perceptions of Tourists and Coastal Users in Morro Bay

Developing an Effective Survey Instrument

A Group Project submitted in partial satisfaction of the requirements for the degree of Master's in Environmental Science and Management
for the
Donald Bren School of Environmental Science & Management

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As authors of this Group Project report, we are proud to archive it on the Bren School's website such that the results of our research are available for all to read. Our signatures on the document signify our joint responsibility to fulfill the archiving standards set by the Donald Bren School of Environmental Science & Management.

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The mission of the Donald Bren School of Environmental Science & Management is to produce professionals with unrivaled training in environmental science and management who will devote their unique skills to the diagnosis, assessment, mitigation, prevention, and remedy of the environmental problems of today and the future. A guiding principal of the School is that the analysis of environmental problems requires quantitative training in more than one discipline and an awareness of the physical, biological, social, political, and economic consequences that arise from scientific or technological decisions.

The Group Project is required of all students in the Master's of Environmental Science and Management (MESM) Program. It is a four-quarter activity in which small groups of students conduct focused, interdisciplinary research on the scientific, management, and policy dimensions of a specific environmental issue. This Final Group Project Report is authored by MESM students and has been reviewed and approved by:

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Abstract

This project developed a survey to characterize the general coastal user in Morro Bay, California by evaluating perceptions of environmental quality and recreational activities and spending. Morro Bay is a coastal community adjacent to an ecologically important estuary. Historically a fishing community, the role of tourism in the local economy has recently grown. The San Luis Obispo Science and Ecosystem Alliance (SLOSEA) supports ecosystem-based management and facilitates understanding of the local environment to inform conservation, restoration, and sustainable use of the ecosystem. As part of the Economic Indicators Initiative of SLOSEA and under the guidance of the Coastal Ocean Values Center, the Bren Group Project developed and administered intercept surveys to residents and tourists in Morro Bay during the summer of 2007. The survey was designed to develop a profile of coastal users in Morro Bay, observe current perceptions of environmental quality for both residents and visitors, quantify expenditures, and explore relationships between perceptions of environmental quality, recreational activity choice, and expenditures. The survey methodology was analyzed to determine its effectiveness relative to different user characteristics and interview format. The results of these analyses can inform future endeavors to determine environmental perceptions of coastal and estuarine recreational users in other locations.

Acknowledgements

We would like to thank our clients, **Dr. Linwood Pendleton and Allison Chan**, for proposing this wonderful group project and for their feedback and guidance throughout every stage of the project.

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- Rick Algert, the Morro Bay Harbor Director, who gave considerable guidance and support to this project, and
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How to Use This Document

This document provides guidance for the Coastal Ocean Values Center and other parties interested in determining environmental perceptions, recreational activities, and expenditures of coastal users in Morro Bay through the use of a survey instrument. In addition, the project presents recommendations for future surveying efforts that will address environmental perceptions, activities, and spending in coastal communities.

To make this information accessible to a wide range of stakeholders and interested parties, the main report was designed to be succinct and require little prior knowledge of the topics presented. More detailed information on survey protocol, results, and the survey materials are presented in the attached appendices.

Project Report

This section presents a background of Morro Bay and relevant scientific literature, summarizes the survey methodology, and presents results from the survey analysis. The report ends with an outline of issues that were encountered during the surveying effort. The group offers a recommendation to address each issue. Because of the potential negative effects of increasing survey length, incorporating all recommendations into a future survey may not be possible, but the full set of recommendations is included to acknowledge all observed limitations of the current survey. We indicate the recommendations we feel deserve the highest priority in the final section of this paper, and present an updated version of the survey reflecting these changes in Appendix II.

Appendix I: Survey and Data Protocols

The first appendix details the methods used to develop, administer, and record the results of the Morro Bay Coastal User Survey.

Appendix II: Survey Materials

This section presents all versions of the survey that were used, including the exploratory survey, the initial summer survey, and the final summer survey. A survey that incorporates the priority recommendations is also included.

Appendix III: Survey Results and Statistics

This section provides all the summary statistics results from the survey administration.

Appendix IV: Data Analysis Results

The final appendix presents the complete data analysis results in a comprehensive tabular form.

Executive Summary

Introduction

Tourism and recreation contribute substantially to the economy of Morro Bay, a small California community that surrounds a vibrant coastal estuary. Perceptions of environmental quality can influence the types of activities in which tourists engage while visiting Morro Bay. Local stakeholders seek to understand the relationship between environmental perceptions and activity-related expenditures that impact the economy. This study explores the relationship between environmental perceptions, activity choices, and expenditures of coastal users in Morro Bay using a survey instrument.

The development of the survey furthered the goals of the Economic Indicators Initiative of the San Luis Obispo Science and Ecosystem Alliance (SLOSEA). The Economic Indicators Initiative researches how ecological health influences the economic well-being of people who live near and make a living from the Morro Bay estuary. The Coastal Ocean Values Center supports the Economic Indicators Initiative from a national perspective. In conjunction with the goals of the Economic Indicators Initiative, the Bren Group Project defined the following project objectives:

- Create an effective and repeatable survey instrument to:
    - develop a profile of coastal visitors in Morro Bay,
    - observe current perceptions of environmental quality of both residents and visitors,
    - quantify local expenditures made by visitors, and
    - explore relationships between perceptions of environmental quality, recreational activity choice, and expenditures.
- Document the survey creation procedure.
- Establish a formal survey protocol.
- Collect 200-400 usable surveys.
- Measure the success and accuracy of the survey instrument.
- Evaluate the effectiveness of survey questions.
- Conduct preliminary analysis of the survey data.

Background

Morro Bay, California is a small coastal city located 230 miles north of Los Angeles. The city has been a tourist destination for over 100 years for those

seeking to camp, hike, fish, bicycle, or enjoy the scenery. More recently, small shops, bird watching, and restaurants have become strong attractions in Morro Bay. The Morro Bay estuary environment is also home to many different animal species, including the tidewater goby, Morro Bay kangaroo rat, and numerous bird species. Some of these species are listed as endangered or threatened and require special management attention.

If not designed properly, plans for new development in Morro Bay could have an adverse effect on the environment. For example, development, even high in the watershed, could increase sedimentation in the Morro Bay estuary. Although the effect of sedimentation on environmental perceptions and human behavior in Morro Bay is unclear, research has found that environmental perceptions are linked to explicit environmental quality indicators (Faulkner et al., 2001). Water clarity, lack of litter, and presence of wildlife are all examples of explicit environmental quality indicators that may affect environmental perceptions. Negative perceptions of environmental quality may in turn alter human behavior in Morro Bay. Since the Morro Bay economy is impacted by expenditures related to environmentally-focused activities, local stakeholders are interested in measuring relationships between human dimensions (behaviors, perceptions and attitudes) and expenditures.

Survey Process and Methodology

The Morro Bay Coastal User Survey was developed in three phases. The first phase generated a six-question exploratory survey. This one page survey was administered to gather introductory information about question form, survey method, and the willingness of coastal users to participate in the survey. In the second phase, information from the exploratory survey led to the creation of visitor and resident versions of the survey. These three page surveys (two pages of questions and a map section) were reviewed by an external advisory group, leading to the addition of a Spanish language version for both residents and visitors. The final phase of survey development was a revision process that fixed ambiguous questions halfway through the summer survey period.

The survey was administered during a ten-week period from the end of June to the beginning of September 2007. Seven locations that represented different coastal habitats of Morro Bay were surveyed in three different time blocks. Two surveyors administered all of the surveys in an "intercept" fashion. Survey respondents were given the option to respond to the survey by themselves (handout mode) or be interviewed by the surveyor (interview

mode). Every reasonable attempt was made to remove bias resulting from question format, sampling strategy or any other part of the survey protocol.

Evaluating the Survey Instrument

When the survey period ended, 681 surveys had been collected with a response rate of 86 percent. Of the 681 surveys collected, 666 were considered usable and 15 deemed unusable because at least half the survey was left blank. Next, the survey was evaluated for biases between the two survey modes and between surveyors. The tests for bias focused on responses to perceptions of environmental quality and expenditures questions. Very little bias was found between surveyors. The next analytical step was to evaluate patterns of environmental perceptions, activities, and expenditures.

Most individuals perceive environmental quality to be better in Morro Bay than other southern California beaches. Responses to the five habitat characteristics explored in the survey (water quality, access to open space, and abundance of fish, birds, and other marine wildlife) show that both residents and visitors believe that Morro Bay has better environmental quality than other similar California coastal areas south of Santa Cruz. The one exception was that those respondents who participated in water related activities (fishing, surfing, etc.) tended to have a more negative opinion of water quality. Residents have a stronger positive opinion of environmental quality in Morro Bay than visitors as it relates to these five characteristics.

In evaluating the effectiveness of the survey instrument, certain questions were found to cause confusion for respondents and resulted in lower response rates or inconsistent answers. To address these problems, specific recommendations were outlined. These recommendations include changing some question formats and wording, and altering the survey methodology to increase the number and type of coastal users captured by the survey.

Conclusion

A survey instrument using these recommendations should yield unbiased time series data. Stakeholders in Morro Bay are interested in gathering data over time to identify trends in coastal user perceptions and connections to the local economy. The larger goal of SLOSEA and the Coastal Ocean Values Center is to use the survey throughout the United States. The Morro Bay Coastal User Survey will be immediately applicable to many other coastal

marine environments. The survey effectively addresses the goal of the Economic Indicators Initiative and the Coastal Ocean Values Center to better understand the relationships between environmental perceptions, recreational activities, and the local economy.

I. INTRODUCTION

Tourism and recreation contribute significantly to the economy of many coastal communities. Although these industries clearly depend on the surrounding environment, the effect of ecosystem conditions on their viability is not well established. To elucidate this relationship, it is necessary to characterize recreational behaviors of coastal users and explore how perceptions of environmental conditions affect those behaviors.

This study explores coastal recreation in Morro Bay, California. The city of Morro Bay, located along Central California's Estero Bay, surrounds an ecologically important estuary (MBNEP, 2007). The estuary provides critical habitat for marine and terrestrial endangered and threatened species. The broader environment of Estero Bay fostered the development of commercial fisheries in the region. Although commercial fishing has historically supported the Morro Bay waterfront economy, the role of tourism has recently grown.

The goal of this project is to develop a survey capable of evaluating the relationships between activity choices, habitat usage, perceptions of environmental quality, and recreational expenditure patterns. Given that actual environmental conditions and perceptions of the environment are not always similar (Pendleton, 2001), it is necessary to establish relationships between perceptions and behavior to accurately explain connections between the ecosystem and the economy.

The development of an effective survey tool will help determine how attitudes and perceptions of coastal users of the Morro Bay waterfront are influenced by the surrounding ecosystem and its management. Surveys are commonly used for gathering information on perceptions and behavior because they collect detailed information at an individual level (Alreck and Settle, 1995). The Bren Group Project Team created the Morro Bay Coastal User Survey to accomplish these goals.

The Bren Group Project was developed to support the Economic Indicators Initiative of the San Luis Obispo Science and Ecosystem Alliance (SLOSEA). SLOSEA is an integrated group of scientists, resource managers, and stakeholders that support sustainable and resilient marine resources on the central California coast through research initiatives and progressive ecosystem-based management (SLOSEA, 2008). Dr. Linwood Pendleton and Allison Chan are leaders of the Economic Indicators Initiative and the non-profit organization Coastal Ocean Values Center, which coordinates research

and data collection on economic indicators of coastal ecosystem health (COVC, 2007).

1. Objectives

In conjunction with Dr. Linwood Pendleton, Allison Chan, and the research goals of the Economic Indicators Initiative, the Bren Group Project Team (hereafter referred to as "the team" or "the group") developed the following project objectives:

- Create an effective and repeatable survey instrument to:
    - develop a profile of coastal visitors in Morro Bay,
    - observe current perceptions of environmental quality of both residents and visitors,
    - quantify local expenditures made by visitors, and
    - explore relationships between perceptions of environmental quality, recreational activity choice, and expenditures.
- Document the survey creation procedure.
- Establish a formal survey protocol.
- Collect 200-400 usable surveys.
- Measure the success and accuracy of the survey instrument.
- Evaluate the effectiveness of survey questions.
- Conduct preliminary analysis of the survey data.

This research project is the first to evaluate how human perceptions of environmental quality in Morro Bay affect recreational behavior and expenditures. Since Morro Bay is a small city and economic activities and environmental conditions are relatively easy to measure, a survey should be able to establish clear and comprehensive relationships. By providing information about expenditures, activities, and perceptions of environmental quality, the Bren Group Project will help link ecosystem-based management to human dimensions (behaviors, perceptions, and attitudes) and of an ecosystem to its management and environmental quality (see Figure 1).

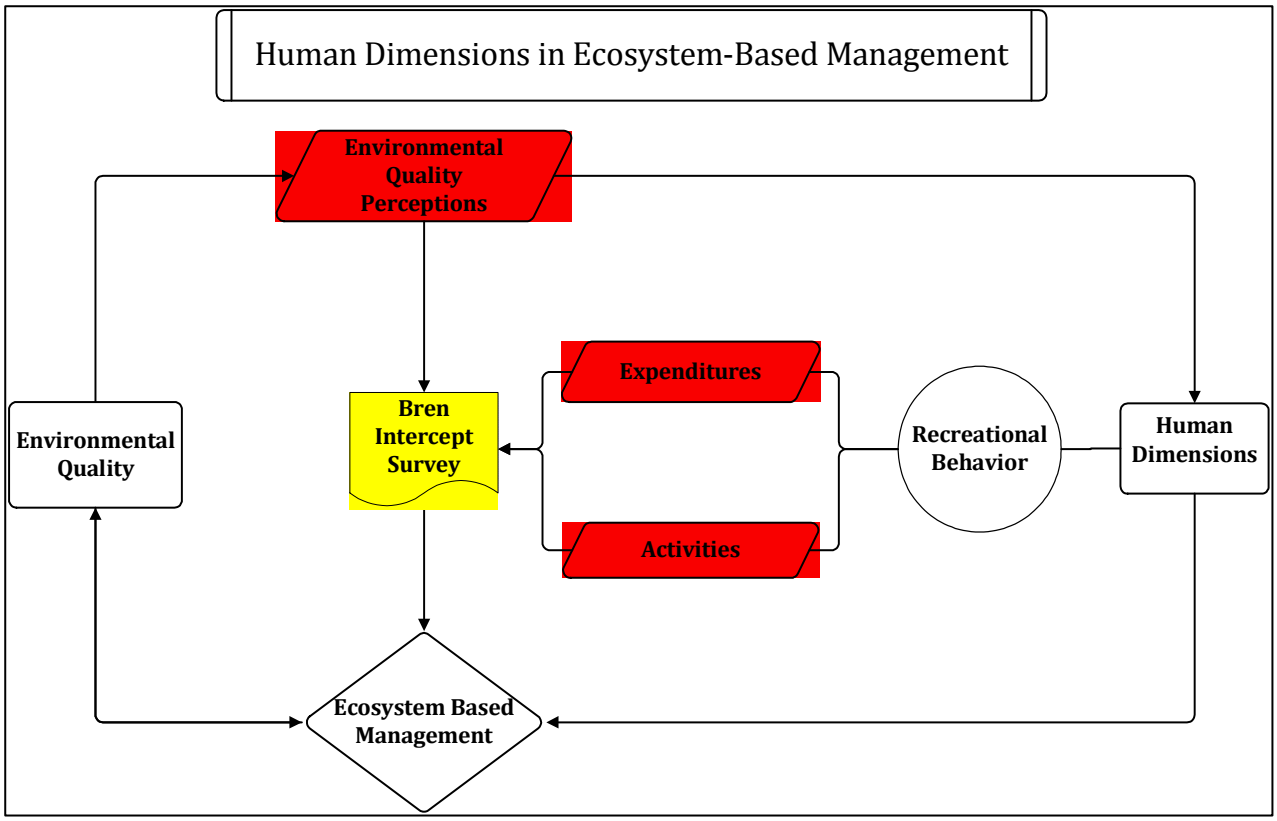

Figure 1: This diagram illustrates the steps in determining the effects of ecosystem-based management decisions on the human dimensions of Morro Bay. Ecosystem-based management focuses on the entire ecosystem and aims to maintain ecological integrity through an integrative process of planning and management (Slocombe, 1998). Using this management strategy, the ecosystem is defined in biological, cultural, and physical terms. The boxes in red and yellow in the figure specify the scope of the Bren Group Project within the greater framework of ecosystem-based management. The arrows in the diagram indicate both the flow of information and causal relationships.

II. BACKGROUND

2. The City of Morro Bay

Morro Bay is located along Estero Bay on the coast of San Luis Obispo County, California. Located about 200 miles north of Los Angeles and 230 miles south of San Francisco, the city of Morro Bay encompasses 5.2 square miles of land and 5 square miles of surface water (NWFSC/NOAA, 2004). In the 2000 United States Census, 10,350 people resided in Morro Bay, with a median age of 45.7 years, and a gender structure of 52.3% females and 47.7% males (NWFSC/NOAA, 2004).

Though Morro Bay has historically been a fishing community, it has become increasingly popular for other amenities, including shops, restaurants, and recreational activities such as bird watching, hiking, surfing, camping, and kayaking (Gates and Bailey, 1982). These recreational activities contribute significantly to the economic viability of coastal cities, as evidenced by the sheer number of people in California that participate in marine recreation. Pendleton and Rooke (2006) found that while California ranks second to Florida in the percent of its population that participates in marine recreation, its large population places California first in the Nation in the number of residents that participate in marine recreation annually (12.2 million).

Morro Bay contains a variety of habitats that provide many recreational opportunities. The 2,300 acres of estuary habitat are fed by water that enters from Chorro and Los Osos Creeks and exits into the larger Estero Bay and the Pacific Ocean (MBNEP, 2000). The well-developed estuary supports a tremendous variety of wildlife due to the combination of creeks, wetlands, salt marshes, mudflats, sand dunes and open water (MBNEP, 2007). The shallow water, eelgrass beds, and wetlands of the Morro Bay estuary provide protected habitat and food for many marine fishes, including endangered steelhead trout that spawn in Los Osos and Chorro Creeks and eventually migrate to the sea (MBNEP, 2007). The estuary and surrounding areas sustain populations of other endangered and threatened species, such as the California red-legged frog, tidewater goby, Morro Bay kangaroo rat, southern sea otter, and western snowy plover (MBNEP, 2000). Additionally, Morro Bay provides vital migratory and wintering grounds for numerous bird species. As essential habitat for many species, Morro Bay is of significant ecological importance. Similar lagoons and wetlands in many other California coastal areas have been lost to sedimentation and land development, emphasizing the need for successful management of the Morro Bay estuary (MBNEP, 2007).

3. Potential Ecological Threats

Environmental changes due to future development could impact the Morro Bay estuary. Increases in population will lead to more roads, construction, and urban runoff, thus increasing sedimentation (MBNEP, 2000). Sedimentation adversely impacts navigation and increases the need to dredge the harbor opening of the estuary. The commercial and sport fishing industries are also affected by sediment reaching the estuary due to the negative impact on spawning habitat for fish species in the area. Studies by

the Morro Bay National Estuary Program (2000) show that sedimentation also impacts:

- Shellfish harvesting by decreasing shellfish survivorship
- Freshwater habitat by smothering gravel beds needed for fish spawning and reducing habitat quality
- Migrations of aquatic organisms by impairing migration and eroding fish gills
- Rare, threatened, and endangered species habitats
- Water-related recreation
- Municipal water supply, and
- Agriculture by increasing erosion and loss of topsoil that could otherwise be farmed.

Other potential ecological effects include nutrient loading, the presence of heavy metals and toxic pollutants, and loss of habitat. High levels of nitrogen and phosphorus generate algal blooms, which reduce available dissolved oxygen for fish species and submerged aquatic vegetation. These organisms may not be able to survive in the presence these high nutrient levels (MBNEP, 2000). Heavy metals such as iron, nickel, cadmium, chromium, and arsenic negatively affect water quality because of their toxicity to many species and persistence in the ecosystem over time (MBNEP, 2000). Other toxic pollutants that affect water quality include pesticides and organic compounds. In addition to water quality issues, the Morro Bay estuary is affected by increased urban development that results in the destruction of estuarine habitat. New residences and roads can fragment habitat, resulting in isolated populations, and diminished or eliminated gene flow between populations (MBNEP, 2000).

4. Current Knowledge of Environmental Perceptions

Perceptions of environmental quality may affect both visitation rates and recreational expenditure patterns. Research by Klein, Osleeb, and Viola (2004) found that: "Beach quality has a major impact on the value of the coastal zone to both residents and visitors. This can be seen in high property values, commercial and residential development, tourism, employment, and tax revenues." These observed tourism and recreation trends include activities such as swimming, fishing, snorkeling and diving, boating, and coastal cruises (Klein et al., 2004).

Environmental perceptions, which influence recreational choices, are driven by several factors. Research by Faulkner et al. (2001) found that residents' trust in local officials, and general public opinion, influence perceptions. These factors are in turn influenced by publicity and newspaper coverage. In addition, studies by Johnson and Chess (2006) and Petrosillo et al. (2007) illustrate connections between environmental perceptions and demographic characteristics, such as gender, ethnicity, education, income, cultural ties, and primary language. These demographic factors affect the determination of an acceptable level of environmental damage. Exposure to the area of concern, personal use of a resource, and work experience also influence a person's perception of local environmental quality (Faulkner et al., 2001). Proximity of residence, frequency of visits to the area of interest, and reported environmental affiliations affect general environmental perceptions (Faulkner et al., 2001).

Despite their importance, perceptions of environmental quality are not always easy to measure. When asking about environmental quality indicators, survey designers must keep in mind that older people are more likely to have difficulty understanding indicators (Johnson and Chess, 2006). Additionally, most respondents cannot differentiate between 'good' and 'bad' environmental quality. The observable characteristics that describe 'good' and 'bad' quality must be clearly defined in the survey questions. For example, the presence of 'many fish' indicates good water quality, whereas foam, oil or dead fish indicate poor water quality (Faulkner et al., 2001).

5. Recreational Expenditures and the Environment

Tourism-generated earnings are an important source of revenues and employment for counties in coastal zones (Klein et al., 2004). Recreation contributes to a region's economic growth through purchases of trip-related materials (English et al., 1994) and through expenditures that support jobs related to dive charters, hotels, eateries, and other services (Pendleton and Rooke, 2006; Bull, 1991). Recreational expenditures cycle though the local economy through increased wages and spending.

Nature visitors, such as birdwatchers, hikers, and campers, tend to spend more money per trip (and more per day) than the average visitor, according to an Arizona study (Leones et al., 1998). Other factors that had a positive effect on spending included the number of local attractions visited, the trip length, and the point of origin.

Accuracy of expenditure surveys is affected by the time that has passed since spending occurred. Howard et al. (1991) found that participants significantly underestimated overall daily expenditures immediately after spending occurred. However, Zhou (2000) found that visitors tend to overestimate expenditures when a significant amount of time has passed.

III. SURVEY PROCESS AND METHODOLOGY

The purpose of the Morro Bay Coastal User Survey was to develop a profile of coastal visitors in Morro Bay, to quantify attitudes and environmental perceptions of Morro Bay, and to explore the relationships between perceptions of environmental quality and recreational activities and expenditures. The final survey resulted from multiple iterations that incorporated feedback from the group project advisors, clients, and members of the Morro Bay community and local organizations. The survey was administered with a uniform protocol at seven strategic locations in Morro Bay during the summer of 2007.

6. Survey Development

Any research using human subjects that is conducted by the University of California, Santa Barbara must follow the guidelines of the Office of Research. Under these guidelines, each group member completed an online course that reviewed the ethical issues of human-subjects research. Successfully completing the course certified each group member to conduct research with human subjects. The Office of Research also approved each survey version that was used over the course of the project.

The group first developed a half-page exploratory survey. This was used to test the effectiveness of certain questions, get respondent feedback on the survey, and gain knowledge on what to expect in the Morro Bay survey environment. The exploratory survey was tested on April 28, 2007, which can be found in Appendix II.

A first draft of a two page survey was presented to the Bren School external advisors for preliminary feedback on May 31, 2007. This meeting provided advice on survey formatting and protocol development. In addition, the external advisor panel suggested the development of a Spanish version of the survey to accommodate respondents that were not comfortable answering in English.

This draft was also introduced to the SLOSEA Advisory Committee in May of 2007. The resulting preliminary survey, which was tested in Morro Bay on June 9, 2007, incorporated the committee's feedback regarding format, wording, and subject matter. Additional edits were made before the initial summer survey was implemented on June 25, 2007. After five weeks of data collection, the initial summer survey underwent one final edit by the clients and group project members to correct unclear or difficult questions. Appendix II includes all versions of the survey and map that were used to collect data.

7. Survey Design and Methodology

There are drawbacks and limitations to both interview surveys and self-administered surveys. Interviews are often criticized because of the several ways interviewers can introduce bias (Alreck and Settle, 1995; Colombotos, 1969). Respondents may tailor their answers to what they think an interviewer wants to hear; an interviewer may ask questions in a suggestive way that is different from another interviewer; and an interviewer may misinterpret responses. However, the presence of an interviewer allows the respondent to ask for help and clarification, so interview surveys typically obtain relatively complete information. Self-administered surveys (questionnaires) are criticized for their low response rate and the inability of the respondent to receive assistance, leading to more questions misinterpreted or left unanswered. However, questionnaires are generally thought to be less subject to bias and easier to administer than interviews (Alreck and Settle 1995; Rea and Parker, 1997).

The Coastal User Survey was created as an *intercept* survey: the surveyor gives the respondent a questionnaire to fill out, but may optionally conduct an interview if the respondent declines, or is unable, to fill out the questionnaire. Administration of the survey as a handout questionnaire provided greater efficiency in surveying groups, and minimized potential interviewer bias. The presence of the surveyor while the respondent filled out the survey allowed the respondent to receive clarification. The interview option prevents biasing the sample against those who are not capable of reading or filling out a questionnaire.

To maximize the number of responses, the survey length was limited to two pages of questions and one map page. While administering the exploratory survey, the team found that residents were confused by, or incapable of

answering, several questions with language that was geared toward visitors. As a result, the team created a visitor survey and a resident survey with wording that was specific to each group. Residents could not characterize a particular visit to Morro Bay because they spend both leisure time and work time in the area. Therefore, the resident survey addressed leisure days rather than a visit to Morro Bay. In addition, the duration of experience in Morro Bay was characterized as length of residency for residents and as repeat visits for visitors. This difference in wording was also used in environmental perception questions that asked for perceptions over time.

The survey questions addressed the nature of the visitor's trip (or resident's leisure day), their activities and spending for that time period, environmental perceptions of Morro Bay, and demographics of the respondent. All questions provided choices for the respondent that covered the full range of possible answers to minimize intentional blank answers. Question wording avoided addressing two issues simultaneously (known as a double-barreled question), which would result in answers that are unclear and difficult to analyze. A map was developed as part of the survey to determine the interaction between respondents' activity choices and habitats visited. The habitat locations were delineated on the map according to categories developed by the Central Coast Wetlands Working Group (2007). Respondents were asked to indicate which activities they did in each place they visited.

8. Sampling Strategy and Intercept Protocol

Seven locations around Morro Bay – the Embarcadero (EM), Harbor Waterfront T-Piers (HA), Morro Rock (MR), State Park Museum (SP), Sand Spit (SS), Montaña de Oro State Park (MO), and Los Osos (LO) (both the Baywood area and Sweet Springs were included in this location) – were chosen as survey sites due to their frequency of use and nearby habitats (see Figure 2 for a map of these locations). These survey sites corresponded to specific regions on the map section of the survey and provided a geographically stratified sample of the population. Three time blocks were chosen for conducting surveys: 10-12pm, 1-3pm, and 4-6pm. Surveys were conducted by two surveyors (one team member and one SLOSEA intern) on three weekdays and two weekend days each week during two of the three time blocks each day. Time slots were chosen to maximize available respondents in each survey location. For example, the Harbor Waterfront T-Piers tended to be empty of visitors until the afternoon because restaurants and shops were not open in the morning. Therefore, few surveys were collected during the earliest time block at that location. Days of the week

were selected to create an even distribution of sampling per day throughout the summer. Locations were chosen randomly, subject to all locations being visited a similar number of times. The final survey schedule is included in Appendix I.

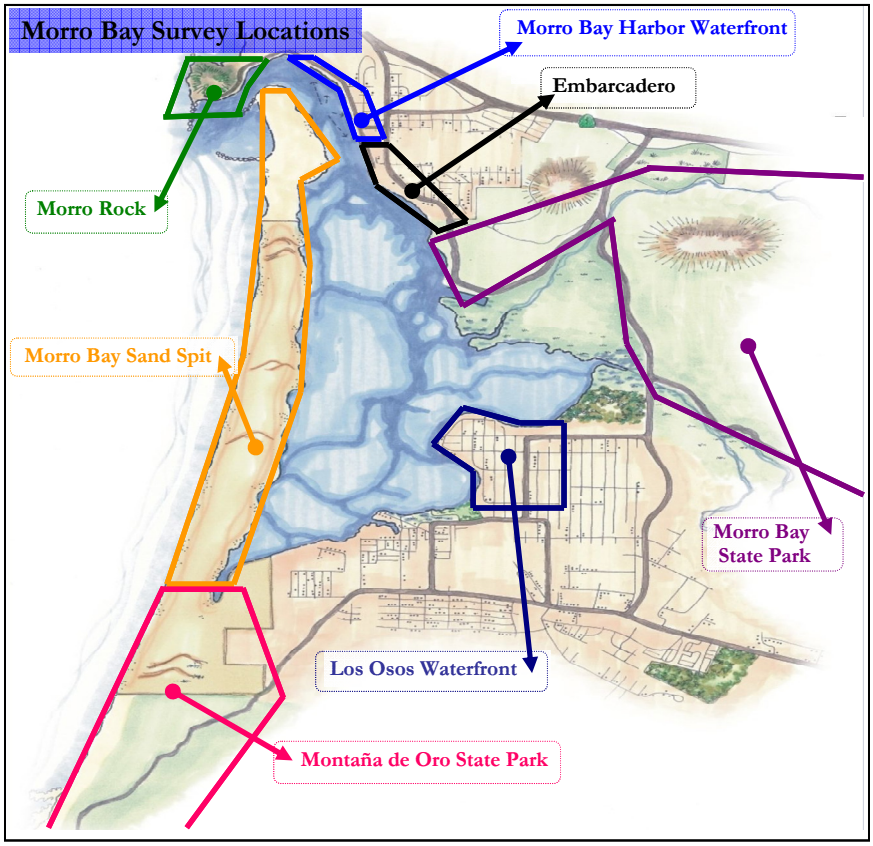

Figure 2: The seven locations surveyed around Morro Bay

At each location, the surveyors positioned themselves to encounter the greatest possible number of respondents, such as at the entrance to the State Park Museum or the beginning of the trail to the beach at the Sand Spit. In general, every person that came within earshot (roughly a 6-foot radius) of the surveyor was approached to take the survey. Certain specific characteristics of each survey location required minor differences in the survey protocol, which are explained in detail in Appendix I. The surveyors introduced themselves as students at their respective universities, explained the nature of the survey, and asked for participation in the form of a handout. If the participant hesitated or seemed unlikely to participate, the surveyor offered to interview them as an alternative. Groups of two or more persons were encouraged to fill out multiple surveys or engage in more than one interview. Protocols were developed over the course of the summer to

address common questions and problems (see Appendix I), such as confusion about the map section. The surveyors verbally reiterated the written directions for the map section for every respondent and offered to help fill it out if the respondent was still confused. The environmental perceptions questions required additional pre-defined explanations, such as examples of water quality and open space.

9. Data Entry Methodology

Entering data continuously throughout the summer avoided a backlog at the end of the survey period. A relational database in Microsoft Access was created to store all collected data. A form was created for each survey version (both the question and map sections) to allow for easy input of data. Where feasible, limits were created on the input fields to minimize data entry errors. The lead surveyor entered every survey into the database and one of the other three group members checked for entry errors. A specific data entry protocol was established (see Appendix I), such as entering all answers exactly as written. Thirty-nine randomly chosen surveys were double-checked to ensure that entry errors were minimal.

10. Data Limitations

The survey period was restricted to the summer due to the time frame of the Bren school academic year and scheduling for group project work. Although the sampling method provided a large data set during the survey period, the data is likely not representative of the year-round population at the Morro Bay waterfront. For example, some popular fishing seasons are closed during the summer, so visitors and residents that participate in those fisheries in Morro Bay may be underrepresented by the current survey time period. In addition, limited funding allowed for only two surveyors during this period.

In order to maximize the number of responses using an intercept mode, the survey was limited to two pages of questions and one map page. A longer survey would have allowed for more specific questions and more precise statistical conclusions. However, a longer format would inevitably lower the response rate, possibly resulting in a less representative sample. Repeating the survey periodically will overcome some of the limitations of the survey length and sampling strategy by providing data about changes in perceptions over time. Instead of asking respondents to gauge changes in their perceptions over time, this information can be obtained from repeating the survey for multiple years.

11. Data Quality and Variability

Social science survey methods have inherent quality limitations due to the extreme variability in participants and the difficulty in sampling a large population. Protocols were established for every step of the surveying process and common problems were addressed quickly by formulating standard responses to common respondent questions. These protocols are described in detail in Appendix I. All original surveys were retained in case mistakes in data entry were found.

IV. EVALUATING THE SURVEY INSTRUMENT

12. Survey Sample and Response Rate

By the end of the summer, 681 surveys were collected with a response rate of 86 percent. The response rate by question (the number of blanks for each question) is summarized in Tables 5 and 6 of Appendix III. These response rates guide the recommendations for changes in the survey that are presented in Section V of the paper. Of the 681 surveys, 666 were considered usable and 15 deemed unusable because at least half of the survey was left blank (see Appendix I for explanation). This far exceeded the group's goal of 200-400 usable surveys. Of the usable surveys, 107 were residents and 559 were visitors. Appendix III contains complete summary statistics and graphs of the trends seen from the answers given by residents and visitors.

The largest number of surveys was collected at the Montaña de Oro State Park (131 surveys), followed closely by the Embarcadero (114 surveys). Los Osos yielded the fewest total surveys, with only 42 collected due to few coastal users in the area. Los Osos is primarily a residential area and coastal access points are not as well-marked as in other survey locations.

An analysis of this preliminary data finds the most popular activities for both visitors and residents were dining, hiking, beach going, and shopping. A greater proportion of residents than visitors participated in kayaking, bird watching, fishing, and boating. However, more visitors than residents engaged in camping. In general, both residents and visitors viewed Morro Bay as being better than other similar coastal areas in terms of the five environmental factors asked on the survey (water quality, open space access, and abundance of fish, birds, and other marine wildlife). With regard to all of

the environmental factors, residents were more likely to state an opinion about Morro Bay than visitors. Perceptions of visitors and residents differed markedly about change in environmental quality over the last five years. The majority of residents perceived the environmental quality as worsening or not changing, while most repeat visitors thought that it had improved. This same trend was seen when respondents were asked about changes on the working waterfront over the last five years. For residents and visitors that were influenced by the environment in their decision to spend leisure time in Morro Bay, the most popular influencing factor was access to open space.

13. Analysis of Survey Bias

The team was most concerned with potential biases in responses to perceptions and expenditure questions. The following analysis explored potential biases related to the survey mode and the interviewer administering the survey.

13.1 Analytical Methods

The environmental quality perceptions data was collected in progressive categories (ordinal data without numbers), which necessitated the use of a Wilcoxon Mann-Whitney test to assess the null hypothesis (Sheskin, 2004). The null hypothesis stated that responses to perception questions would not differ significantly across survey modes (H_o = Interview = Handout). The same hypothesis was then tested across interviewers (H_o = Interview #1 = Interviewer #2) using data only from surveys administered while both interviewers were at the same location. Similarly, a t-test was used to determine differences in responses to expenditures across survey modes and across interviewers. P-values less than 0.1 (alpha = 0.1) indicated the presence of bias in the results. The p-value denotes the probability that the deviation in the data is explained by chance rather than bias from the survey mode or interviewer, so small p-values indicate a very small chance that deviation is due to chance.

13.2 Results

Perceptions of bird abundance in Morro Bay compared to similar coastal areas were significantly more positive with the interview mode compared to the handout mode. Perceptions of access to open space compared to similar coastal areas were significantly more positive with the interview mode compared to the handout mode. However, perceptions of change in

environmental quality over time in Morro Bay were significantly more positive with the handout mode compared to the interview mode. No significant bias from the survey mode was found in the expenditure measures.

Perceptions of environmental quality over time were significantly more positive on surveys collected by Interviewer #1 compared to surveys collected by Interviewer #2. No significant bias related to the interviewer was found in the expenditure measures.

The scores and p-values of significant relationships for the hypothesis tests are reported in Tables 1 and 2 below, followed by an interpretation of the significant results. Perceptions were ranked Worse = 0, Equal = 1, and Better = 2. The corresponding ranks of the two samples were then summed. In the table below, the z-score represents the number of standard deviations the actual sum is away from the expected sum. The number of surveys with completed answers for question tested is n, and P is the p-value. The p-value indicates the probability that the variation in the data is explained by chance. Full analytical results can be found in Appendix IV.

Table 1: Results of testing the null hypothesis (H_o) that there are no differences between interview and handout surveys.

Ho: Interview = Handout		**z**	**n**	**P**
Wilcoxon Mann-Whitney	Bird Abundance	2.91	496	0.004
	Access to Open Space	1.67	513	0.01
	Environmental Quality Over Time	- 2.34	366	0.02

Table 2: Results of testing the null hypothesis (H_o) that there are no differences between Interviewer #1 and Interviewer #2.

Ho: Interviewer #1 = Interviewer #2		**z**	**n**	**P**
Wilcoxon Mann-Whitney	Environmental Quality Over Time	1.75	244	.08

13.3 Discussion

The observed biases in the perception responses resulting from the survey mode are not as expected. Although one might reason that respondents would be more positive (or negative) about environmental quality to please the interviewer, perceptions of environmental quality were positively related to handouts rather than interview mode. Additionally, the relationship between survey mode and perceptions of environmental quality over time was opposite to the relationship between mode and perceptions

environmental quality characteristics, specifically bird abundance and access to open space, across similar coastal areas. Since the spatially related perceptions about local environmental quality tend to be more positive from surveys collected by interview, it may be that respondents consider potential public scrutiny and conform to views of local pride when answering these questions.

Due to the observed interviewer bias regarding environmental quality over time, the collected data were analyzed more closely to determine the cause of the bias. One variable that appears to play a factor in perceptions of environmental quality is location (complete results in Appendix IV). One location that stands out from the rest in this category is Los Osos, due to its respondents' low perceptions of environmental quality over time. Thirty-six percent of those surveyed in Los Osos thought that the environmental quality had worsened, while only 14% of respondents from all locations thought the same. In addition, only 4% of respondents at the Los Osos location thought environmental quality had improved, which is much lower than the overall sample average of 26%. Looking at the ratio of surveys administered by Interviewer #1 to Interviewer #2 (on days they surveyed together), the tests shows that the lowest ratio occurs at the Los Osos location, where Interviewer #2 surveyed almost three times as many respondents as Interviewer #1 (complete results in Appendix IV). This large discrepancy may explain why Interviewer #1 had significantly more positive responses to this question.

14. Analysis of Perceptions and Recreational Activities: Analysis of Preliminary Data

Positive and negative environmental perceptions impact coastal use decisions in different ways. A respondent that negatively perceives a certain factor of environmental quality may be less likely to partake in an activity that corresponds with that factor (Pendleton et al., 2001). For example, if a visitor to Morro Bay feels that the fish abundance is poor compared to other areas, that respondent may be less likely to participate in fishing activities. The data collected from the survey elucidates these relationships between perceptions and activity choices.

14.1 Analytical Methods

The team tested for significant relationships between recreational activity participation and environmental perceptions. The team first examined

respondents' perceptions of Morro Bay's environmental quality compared to similar areas visited along the central and southern California coasts. Perceptions of water quality, fish, bird, and other wildlife abundance, and access to open space were analyzed across each activity. Perceptions from a sample of respondents who had participated in a specific activity in Morro Bay were compared with perceptions from a sample of respondents who had not participated in that activity in Morro Bay.

A Wilcoxon Mann-Whitney test assessed the null hypothesis that respondents who participated in the activity being tested had the same perceptions as respondents who had not done the activity. P-values less than 0.1 (alpha = 0.1) were considered statistically significant relationships.

The team was also interested in the relationship between activities and perceptions of environmental quality in Morro Bay over time. Respondents' perceptions of environmental quality in Morro Bay over the last five years were compared by activity participation. As with the first perceptions analysis above, the team performed a Wilcoxon Mann-Whitney test for each activity. P-values less than an alpha of 0.1 were considered statistically significant relationships.

14.2 Results

The scores and p-values of significant relationships for the hypothesis tests are reported in Table 3 below, followed by an interpretation of the significant results. Perceptions were ranked Worse = 0, Equal = 1, and Better = 2. The corresponding ranks of the two samples were then summed. In the table below, the z-score represents the number of standard deviations the actual sum is away from the expected sum. The number of surveys that had completed answers for question being tested is n, and P is the p-value.

Table 3: Results of testing the relationships between perceptions and activity choice. Significant relationships that involve water-related factors are highlighted in blue.

	Environmental Quality Factor	Activity	z	n	P
Perceptions Compared to Similar Coastal Areas	Water Quality	Beach Going	-1.12	441	0.01
	Fish Abundance	Bird Watching	2.60	204	0.01
	Bird Abundance	Kayaking	2.51	496	0.01
	Bird Abundance	Boating	2.89	496	0.00
	Bird Abundance	Dining	1.65	496	0.10
	Bird Abundance	Bird Watching	3.58	496	< 0.001
	Other Marine Wildlife Abundance	Kayaking	2.31	474	0.02
	Other Marine Wildlife Abundance	Boating	2.21	474	0.03
	Other Marine Wildlife Abundance	Surfing	3.02	281	< 0.001
	Access to Open Space	Hiking/Walking	1.98	513	0.05
	Access to Open Space	Kayaking	3.40	513	0.001
	Access to Open Space	Dining	2.80	513	0.01
	Access to Open Space	Bird Watching	1.70	513	0.09
	Access to Open Space	Whale or Other Marine Mammal Viewing	1.91	513	0.06
	Access to Open Space	Other Wildlife Viewing	2.35	513	0.02
	Access to Open Space	Surfing	2.96	302	< .001
Perceptions Over the Last Five Years	Overall Environmental Quality	Fishing	1.78	366	0.08
	Overall Environmental Quality	Kayaking	-3.33	366	0.001
	Overall Environmental Quality	Boating	-2.49	366	0.01
	Overall Environmental Quality	Dining	1.74	366	0.08
	Overall Environmental Quality	Shopping	2.40	366	0.02
	Overall Environmental Quality	Camping	3.24	298	< 0.001

- Respondents who had gone to the beach in Morro Bay had a more negative perception of water quality relative to similar coastal areas compared to respondents who had not gone to the beach.

- Respondents who had previously bird watched in Morro Bay had a more positive perception of fish abundance relative to similar coastal areas when compared to respondents who had not previously bird watched.

- Respondents who had previously bird watched in Morro Bay had a more positive perception of bird abundance relative to similar coastal areas when compared to respondents who had not previously bird watched. The same relationship held for respondents who had previously kayaked, boated and dined.

- Respondents who had previously kayaked in Morro Bay had a more positive perception of other marine wildlife abundance relative to similar coastal areas when compared to respondents who had not previously kayaked. The same relationship held for respondents who had previously boated and surfed.

- Respondents who had previously hiked/walked in Morro Bay had a more positive perception of access to open space relative to similar coastal areas when compared to respondents who had not previously hiked/walked in Morro Bay. The same relationship held for respondents who had previously dined, bird watched, viewed marine mammals, viewed other wildlife, and surfed.

- Respondents who had previously fished in Morro Bay had a more positive perception of environmental quality over the last five years compared to respondents who had not fished. The same relationship held for respondents who had previously dined, shopped, and camped. Respondents who had previously kayaked in Morro Bay had a more negative perception of environmental quality over the last five years compared to respondents who had not kayaked. The same relationship held for respondents who had previously been boating in Morro Bay.

Full results can be found in Appendix IV.

14.3 Discussion

In general, involvement in recreational activities was positively correlated with environmental perceptions, especially perceptions comparing Morro Bay to other coastal communities. The singular exception was the negative relationship between beach goers and perceptions of water quality. Most of

the observed relationships between environmental factors and activities were strongest when the environmental factor was directly associated with an activity. For example, surfing had a very strong positive relationship with perceptions of marine wildlife abundance, and bird watching had a strong positive relationship with bird abundance.

It might be reasonable to assume that bird watchers come to Morro Bay because of the high number of bird species, but caution must be taken when trying to establish the direction of causality for any of these environmental factors. For example, does the abundance of marine wildlife in Morro Bay make it more likely that coastal users will choose to surf there? Or does increased exposure to the marine environment from surfing lead to more positive perceptions of marine wildlife abundance? If the latter explanation were true, similar ratios of positive and negative relationships between activities and environmental perceptions would be expected. If the abundance of marine wildlife leads to specific activity choices, then a positive relationship between activities and environmental perceptions would be expected. For example, it would be hard to believe that coastal users would go to the beach to take advantage of the poor water quality.

15. Analysis of Perceptions and Habitat Experience: Analysis of Preliminary Data

15.1 Analytical Methods

Do perceptions of environmental quality also influence which habitats respondents choose to visit? To explore this question about habitats visited, respondents were asked to indicate on the survey map (Figure 3 in Section 16.2) the areas in Morro Bay they visited and the activities undertaken there. This spatial data was matched with habitat classifications created by the Central Coast Wetlands Working Group to establish habitat types in Morro Bay with which respondents interacted (CCWWG, 2007). The analysis of perceptions by habitat was identical to the analysis of perceptions by activities detailed in Section 15 above. The Wilcoxon Mann-Whitney test was used to test differences in perceptions according to habitats visited. P-values less than 0.1 (alpha = 0.1) were considered statistically significant relationships.

15.2 Results

Data analysis of habitats visited during all trips and environmental perceptions of respondents revealed the following relationships:

- Respondents who visited the Tidal Wetlands, the Sand Spit, the South Bay, or Morro Bay State Park, had more positive perceptions of the water quality in Morro Bay than respondents who had not visited these areas.

- Respondents who went to Morro Bay State Park, Los Osos, Morro Rock, the Sand Spit, the South Bay, or the Tidal Wetlands had more positive perceptions of bird abundance.

- Respondents who visited the South Bay or Morro Bay State Park had more positive perceptions of other marine wildlife abundance, while respondents who had been to the Harbor Waterfront had more negative perceptions of the marine wild life abundance compared to respondents who had not been there.

- Respondents who spent time in Los Osos, the Tidal Wetlands, Montaña de Oro State Park, or the South Bay had more positive perceptions of access to open space in Morro Bay than respondents who had not visited these areas.

- Respondents who visited the Tidal Wetlands, Montaña de Oro State Park, or the Sand Spit had more negative perceptions of the overall environmental quality in Morro Bay over the last five years, compared to respondents who had not been to these areas.

The scores and p-values of significant relationships for the hypothesis tests are reported in Table 4 below, followed by an interpretation of the significant results. Complete analytical results can be found in Appendix IV. Perceptions were ranked Worse = 0, Equal = 1, and Better = 2. The corresponding ranks of the two samples were then summed. In the table below, the z-score represents the number of standard deviations the actual sum is away from the expected sum. The number of surveys that had completed answers for question being tested is n, and P is the p-value. The map page of the final summer survey is included as Figure 3 for referencing the habitat areas used in the analysis.

Table 4: Results of testing the relationships between environmental perceptions and habitats that are experienced.

	Environmental Quality Factor	Area Experienced	z	n	P
Perceptions Compared to Similar Coastal Areas	Water Quality	Tidal Wetlands	2.18	441	0.03
	Water Quality	Sand Spit	2.12	441	0.03
	Water Quality	South Bay	1.97	441	0.05
	Water Quality	Morro Bay State Park	1.98	441	0.05
	Bird Abundance	Morro Bay State Park	2.76	496	0.006
	Bird Abundance	Los Osos	2.72	496	0.007
	Bird Abundance	Morro Rock	1.99	496	0.05
	Bird Abundance	Sand Spit	1.82	496	0.07
	Bird Abundance	South Bay	1.82	496	0.07
	Bird Abundance	Tidal Wetlands	1.77	496	0.08
	Other Marine Wildlife Abundance	South Bay	2.72	474	0.007
	Other Marine Wildlife Abundance	Morro Bay Harbor Waterfront	-2.17	474	0.03
	Other Marine Wildlife Abundance	Morro Bay State Park	2.05	474	0.04
	Access to Open Space	Los Osos	2.85	513	0.004
	Access to Open Space	Tidal Wetlands	2.76	513	0.006
	Access to Open Space	Montaña de Oro	2.67	513	0.008
	Access to Open Space	South Bay	1.73	513	0.08
Perceptions Over the Last Five Years	Overall Environmental Quality	Tidal Wetlands	-3.11	366	0.002
	Overall Environmental Quality	Montaña de Oro	-2.96	366	0.003
	Overall Environmental Quality	Sand Spit	-1.84	366	0.07

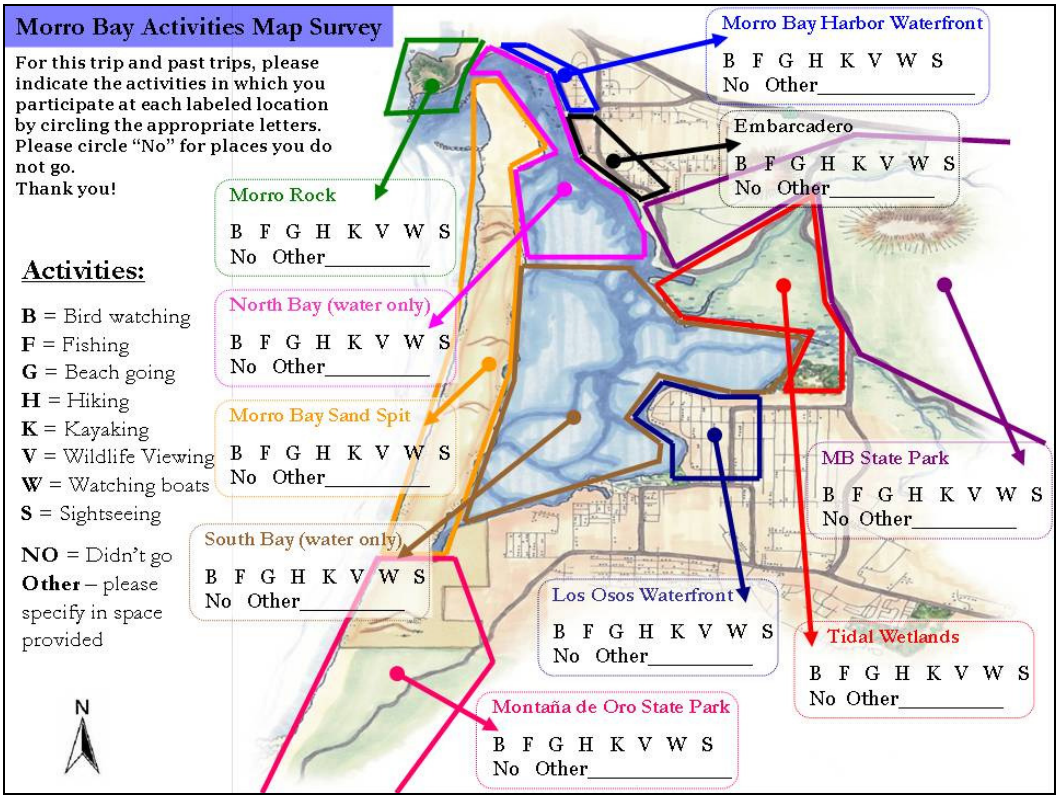

Figure 3: Map page of the Final Summer Survey, which delineated locations visited.

15.3 Discussion

There seems to be a general positive relationship between the perceptions of environmental factors and a respondent's access to natural areas away from the harbor and downtown areas of Morro Bay. This is not surprising since it might be expected that a respondent would have a better general awareness of Morro Bay's environmental amenities if they experienced them more frequently. It might also be expected that respondents with high perceptions of environmental quality would seek out these natural areas and take advantage of them. A similar problem of causality was found with the relationship between activities and perceptions.

While exposure to natural areas seems to be correlated with higher perceptions of environmental quality in Morro Bay compared to similar locations, this same exposure also has a correlation with more negative perceptions of the area over time. It is difficult to derive any specific or clear causal theory for this relationship without knowing the basis for respondents' perceptions. Perhaps as a general rule, it may be reasonable to suspect that coastal users spending time in these natural areas are more in tune with

current environmental issues, which may be positive or negative. It is also very possible that "Environmental Quality" means something different to users who interact more directly with the environment. The observed negative association of perceptions over time with habitat exposure should be targeted more specifically in future studies.

16. Factors That Affect Visitor Expenditures: Analysis of Preliminary Data

16.1 Analytical Methods

The effect of recreational activity choices on overall expenditures was analyzed using visitor expenditure data. The team also tested the relationship between expenditures and responses to the question *"Did the environmental quality of Morro Bay play a role in your decision to visit?"* Respondents who answered yes to this question are referred to as 'environmentally conscious visitors' and those who answered no as 'environmentally indifferent visitors'.

The survey collected expenditure data on lodging, dining, kayak rentals, bait and tackle, boat rentals and chartered boats, camping and recreational vehicle (RV) rentals, boat cruises and tours, gas, and shopping. The team limited the analysis of expenditure determinants to visitor expenditures only. To calculate total expenditures, all of the above expenditure categories were summed except expenditures on gas. Gas expenditures were excluded because it was not clear to what extent gas was purchased locally. To analyze total expenditure determinants, the team used a linear regression model with the following general form:

$$\text{Total Expenditures} = \beta_0 + \beta_1 \text{Activities} + \beta_2 \text{EConscious} + \beta_3 \text{Controls} + \varepsilon$$

The variable *Activities* represents a group of individual dummy variables, rather than one variable with multiple categories. Fishing, kayaking, hiking, beach going, and boating, each have their own dummy variable where a value of 1 indicates that the respondent had participated or intended to participate in the respective activity during their trip.

The variable *EConscious* is a dummy variable in which a value of 1 represents a return visitor who stated that the environmental quality in Morro Bay played a role in their decision to visit.

The variable *Controls* represents a set of variables that control for both individual characteristics and survey characteristics. Variables that control for individual characteristics included age, gender, race, income, and education. Variables that control for survey characteristics included survey location, time of day, interviewer, survey mode, and whether the survey was administered on a weekend or weekday.

16.2 Results

Factors that explain expenditures were evaluated with three regression models: a linear model (Linear I), a linear model using only observations with positive expenditures (Linear II), and a log-linear model. The linear model showed increasing variance in residuals as total expenditures increased. The log-linear model was used to account for this variance. The second linear model allowed for a comparative set of observations with the log-linear model, since log(0) is undefined.

In the linear models, people who engaged in an activity were compared to people that did not engage in the same activity. Fishing increased total expenditures per trip by about $400 while holding the other variables constant. In addition, kayaking led to an increase of about $160 per trip, and going to the beach had the effect of increasing total expenditures by about $190. Conversely, mountain biking led to a decrease of over $300 in spending per trip among visitors, and camping led to a decrease of about $400, all else being equal.

The coefficients in the log-linear model did not have drastic changes in relative magnitude, but there were some changes in which variables were significant. The p-values for the coefficients of both mountain-biking and kayaking fell well out of the range of significance, while the coefficient for watching boats on the harbor waterfront became significant. Holding all else equal, fishing led to a 46% increase in total expenditures per trip by visitors, watching boats led to a 34% increase per trip, and beach going led to a 61% increase per trip. On the other hand, camping led to a 36% decrease in total expenditures per trip.

In all three models, the coefficient on the EConscious variable was positive, and was statistically significant in both linear models. From the linear models, visitors stating that environmental quality in Morro Bay played a role in their decision to visit led to an increase of $130 in total expenditures, all else equal.

The coefficients and p-values for the models are reported in Table 5 below, followed by an interpretation of the significant results. In the table, the F value indicates the statistical significance of the regression as a whole, with a value greater than 4 generally indicating significance. The number of surveys that had completed answers for question being tested is n, and P is the p-value. The adjusted R^2 represents how well the regression approximated the real data, with a value of 1 indicating perfect correlation between the model and the data.

Table 5: Results of the expenditure linear regression models. Linear I is the original linear model and Linear II is a linear model using only observations with positive expenditures. The log-linear model was used to account for the increasing variance in residuals as total expenditures increased in the linear models.

		Linear I n = 365 Adjusted R^2 = 0.49 F = 12.82		**Linear II** n = 351 Adjusted R^2 = 0.49 F = 12.33		**Log-Linear** n = 351 Adjusted R^2 = 0.42 F = 9.61	
		Coeff	**P**	**Coeff**	**P**	**Coeff**	**P**
EConscious		129.52	0.024	128.41	0.030	0.17	0.149
Activities	Fishing	401.89	< 0.001	404.28	< 0.001	0.46	0.016
	Mountain Biking	-305.41	0.018	-311.64	0.017	-0.28	0.285
	Kayaking	165.53	0.046	158.24	0.060	0.12	0.461
	Boating	-216.98	0.116	-217.39	0.121	-0.18	0.514
	Watching Boats	76.92	0.254	78.79	0.256	0.34	0.015
	Beach Going	190.46	0.006	199.32	0.005	0.61	< 0.001
	Camping	-406.02	< 0.001	-401.51	< 0.001	-0.36	0.020
	Bird Watching	-92.53	0.208	-108.83	0.151	-0.04	0.767
	Whale Watching	81.86	0.248	70.03	0.333	0.05	0.703
	Other Wildlife Viewing	38.93	0.562	48.69	0.485	0.16	0.238

Complete regression results can be found in Appendix IV.

16.3 Discussion

The statistically significant coefficients of the log-linear model indicate that there is a significant effect of activity choice on expenditures. The effect also appears to be substantial in the linear model, especially considering that the average visitor from the survey spent a total of $387. Looking in more detail at the visitors who fished during their trip, the results show that

environmental quality played a factor in approximately 1/3 of their visits. This is also true for about 1/3 of the visitors who watched fishing boats on the waterfront, 1/2 of the visitors who kayaked, and 1/2 of the visitors who went to the beach. In each of these activities, visitor participation reveals a positive relationship with expenditures, and indicates that attracting similar recreational visitors can be beneficial to the local economy. Furthermore, the nontrivial links between environmental quality and activities of these recreational visitors suggests a direct connection between ecosystem health and the local economy.

The relationship between the EConscious variable and expenditures is perhaps even more interesting. Even when controlling for many outdoor recreational activities, visitors who based their decision to visit Morro Bay, at least partly, on environmental quality, appear to be spending more money. Like before, this suggests an important role of ecosystem quality in bringing outside money into the local economy through tourist expenditures. This warrants further investigation into what the most significant environmental factors are for these visitors, and can be used as a guide for Morro Bay management efforts. Forty percent of visitors who indicated that environmental quality did influence their decision to visit could not distinguish the most significant factor in their decision and answered "No Preference." Given the choice between water quality, fish abundance, bird abundance, other marine wildlife abundance, and access to open space, the most popular choice by visitors who indicated a preference was access to open space (43%), followed by water quality (8%) and other marine wildlife abundance (7%) as a distant second and third, respectively.

V. RECOMMENDATIONS FOR FUTURE EFFORTS

Survey notes collected during the three month survey period and observations made during the data analysis generated a set of recommendations focused on improving the survey methodology and design. These recommendations include additional questions to collect supplementary data, revisions and simplifications of confusing questions, and the omission of extraneous questions. Changes to survey questions are based in part on response rates (number of blank responses) for each question, which are presented in Appendix III.

17. Issue 1: Capturing Spatial Data of Recreational Activities

One point of contention is how to better capture spatial data. Currently, the survey map provides information on which locations the respondent visits and on which activities the respondent does in those particular locations, but not on the frequency of visits or the reasons why particular locations are chosen.

17.1 Recommendation: Alternative Modes of Collecting Spatial Data

Possible alternatives for collecting spatial data include asking respondents to:

1. Weight locations on the map by frequency of visitation.
2. Indicate locations on the map where they participate in their primary activity.
3. Rank locations on the map by preference or favorite location.

Knowing where respondents engage in primary activities can allow researchers to make inferences about how the habitat a respondent visits affects the respondent's environmental perceptions. However, using the map to generate information about primary activity locations does not address how frequently respondents use these locations. Since there are tradeoffs between comprehension and information gathering, the map needs to be as simple as possible. Asking a respondent to weight locations by frequency may be too complicated and result in higher non-response rates. Having data about primary activities will be sufficient to generate more thorough statistical analyses because the map data will be comparable to survey questions about primary activities.

18. Issue 2: Limitations of Sampling Strategy

The survey did not sample all Morro Bay coastal users. The survey was only conducted for a three-month period during the summer of 2007, and the number and type of visitors and the ratio of visitors and residents will vary throughout the year. Additionally, the survey was only administered in seven different locations in Morro Bay, and some coastal users may never visit the current survey locations. Since surveys were administered during three time blocks (10-12pm, 1-3pm, and 4-6pm), respondents recreating during these times were more accessible than others. People that only visit at night or that did not visit Morro Bay during the time blocks surveyed were not surveyed.

18.1 Recommendation: Expand Survey Period, Times, and Locations

Expanding the survey period to include all seasons and adding additional survey locations will capture more types of coastal users who frequent Morro Bay. Additionally, extending the length of survey time blocks or adding more time blocks to the survey protocol will allow the surveyor to cover more time and capture different coastal users. Surveying year-round will account for differences in visitor profiles due to seasonal phenomena, such as fishing closures and festivals in the area. There are many coastal access points, such as Elfin Forest, coastal access locations in Los Osos, the park at the far end of the Embarcadero, and other locations in Morro Bay State Park and Montaña de Oro State Park, that can be added to the survey protocol to capture additional coastal users.

19. Issue 3: Homogenous Interviewer Characteristics

Since both interviewers were young, white females, some bias may have been introduced while surveying. Whether response rate would differ if the interviewer was a different race or gender is unclear. An analysis of select questions did not show any significant differences in responses between the two interviewers.

19.1 Recommendation: Variation in Interviewer Characteristics

To test for bias, the survey protocol should incorporate interviewers of different genders, race, and age.

20. Issue 4: Unclear Question Wording

Some questions were not easily understood by respondents or were asked in a way that complicated the data analysis (see Tables 5-6 in Appendix III for response rates for each question). One problematic question, 3b on the visitor survey, reads as follows:

> *#3b: Over the last 12 months, how many times (including this trip) have you visited? ____ times/year*

Respondents often wrote a zero (0) for this answer although at least a one (1) should have been recorded. When zeros were entered, this question could not be used for the analysis.

The two questions that asked respondents to record activities for both "this trip" and "past trips" (questions 4 and 5) yielded data in a format that limited the robustness of the analysis. Allowing respondents to choose multiple activities made it difficult to analyze the relationship between perceptions and activity choice.

> *#4: Please indicate all activities you will do during this trip in "the Bay": Fishing, Hiking/Walking, Surfing, Mountain Biking, Kayaking, Boating, Dining, Camping, Watching Fishing Boats, Shopping, Beach Going, Bird Watching, Whale/Wild Marine Mammal Viewing, Viewing Other Wildlife, Other*

> *#5: Please indicate all activities you have done during past trips in "the Bay": Fishing, Hiking/Walking, Surfing, Mountain Biking, Kayaking, Boating, Dining, Camping, Watching Fishing Boats, Shopping, Beach Going, Bird Watching, Whale/Wild Marine Mammal Viewing, Viewing Other Wildlife, Other, Never been to Morro Bay before*

Question 5a, as worded below, resulted in some blank responses (52 blanks, with an overall response rate of 92.2%):

> *#5a: If you come to "the Bay" to fish, do you fish from a: Pier or shore, Private or rental boat, Chartered boat, or I don't fish in the Bay*

The non-responses were mostly from people who did not indicate fishing as an activity in questions 4 and 5.

Lastly, the answer choices listed for questions 11 and 12 did not accurately describe all possible visitor respondents.

> *#11: If you have visited "the Bay" periodically over the past 5 years, do you think overall environmental quality has improved or declined in that time? Improved, Hasn't Changed, Worsened, Not Sure, or Not a Repeat Visitor*

> *#12: If you are a repeat visitor, do you think the overall working waterfront experience (i.e. working fishing boats, marina atmosphere, etc.) has improved or declined in Morro Bay over the past 5 years? Improved, Hasn't Changed, Worsened, Not Sure, or Not a Repeat Visitor*

Repeat visitors may have come to Morro Bay many times in one year or few times over multiple years. Those that visited all in one year would not be able to state an opinion about environmental change over five years, but they would also not be labeled as "not a repeat visitor."

20.1 Recommendation: Clarify Survey Questions

Rewording question 3b (see wording in Section 21 above or in Appendix II), to avoid respondents entering zeros is important. To address this issue, the question can be asked as follows:

> *Not including this trip, over the last 12 months, how many times have you visited? ____ times/year*

There are several ways to improve the activities questions:

- Eliminate the least frequently cited activities. This would minimize the length of the question and make the survey more manageable.
- Change some of the listed activities to popular responses listed in the "other" category. This would reduce order bias (people are more likely to remember an activity that is actually listed instead of thinking of "others"). Researchers need to decide if it is more important to have data on certain activities than others. For example, although "bicycling" was often written in the other category, few respondents chose the "mountain biking" option. Therefore, changing "mountain biking" to "bicycling" is suggested.
- Change question 5 to ask about the respondent's single primary activity for both trips with a comprehensive activity list, which would allow for more robust statistical analysis of relationships between activities and perceptions. The question would read as follows:

  For all your visits, which activity most often influences you to come to the Bay?

To improve the data analysis, separating question 5a regarding fishing (see wording in Section 21 or in Appendix II) into two separate parts will help avoid blank answers. The two new questions would read as follows:

> *(a) Do you fish in the Bay? Yes or No – If No, please skip Question (b)*
>
> *(b) Do you fish from a: Pier or shore, Private or rental boat, or Chartered boat*

To refine the data analysis for the questions asking about environmental quality over time, the answer choice of "Have been visiting Morro Bay for less than five years" should be added.

21. Issue 5: Limitations of Survey Data

The survey does not differentiate between perceptions of people who were just passing through Morro Bay and people who are specifically choosing Morro Bay as their destination.

Additionally, the survey does not capture to what extent, if any, residents and visitors are aware of what conservation efforts are going on in Morro Bay. Awareness of environmental initiatives may influence the respondent's perceptions of environmental quality.

21.1 Recommendation: Additional Questions to Capture More Data

Adding a question on the visitor survey that asks the respondent to indicate their "reason for coming" will differentiate between visitors whose destination is Morro Bay versus other locations. The respondent will check all answers that apply, as follows: visiting family/friends, weather, recreation, work/business, driving through, other, or none of the above. By incorporating this question into the survey, question 10 (*Did the weather in your place of residence play a role in your decision to visit "the Bay? Yes or No*) can be removed.

A question regarding the respondent's awareness of conservation efforts in Morro Bay cannot be asked as simply as: *Do you think there are environmental management activities occurring in the Bay?* There is a concern that this question may indicate some opinion about conservation or environmental management from the survey and therefore would influence the choice made by respondents.

An alternative way to ask this question is: *Have you heard of the National Estuary Program (NEP)?* If the respondent has heard of the NEP, then it can be inferred that the respondent is aware of environmental management and conservation occurring in Morro Bay. The appropriate wording for this question requires further research about current environmental management issues and public awareness in Morro Bay.

22. Issue 6: Interpretation of Race and Ethnicity Questions

The demographic questions listed below were not answered by all respondents (3 blanks and 99% response rate for #16; 39 blanks and 89.5% response rate for #17).

> *#16: Are you of Hispanic or Latino origin? Yes or No*
>
> *#17: Race (choose all that apply): White, Asian, Native Hawaiian/Pacific Islander, American Indian or Alaskan Native, African American, Other, and Decline to Answer*

The format of these questions (on the final survey administered in the summer) is identical to that of the United States Census (USCB, 2000). However, respondents often only chose a *"Yes"* or *"No"* answer for question 16 (ethnicity) and did not answer question 17 (race). The original survey question, which was changed as a result of respondent feedback, asked:

> *Ethnicity (choose all that apply): Caucasian, Latino, Native American, African American, Asian, Other, and Decline to Answer*

22.1 Recommendation: Maintain Race and Ethnicity Questions

The race and ethnicity questions are formatted to match that of the United States Census. Therefore, the data is easily comparable to other datasets. Although respondents sometimes found the questions to be difficult to answer, it is recommended that the format remains the same as that of the U.S. Census. Race and ethnicity questions will always result in some non-responses that cannot be rectified.

23. Issue 7: Lack of Respondent Feedback

Besides casual verbal comments, there is no structured, documented feedback from respondents about the nature of the survey. During survey administration, interviewers recorded various concerns about difficult questions, but no feedback regarding survey length, questions, or suggestions to improve the survey in the future were gathered.

23.1 Recommendation: Written Feedback from Respondents

Depending on survey length limitations, adding questions to get respondent feedback may help improve future versions of the survey.

VI. CONCLUSIONS & PRIMARY RECOMMENDATIONS

This research has demonstrated that a survey can be used to provide valuable information about human dimensions and perceptions of environmental quality in Morro Bay. A goal of this project has been to identify all possible recommendations to improve the survey instrument and its applicability. These priority recommendations should be addressed before the survey is used again (see Appendix II for a sample survey that incorporates these priority recommendations).

24. Priority Recommendations for Survey Questionnaire

1. Change the map question to focus on the location of the respondent's primary activity: *"Where do you engage in your primary activity?"*
2. Expand the survey period to sample all seasons.
3. Add *"Not including this trip…"* to the beginning of the *"How many times have you visited…"* question.
4. Replace the question about activities from past trips (question 5) with a question asking about the primary activity for all trips.
5. Change *"Mountain Biking"* to *"Bicycling."*
6. Separate question 5a into *"(i) Do you fish in the Bay?"* and *"(ii) Do you fish from…"*
7. Add the categories *"have been visiting Morro Bay for less than five years"* and *"not a repeat visitor"* to the environmental perceptions question.
8. Add a *"reason for coming"* question to the visitor's survey, and remove the weather question (question 10).

25. General Conclusions

These recommendations should create a survey instrument capable of gathering much more meaningful and accurate data about the environmental perceptions, activities, and expenditure patterns of coastal users. These data can then inform Morro Bay managers and SLOSEA as they consider the

possible impacts of management decisions. For example, survey data gathered thus far identifies several activities as most common for visitors to Morro Bay. Any management decision that would change perceptions about those activities in Morro Bay may be of concern to decision-makers.

This survey is a baseline for future surveys, and is the beginning of an iterative process. By gathering data about perceptions and recreational behavior, it should be possible to explain relationships between historical data of estuary condition and use and current patterns of perceptions and activity choices. Developing an expenditure profile by activity will allow managers to evaluate the economic consequences of restoration measures.

Survey protocol will be a limiting factor for continuing analysis. Surveyors must acknowledge and account for the biasing effects of the survey procedure. Time, location, and wording of questions can all have a biasing effect on the data sample. Survey mode (interview vs. handout) can potentially lead to biases in future survey results, although there were no biases of this type observed during this project. During the development stage of the survey, surveyors should edit and update the survey instrument as it is administered to mitigate biases and ensure that the survey is collecting the data in a form that will be statistically viable. Over time, the data sample will more accurately reflect changing visitor and resident perceptions.

The Morro Bay survey could be easily used in similar coastal communities. The survey was written using characteristics that are common to many coastal environments. Ecosystem-based management and the SLOSEA initiative have been designed for standardized application to many coastal communities. In particular, the Coastal Ocean Values Center seeks to apply the survey instrument to similar projects developing economic indicators of coastal health in Elkhorn Slough and Santa Monica, California (COVC, 2007).

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Appendix I: Survey and Data Protocols

Introduction to Sampling Strategy – A Geographically Stratified Sample

The surveying protocol for the Morro Bay Coastal User Survey was designed to maximize the number of respondents and minimize questionnaire biases, such as non-response bias and interviewing bias. The goal of the Morro Bay Group Project was to produce a replicable survey instrument that could be used in many locations to generate a baseline of data about coastal users and environmental perceptions. The results will be used to characterize the general coastal user, not to define characteristics about all residents and visitors to Morro Bay. For this reason, the protocol was designed to determine the strength of the survey rather than to achieve a perfectly random sample. The sampling strategy used is a geographically stratified sample. Specific survey locations were chosen to best represent habitats around Morro Bay used for recreational activities and to create a sample that represents as many coastal user types as possible (see Table 1 below for a description of each location). The premise for this strategy was that people visit Morro Bay to do specific activities and some activities, such as bird watching or kayaking, require specific habitats. Surveying in only one or two locations would not capture the characteristics of all coastal users.

Table 1: Seven survey locations – represented habitats and coastal users.

Location	Habitat Represented	Common Coastal Activities
Embarcadero	Coastal Estuary	Shopping, Dining, Kayaking
Harbor Waterfront	Coastal Estuary	Dining, Wildlife viewing, Boat watching, Fishing, Kayaking
Morro Rock	Beach/Harbor Mouth	Hiking, Beach going, Bird watching
Morro Bay State Park	Coastal Estuary/Mud Flats	Boating, Kayaking, Golfing, Bird watching, Wildlife viewing, Camping
Los Osos	Mud flats/Beach/Scrub	Boating, Kayaking, Dining, Hiking, Bird watching
Sand Spit	Beach/Dunes	Surfing, Beach going, Hiking,
Montaña de Oro State Park	Cove/Tidepools/Beach	Beach going, Hiking, Mountain Biking, Camping

Schedule Protocol

The survey schedule was designed to achieve the maximum number of surveys in each location. Three days of the week and both weekend days were surveyed each week. This frequency was used to allow the surveyors to work five out of seven days per week while still surveying weekdays evenly. The three weekdays were chosen randomly with a random number generator in Excel. Surveys were completed during two time blocks each day so that two different locations were visited per day. The time blocks used were 10-12pm (time slot 1), 1-3pm (time slot 2) and 4-6pm (time slot 3). Two hours was considered a reasonable time for the surveyors to be in one location without getting fatigued and still being able to interact with a large percentage of users in each area. The times were chosen to avoid meal times (since most people would be eating or on their way to eat) while still representing a majority of the day. No nighttime slot was created because very few of the coastal uses on the survey could be done at night. The time blocks and corresponding locations were also chosen using the Excel random

number generator. Given that the goal of the survey period was to learn as much as possible about the survey as a tool, time blocks were updated after the first two weeks of surveying to maximize the number of responses. Locations were still chosen randomly, but time blocks were picked according to specific characteristics of each place (see Table 2). This approach was used to ensure a more even sampling of all coastal users because some coastal activities are tied more closely to location and time of day than others.

Table 2: Locations and preferred time blocks.

Location	Preferred Time Blocks	Reasoning
Embarcadero	10-12pm or 1-3pm	Late afternoon began dinner rush.
Harbor Waterfront	1-3pm or 4-6pm	Usually empty in the morning because restaurants closed and little action on Piers.
Morro Rock	Anytime	No preference.
Morro Bay State Park	10-12pm or 1-3pm	State Park Museum closes at 5pm.
Los Osos	Anytime	No preference.
Sand Spit	10-12pm or 1-3pm	Most beach activity seemed to occur in morning. Usually cold and windy 4-6pm.
Montaña de Oro State Park	1-3pm or 4-6pm	Tended to be cold and empty in the morning.

Table 3a: Schedule - Shifts that are grey were not surveyed due to personnel time constraints. (Y=yes, N=no; Time Blocks: 1=10-12pm, 2=1-3pm, 3=4-6pm; Locations: EM=Embarcadero, HA=Harbor Waterfront, LO=Los Osos, MO=Montaña de Oro, MR=Morro Rock, SP=State Park, SS=Sand Spit).

Day of the week:			Times:		Locations:	
Date	**Day**	**Yes/No**	**Time Slot 1**	**Time Slot 2**	**Time Slot 1**	**Time Slot 2**
25-Jun-07	Monday	Y	2	3	EM	MR
26-Jun-07	Tuesday	N				
27-Jun-07	Wednesday	Y	1	3	SP	MO
28-Jun-07	Thursday	N				
29-Jun-07	Friday	Y	1	2	LO	MO
30-Jun-07	Saturday	Y	1	2	SS	HA
1-Jul-07	Sunday	Y	2	3	SP	EM
2-Jul-07	Monday	Y	1	3	MR	EM
3-Jul-07	Tuesday	N				
4-Jul-07	Wednesday	Y	1	2	MO	HA
5-Jul-07	Thursday	N				
6-Jul-07	Friday	Y	2	3	SS	SP
7-Jul-07	Saturday	Y	1	2	LO	EM
8-Jul-07	Sunday	Y	2	3	MR	HA
9-Jul-07	Monday	N				
10-Jul-07	Tuesday	Y	1	2	HA (also 3)	LO
11-Jul-07	Wednesday	N				
12-Jul-07	Thursday	Y	2	3	SS	MO
13-Jul-07	Friday	Y	1	2	EM	SP
14-Jul-07	Saturday	N				
15-Jul-07	Sunday	Y	1	2	EM	HA
16-Jul-07	Monday	N				
17-Jul-07	Tuesday	Y	2	3	SS	MR
18-Jul-07	Wednesday	Y	2	3	SP	EM
19-Jul-07	Thursday	N				
20-Jul-07	Friday	Y	1	2	LO	SS
21-Jul-07	Saturday	Y	2	3	MO	MR
22-Jul-07	Sunday	Y	2	3	LO	HA
23-Jul-07	Monday	N				
24-Jul-07	Tuesday	Y	1	2	SS	MR
25-Jul-07	Wednesday	Y	2	3	EM	LO
26-Jul-07	Thursday	Y	2	3	SP	HA
27-Jul-07	Friday	N				
28-Jul-07	Saturday	Y	1	2	MO	HA
29-Jul-07	Sunday	Y	2	3	LO	MR
30-Jul-07	Monday	Y	2	3	LO	MO
31-Jul-07	Tuesday	Y	1	2	SP	EM
1-Aug-07	Wednesday					
2-Aug-07	Thursday	Y	1	2	SS	MR
3-Aug-07	Friday	N				
4-Aug-07	Saturday	Y	2	3	HA	MO
5-Aug-07	Sunday	Y	1	2	SS	MR
6-Aug-07	Monday	N				
7-Aug-07	Tuesday	Y	1	2	LO	MO
8-Aug-07	Wednesday	Y	1	3	EM	MO
9-Aug-07	Thursday	Y	1	2	MR	HA
10-Aug-07	Friday	N				
11-Aug-07	Saturday	Y	1	2	EM	MR
12-Aug-07	Sunday	Y	1	2	SS	LO
13-Aug-07	Monday	Y	2	3	LO	MO

Table 3b: Schedule continued.

Day of the week:			Times:		Locations:	
Date	**Day**	**Yes/No**	**Time Slot 1**	**Time Slot 2**	**Time Slot 1**	**Time Slot 2**
14-Aug-07	Tuesday	N				
15-Aug-07	Wednesday	N	1	2	SP	HA
16-Aug-07	Thursday	Y	1	2	SP	MO
17-Aug-07	Friday	Y				
18-Aug-07	Saturday	Y	1	3	EM	MO
19-Aug-07	Sunday	Y	2	3	HA	MR
20-Aug-07	Monday	N				
21-Aug-07	Tuesday	Y	1	3	SS	HA
22-Aug-07	Wednesday	Y	1	2	EM	MO
23-Aug-07	Thursday	N	1	2	LO	MO
24-Aug-07	Friday	Y				
25-Aug-07	Saturday	Y	1	3	HA	EM
26-Aug-07	Sunday	Y	1	2	SS	SP
27-Aug-07	Monday	Y	1	3	HA	MR
28-Aug-07	Tuesday	N				
29-Aug-07	Wednesday	N				
30-Aug-07	Thursday	Y	1	2	MO	HA
31-Aug-07	Friday	Y	2	3	LO	MR
1-Sep-07	Saturday	Y	1	2	HA	SP
2-Sep-07	Sunday	Y	1	3	HA	LO
3-Sep-07	Monday	Y	1	3	EM	LO

Survey Administration Protocol

A step-by-step protocol for administering the survey ensured that each survey was collected in an unbiased manner. This protocol was developed and changed throughout the summer as experiences with different respondents highlighted necessary steps.

Approach:

1. Surveyors were strategically positioned at each location, according to characteristics of that location.
    - Embarcadero – In front of Marina Square building due to high level of traffic and lots of space (not crowded or near a specific establishment that would be get upset).
    - Harbor Waterfront – Walked up and down South T-Pier and asked all visitors present. North T-Pier was surveyed for the second hour of the time block.

- Morro Rock – In front of benches at entrance to park walking path to intercept people leaving and entering both the path and the beach area.
- Morro Bay State Park – In front of State Park Museum because there was a concentration of people there. Also walked through the Marina once during the time block in case there were people around the docks or renting kayaks.
- Los Osos – Pasadena beach area and Los Osos Pier and Sweet Springs were all visited each time block. These were the main places of congregation for coastal activities. None were very busy, so the number of surveys was maximized by visiting all.
- Sand Spit – At top of beach trail, to get as many visitors as possible (bottleneck point).
- Montaña de Oro State Park – Because people tended to stay in one place within Spooner's Cove (picked a place along the beach), the surveyors split the beach in half and asked everyone present in their area. As new people arrived, they were also approached until the time block ended.

2. All persons that came within a 6-foot radius (estimated to be the distance that a normal greeting would be audible at a socially acceptable level) were asked to participate in the survey.
    - Exceptions: Minors (under the age of 18) and people that were actively eating. Minors were excluded from the survey according to the UCSB Office of Research guidelines. People that were actively eating were excluded due to the social stigma against interrupting people during a meal.
    - People that were working (not engaging in leisure or vacation time) were not allowed to complete the survey because they were not actively engaged in being coastal recreational users.

Surveying:

3. Introduction of survey and greeting: "Hello, how are you doing today?...My name is _____ and I am a (under)graduate student at _____. I am working with a local organization to find out what people do while they are visiting Morro Bay (or "…what people do for leisure in Morro Bay…" for residents). Please help us out by taking about five minutes to complete our short survey!"

4. Interview vs. Handout: After the individual agreed to participate, the survey was offered as a handout. If they expressed a desire to be interviewed, or if they hesitated to fill out the survey themselves, the surveyor offered to interview the respondent.

    - Handout: The respondent was provided with a survey attached to a clipboard and a black pen. The surveyor flipped through the pages of the survey to show the respondent the length and informed them that the surveyor would be available for any questions.

    - Interview: The surveyor read the questions to the respondent exactly as they appeared on the survey.

5. Demographic protocol:

    - Handout: If the respondent hesitated during the demographic section (or asked if the survey was confidential), the surveyor responded: "This section asks some simple demographic questions and the information is completely anonymous. You can select the 'Decline to Answer' box for any questions you prefer not to answer."

    - Interview: The demographic section was introduced as follows: "The following are demographic questions, so please let me know if you prefer not to answer any of them or if you prefer to fill them out yourself. The information you give will be anonymous."

6. Map Protocol:

    - Handout: Once the respondent reached the end of the demographic questions, the surveyor reviewed the map as follows: "The last part of the survey is this map of Morro Bay. Please indicate if you have done any of the activities on the list (this trip or past trips) in each location by circling the letter that corresponds to the activity. If you have never been to a location, please circle "NO". You can also write in activities that are not on the list. If you would like help, I can fill out the map as you look at it."

    - Interview: The map was shown to the respondent and introduced as follows: "The last part of the survey is this map of Morro Bay. Please let me know if you have done any of the activities on the list (this trip or past trips) in each location. If you have never been to a location, please tell me so that I can circle "No". You can mention activities that are not on the list for me to fill in. If you would prefer, you can fill out the map yourself."

Answers to common questions:

1. Question: Does the spending question (#6) refer to just me or my group?

    - Answer: You can enter spending whichever way is most convenient for you. Please be sure to indicate the number of people covered by the spending you enter. If you will not be spending any money in Morro Bay (e.g. if you will only be spending in another city), please check the box that indicates "I will not spend any money in Morro Bay."

2. Question: What does question 8 mean by "water quality" (Or: "Do you mean drinking water or the Bay?")?

    - Answer: We would like to know what you think about the state of the water in the Bay and ocean in the areas you visit around Morro Bay. Water quality characteristics include bacterial contamination, pollution, and clarity.

3. Question: What does question 8 mean by "access to open space?"
    - Answer: Open space includes areas that are undeveloped, such as parks or wilderness areas that are available for some type of recreational use.
4. Question: What does question 10 mean by "environmental quality?"
    - Answer: We would like to know your general impression of environmental quality around Morro Bay, including the characteristics listed in question 8 (water quality, fish abundance, bird abundance, abundance of other marine wildlife, and access to open space) and any other aspects of the environment that are important to your view of Morro Bay.
5. Question: What does question 11 mean by the "working waterfront?"
    - Answer: The working waterfront is the area in Morro Bay where the T-Piers and fishing boats are located. There are also some restaurants and shops in this area.
6. Question: Who is conducting the survey? Why? Will the data/results be made public?
    - Answer: The survey is being conducted as part of my Master's thesis/undergraduate work (depending on surveyor) and as part of a study with a local organization called SLOSEA (San Luis Obispo Science and Ecosystem Alliance). SLOSEA is interested in learning more about why people come to Morro Bay, what they do when they come here, and what their perceptions are of the area. This information will be made available to interested parties, such as local business organizations, and to the public via SLOSEA's website once the study is completed.

7. Question: Can you explain the map again? Where is _____ location? What part of the map includes the Elfin Forest/Morro Strand Beach?

    - Answer: (Reiteration of directions and visual indication by pointing to locations that respondent cannot locate.) The Elfin Forest is located at the bottom of the Tidal Wetlands. The part of Morro Strand Beach immediately north of Morro Rock is included on the map.

Data Entry Protocol

Data was entered throughout the summer to avoid a backlog:

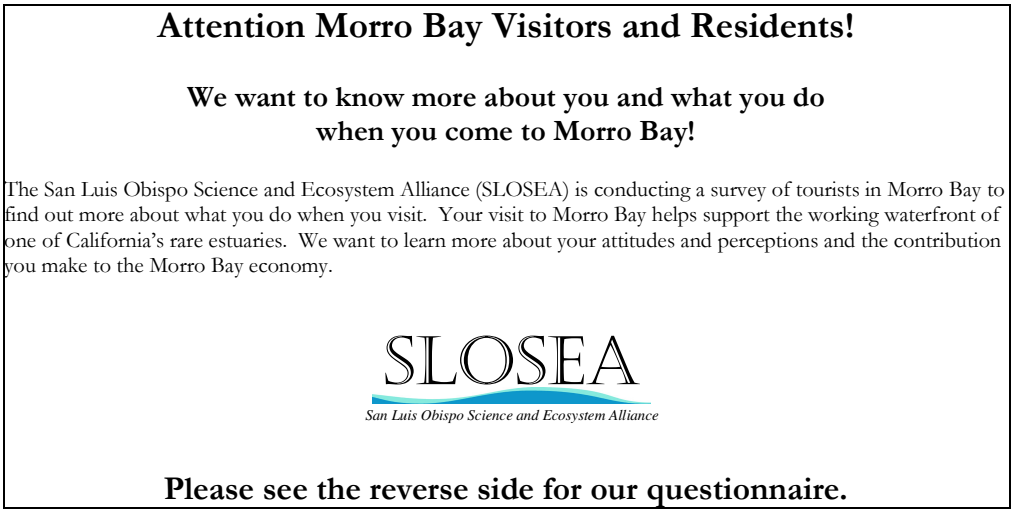
- Access Database: An Access database was created to store all survey information. Separate tables were made for visitors and residents for each survey version (initial and final summer surveys) and for both map versions. The tables were designed to minimize entry errors by formatting each column for the type of data being entered. For example, no words could be entered into columns that required numbers. Columns that represented questions with multiple choice answers were limited to pull down menus of those answers. Survey identification numbers were set to be unique so that no survey could be accidentally entered with the wrong identification number. Forms were also created to correspond to each table. Forms make the process of entering data easier because the interface more closely resembles the actual surveys. Pull-down menus and check boxes were used on the forms to minimize entry errors.

- Surveys and maps were entered by the lead surveyor. Other group members checked all entries at the end of the survey period. A "Checked" and "Checker" column was added to each table so that the Checker was identified in case there was a problem with the data.

- A third and final check was performed on 39 surveys to get an idea of the rate of entry error. Very few errors were found and most were tied to poor handwriting that was difficult to interpret on surveys that were filled out by respondents.

Appendix II: Survey Materials

Exploratory Survey: This survey was administered on April 28, 2007 in Morro Bay to test the effectiveness of certain questions, get respondent feedback on the survey, and gain knowledge on what to expect in the Morro Bay survey environment when developing the full survey.



Attention Morro Bay Visitors and Residents!

We want to know more about you and what you do when you come to Morro Bay!

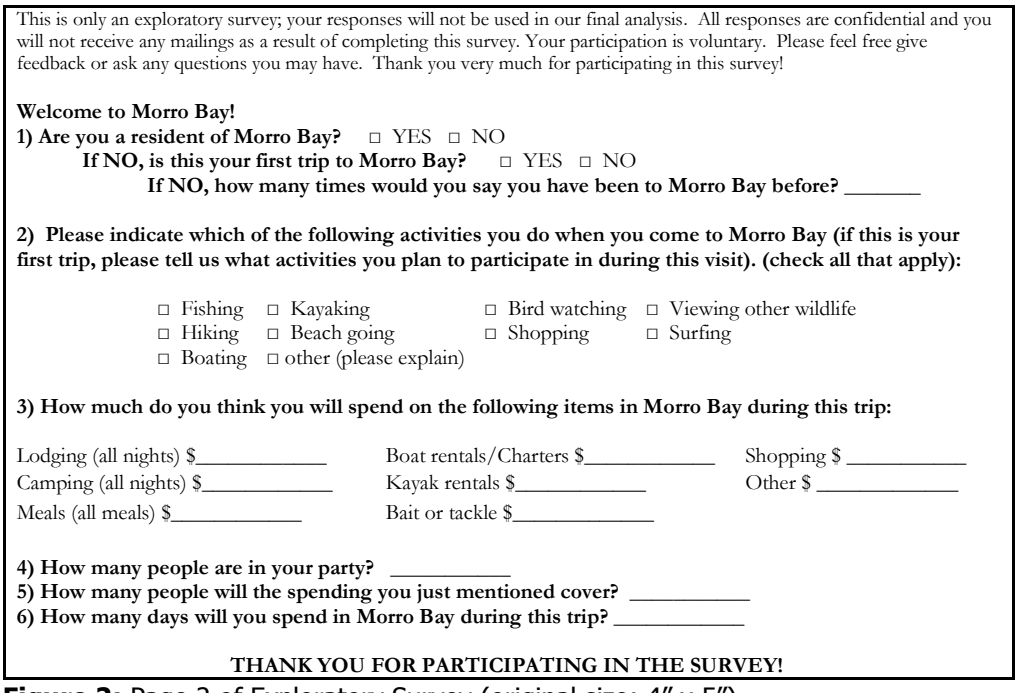
The San Luis Obispo Science and Ecosystem Alliance (SLOSEA) is conducting a survey of tourists in Morro Bay to find out more about what you do when you visit. Your visit to Morro Bay helps support the working waterfront of one of California's rare estuaries. We want to learn more about your attitudes and perceptions and the contribution you make to the Morro Bay economy.

SLOSEA

San Luis Obispo Science and Ecosystem Alliance

Please see the reverse side for our questionnaire.

Figure 1: Page 1 of Exploratory Survey (original size: 4" x 5").



This is only an exploratory survey; your responses will not be used in our final analysis. All responses are confidential and you will not receive any mailings as a result of completing this survey. Your participation is voluntary. Please feel free give feedback or ask any questions you may have. Thank you very much for participating in this survey!

Welcome to Morro Bay!

1) Are you a resident of Morro Bay? □ YES □ NO

If NO, is this your first trip to Morro Bay? □ YES □ NO

If NO, how many times would you say you have been to Morro Bay before? _____

2) Please indicate which of the following activities you do when you come to Morro Bay (if this is your first trip, please tell us what activities you plan to participate in during this visit). (check all that apply):

□ Fishing □ Kayaking □ Bird watching □ Viewing other wildlife
□ Hiking □ Beach going □ Shopping □ Surfing
□ Boating □ other (please explain)

3) How much do you think you will spend on the following items in Morro Bay during this trip:

Lodging (all nights) $_____ Boat rentals/Charters $_____ Shopping $ _____
Camping (all nights) $_____ Kayak rentals $_____ Other $ _____
Meals (all meals) $_____ Bait or tackle $_____

4) How many people are in your party? _____
5) How many people will the spending you just mentioned cover? _____
6) How many days will you spend in Morro Bay during this trip? _____

THANK YOU FOR PARTICIPATING IN THE SURVEY!

Figure 2: Page 2 of Exploratory Survey (original size: 4" x 5").

Initial Summer Survey: This version of the survey was administered in Morro Bay from June 25, 2007 to July 29, 2007. A draft was presented to the Group Project external advisors and the SLOSEA Advisory Committee in May of 2007. Both groups gave feedback on question formatting, activities included, and questions that were included in the Initial Summer Survey.

Donald Bren School of Environmental Science and Management
University of California, Santa Barbara

SLOSEA
San Luis Obispo Science and Ecosystem Alliance

Visitor Recreational Behavior in Morro Bay

Graduate students from the University of California, Santa Barbara are working with the San Luis Obispo Science and Ecosystem Alliance (SLOSEA) to conduct a survey of coastal visitors in Morro Bay. We want to learn more about your activities and perceptions. Please help us by taking a few minutes to complete our survey!

All responses are confidential and no mailings result from this survey. Your participation is voluntary. Thank you very much for you participation and support!

1) **How many days will you spend in Morro Bay during this trip?** _____ days

2) **How many people are you traveling with (including yourself)?** _____ people

3) **Have you been to "the Bay" before? ("the Bay" = Morro Bay and Los Osos waterfronts, the bay and estuary, and the surrounding state parks)** □ YES □ NO → If 'NO', please skip to Question 4

   a) **If yes, how many times including this trip?** □ less than 5 □ 5-10 □ 10-20 □ more than 20

   b) **Over the last 12 months, how many times have you visited "the Bay"?** ____ times/year

4) **Please indicate all activities you will do during this trip in "the Bay":**
   □ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
   □ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
   □ SCUBA diving □ Dining □ Beach going □ Viewing other wildlife
   □ Mountain biking □ Camping □ Other _____

5) **Please indicate all activities you have done during past trips in "the Bay":**
   □ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
   □ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
   □ SCUBA diving □ Dining □ Beach going □ Viewing other wildlife
   □ Mountain biking □ Camping □ Other _____
   □ Never been to "the Bay" before

   a) **If you come to "the Bay" to fish, do you fish from a:**
      □ Pier or shore □ Private or rental boat □ Chartered boat □ I don't fish in the Bay

   b) **Do you plan to eat locally caught seafood during this trip?**
      □ YES □ NO □ Not sure

6) **How much do you think you (including anyone in your party that you are paying for) will spend on the following items *in Morro Bay* during this trip:**
   Lodging (total) $_____ Camping or RV (total) $_____ Meals (total) $ _____
   Boat rental or charter $_____ Kayak rental $ _____ Shopping $ _____
   Bait and tackle $ _____ Boat cruise or tour $_____ Gas $ _____
   Other (specify) $ _____
   a) **How many people are covered by the spending you just indicated?** _____ people

7) **Have you ever been to other parts of the Central/Southern California coast (south of Santa Cruz)?**
   □ YES □ NO → If 'NO', please skip to Question 9

Figure 3: Page 1 of Initial Summer Visitor Survey (original size: 8.5" x 11").

8) For each of the following factors, how do you feel "the Bay" compares to similar areas on the Central/Southern California coast?

a) Water quality (i.e. pollution or bacterial contamination):
□ Better □ Equal □Worse □ Not sure

b) Fish abundance:
□ Better □ Equal □Worse □ Not sure

c) Bird abundance:
□ Better □ Equal □Worse □ Not sure

d) Abundance of other marine wildlife (i.e. whales, sea lions, and seals):
□ Better □ Equal □Worse □ Not sure

e) Availability of access to undeveloped open spaces and wilderness areas?
□ Better □ Equal □Worse □ Not sure

9) Did water quality, abundance of birds, fish or other wildlife, or access to open spaces play a role in your decision to visit Morro Bay?
□ YES □ NO → If 'NO', please skip to Question 10

a) If yes, check the most significant factor in your decision:
□ Water quality □ Fish abundance □ Bird abundance □ Other wildlife abundance
□ Access to undeveloped open spaces □ No preference

10) Did the weather in your place of residence play a role in your decision to visit "the Bay"?
□ YES □ NO

11) If you have visited "the Bay" periodically over the past 5 years, do you think overall environmental quality has improved or declined in that time?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a repeat visitor

12) If you are a repeat visitor, do you think the overall working waterfront experience (i.e. working fishing boats, marina atmosphere, etc.) has improved or declined in Morro Bay over the past 5 years?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a repeat visitor

13) Age: _____ years old
14) Are you: □ MALE □ FEMALE
15) Home zip code: _____

16) Ethnicity (Choose all that apply):
□ Caucasian □ Latino □ Native American □ African American
□ Asian □ Other _____ □ Decline to answer

17) Education: □ No formal education □ Elementary/Junior High □ High School
□ Vocational School □ Community College □ Some College
□ Four-year College □ Graduate School □ Decline to answer

18) Total annual household income before taxes, from all sources?
□ Less than $15,000 □ $15,000 to under $30,000 □ $30,000 to under $50,000
□ $50,000 to under $75,000 □ $75,000 to under $100,000 □ $100,000 to under $150,000
□ $150,000 to under $300,000 □ more than $300,000 □ Decline to answer

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Figure 4: Page 2 of Initial Summer Visitor Survey (original size: 8.5" x 11").

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All responses are confidential and you will not receive any mailings as a result of completing this survey. Your participation is voluntary. Thank you very much for you participation and support!

1) Are you a resident of:

□ Morro Bay □ Los Osos □ Cayucos □ Nearby unincorporated areas

a) How long have you been a resident?_____years

2) How many days do you spend some leisure time in "the Bay" ("the Bay" = Morro Bay and Los Osos waterfronts, the bay and estuary, and the surrounding state parks):

Summer (June-August)? ___ days
Fall (September-November)? ___ days
Winter (December-February)? ___ days
Spring (March-May)? ___ days

3) How many people are in your party today (including yourself)? _____ people

4) Please indicate all activities you will do today in "the Bay":

□ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
□ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
□ SCUBA diving □ Dining □ Beach going □ Viewing other wildlife
□ Mountain biking □ Other _____

5) Please indicate all activities you have done in the past in "the Bay":

□ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
□ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
□ SCUBA diving □ Dining □ Beach going □ Viewing other wildlife
□ Mountain biking □ Other _____

a) If you fish in "the Bay", do you fish from a:

□ Pier or shore □ Private or rental boat □ Chartered boat □ I don't fish in the Bay

b) Have you eaten locally caught seafood?

□ YES □ NO □ Not sure

6) How much do you think you will spend on the following items *in Morro Bay* today:

Meals (total) $ _____ Boat rental or charter $_____ Kayak rental $ _____
Shopping $ _____ Bait and tackle $ _____ Boat Cruise or tour $_____
Gas $ _____ Other (specify) $ _____

a) How many people are covered by the spending you just indicated? _____ people

Figure 5: Page 1 of Initial Summer Resident Survey (original size: 8.5" x 11").

7) Have you ever been to other parts of the Southern/Central California coast (south of Santa Cruz)?
□ YES □ NO → If 'NO', please skip to Question 9

8) For each of the following factors, how do you feel "the Bay" compares to similar areas on the Southern California coast?

a) Water quality (i.e. pollution or bacterial contamination):
□ Better □ Equal □Worse □ Not sure

b) Fish abundance:
□ Better □ Equal □Worse □ Not sure

c) Bird abundance:
□ Better □ Equal □Worse □ Not sure

d) Abundance of other marine wildlife (i.e. whales, sea lions, and seals):
□ Better □ Equal □Worse □ Not sure

e) Availability of access to undeveloped open spaces and wilderness areas?
□ Better □ Equal □Worse □ Not sure

9) Did water quality, abundance of birds, fish or other wildlife, or access to open spaces play a role in your decision to spend leisure time in "the Bay"?
□ YES □ NO → If 'NO', please skip to Question 10

a) If yes, check the most significant factor in your decision:
□ Water quality □ Fish abundance □ Bird abundance □ Other wildlife abundance
□ Access to undeveloped open spaces □ No preference

10) If you have lived in "the Bay" for 5 years or more, do you think overall environmental quality has improved or declined in that time?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a 5 year resident

11) If you are a long-term resident, do you think the overall working waterfront experience (i.e. working fishing boats, marina atmosphere, etc.) has improved or declined in Morro Bay over the past 5 years?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a 5 year resident

12) Age: _____ years old
13) Are you: □ MALE □ FEMALE
14) Home zip code: _____

15) Ethnicity (Choose all that apply):
□ Caucasian □ Latino □ Native American □ African American
□ Asian □ Other _____ □ Decline to answer

16) Education: □ No formal education □ Elementary/Junior High □ High School
□ Vocational School □ Community College □ Some College
□ Four-year College □ Graduate School □ Decline to answer

17) Total annual household income before taxes, from all sources?
□ Less than $15,000 □ $15,000 to under $30,000 □ $30,000 to under $50,000
□ $50,000 to under $75,000 □ $75,000 to under $100,000 □ $100,000 to under $150,000
□ $150,000 to under $300,000 □ more than $300,000 □ Decline to answer

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Figure 6: Page 2 of Initial Summer Resident Survey (original size: 8.5" x 11").

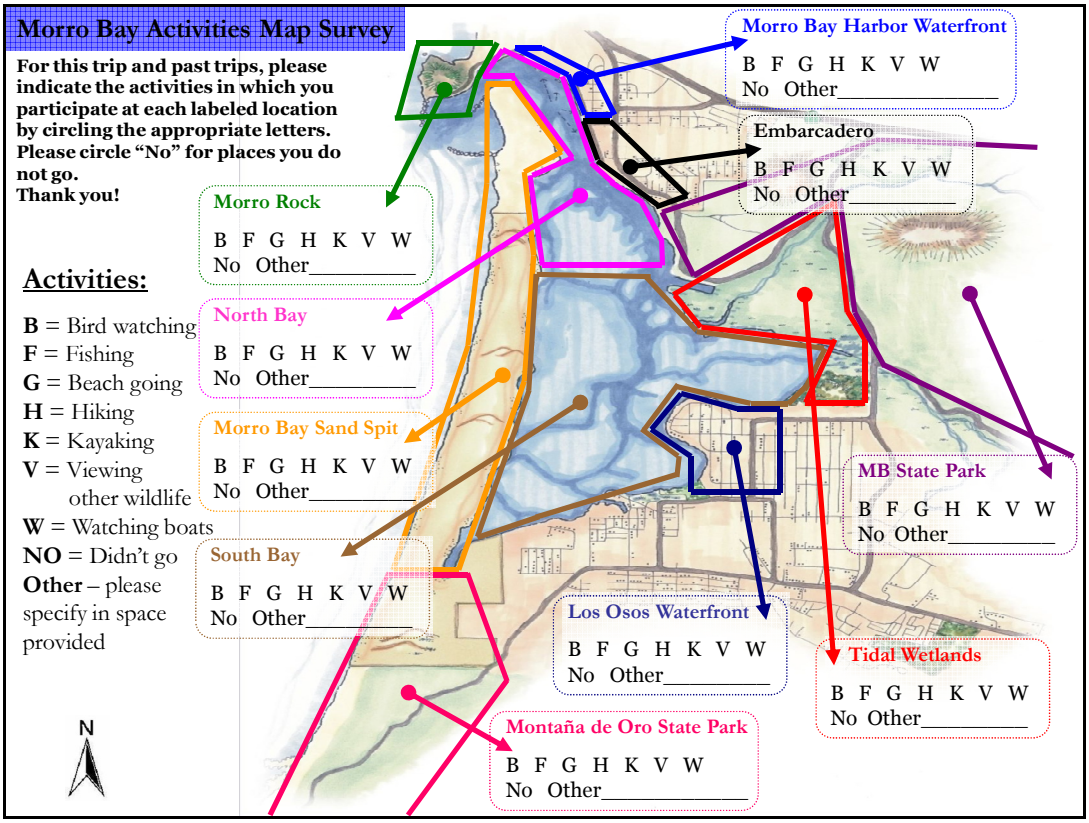

Figure 7: Map Page (Page 3) of Initial Summer Visitor and Resident Surveys (original size: 8.5" x 11").

Final Summer Survey: This version was administered from July 30, 2007 to September 3, 2007. The Final Summer Survey clarifies confusing questions discovered during the administration of the Initial Summer Survey.

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All responses are confidential and no mailings result from this survey. Your participation is voluntary. Thank you very much for you participation and support!

1) How many days will you spend in Morro Bay during this trip? _____ days

2) How many people are you traveling with (including yourself)? _____ people

3) Have you been to "the Bay" before? ("the Bay" = Morro Bay and Los Osos waterfronts, the bay and estuary, and the surrounding state parks) □ YES □ NO → If 'NO', please **skip** to Question 4

a) If yes, how many times including this trip? □ less than 5 □ 5-10 □ 10-20 □ more than 20

b) Over the last 12 months, how many times (including this trip) have you visited? ____ times/year

4) Please indicate all activities you will do during this trip in "the Bay":

□ Fishing	□ Kayaking	□ Watching fishing boats	□ Bird watching
□ Hiking/Walking	□ Boating	□ Shopping	□ Whale/wild marine mammal viewing
□ Surfing	□ Dining	□ Beach going	□ Viewing other wildlife
□ Mountain biking	□ Camping	□ Golfing	□ Other _____

5) Please indicate all activities you have done during past trips in "the Bay":

□ Fishing	□ Kayaking	□ Watching fishing boats	□ Bird watching
□ Hiking/Walking	□ Boating	□ Shopping	□ Whale/wild marine mammal viewing
□ Surfing	□ Dining	□ Beach going	□ Viewing other wildlife
□ Mountain biking	□ Camping	□ Golfing	□ Other _____

□ Never been to "the Bay" before

a) If you come to "the Bay" to fish, do you fish from a:
□ Pier or shore □ Private or rental boat □ Chartered boat □ I don't fish in the Bay

b) Do you plan to eat locally caught seafood during this trip?
□ YES □ NO □ Not sure

6) How much do you think you (including anyone in your party that you are paying for) will spend on the following items *in Morro Bay* during this trip:

Lodging (total) $_____	Boat rental or charter $_____	Meals (total) $ _____
Camping or RV (total) $_____	Kayak rental $ _____	Shopping $ _____
Bait and tackle $ _____	Boat cruise or tour $_____	Gas $ _____
Other (specify) $ _____		I will not spend any money in Morro Bay: □

a) How many people are covered by the spending you just indicated? _____ people

7) Have you ever been to other parts of the Central/Southern California coast (south of Santa Cruz)?
□ YES □ NO → If 'NO', please **skip** to Question 9

Figure 8: Page 1 of Final Summer Visitor Survey (original size 8.5" x 11").

8) For each of the following factors, how do you feel "the Bay" compares to similar areas on the Central/Southern California coast?

a) Water quality (i.e. pollution or bacterial contamination):
□ Better □ Equal □Worse □ Not sure

b) Fish abundance:
□ Better □ Equal □Worse □ Not sure

c) Bird abundance:
□ Better □ Equal □Worse □ Not sure

d) Abundance of other marine wildlife (i.e. whales, sea lions, and seals):
□ Better □ Equal □Worse □ Not sure

e) Availability of access to undeveloped open spaces and wilderness areas?
□ Better □ Equal □Worse □ Not sure

9) Did water quality, abundance of birds, fish or other wildlife, or access to open spaces play a role in your decision to visit Morro Bay?
□ YES □ NO → If 'NO', please **skip** to Question 10

a) If yes, check the ONE most significant factor in your decision:
□ Water quality □ Fish abundance □ Bird abundance □ Other wildlife abundance
□ Access to undeveloped open spaces □ No preference

10) Did the weather in your place of residence play a role in your decision to visit "the Bay"?
□ YES □ NO

11) If you have visited "the Bay" periodically over the past 5 years, do you think overall environmental quality has improved or declined in that time?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a repeat visitor

12) If you are a repeat visitor, do you think the overall working waterfront experience (i.e. working fishing boats, marina atmosphere, etc.) has improved or declined in Morro Bay over the past 5 years?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a repeat visitor

13) Age: _____ years old
14) Are you: □ MALE □ FEMALE
15) Home zip code: _____

16) Are you of Hispanic or Latino origin? □ YES □ NO
17) Race (Choose all that apply):
□ White □ Asian □ Native Hawaiian/Pacific Islander □ American Indian or Alaskan Native
□ African American □ Other _____ □ Decline to answer

18) Education: □ No formal education □ Elementary/Junior High □ High School
□ Vocational School □ Community College □ Some College
□ Four-year College □ Graduate School □ Decline to answer

19) Total annual household income before taxes, from all sources?
□ Less than $15,000 □ $15,000 to under $30,000 □ $30,000 to under $50,000
□ $50,000 to under $75,000 □ $75,000 to under $100,000 □ $100,000 to under $150,000
□ $150,000 to under $300,000 □ more than $300,000 □ Decline to answer

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Figure 9: Page 2 of Final Summer Visitor Survey (original size 8.5" x 11").

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All responses are confidential and you will not receive any mailings as a result of completing this survey. Your participation is voluntary. Thank you very much for you participation and support!

1) Are you a resident of:
□ Morro Bay □ Los Osos □ Cayucos □ Nearby unincorporated areas

a) How long have you been a resident?_____years

2) How many days do you spend some leisure time in "the Bay" ("the Bay" = Morro Bay and Los Osos waterfronts, the bay and estuary, and the surrounding state parks):
Summer (June-August)? ___ days/week **Fall (September-November)?** ___ days/week
Winter (December-February)? ___ days/week **Spring (March-May)?** ___ days/week

3) How many people are in your party today (including yourself)? _____ people

4) Please indicate all activities you will do today in "the Bay":
□ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
□ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
□ Surfing □ Dining □ Beach going □ Viewing other wildlife
□ Mountain biking □ Golfing □ Other _____

5) Please indicate all activities you have done in the past in "the Bay":
□ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
□ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
□ Surfing □ Dining □ Beach going □ Viewing other wildlife
□ Mountain biking □ Golfing □ Other _____

a) If you fish in "the Bay", do you fish from a:
□ Pier or shore □ Private or rental boat □ Chartered boat □ I don't fish in the Bay

b) Have you eaten locally caught seafood?
□ YES □ NO □ Not sure

6) How much do you think you will spend on the following items *in Morro Bay* today:
Meals (total) $ _____ Boat rental or charter $_____ Kayak rental $ _____
Shopping $ _____ Bait and tackle $ _____ Boat Cruise or tour $_____
Gas $ _____ Other (specify) $ _____
I will not spend any money in Morro Bay: □

a) How many people are covered by the spending you just indicated? _____ people

7) Have you ever been to other parts of the Southern/Central California coast (south of Santa Cruz)?
□ YES □ NO → If 'NO', please **skip** to Question 9

Figure 10: Page 1 of Final Summer Resident Survey (original size 8.5" x 11").

8) For each of the following factors, how do you feel "the Bay" compares to similar areas on the Southern/Central California coast?

a) Water quality (i.e. pollution or bacterial contamination):
□ Better □ Equal □Worse □ Not sure

b) Fish abundance:
□ Better □ Equal □Worse □ Not sure

c) Bird abundance:
□ Better □ Equal □Worse □ Not sure

d) Abundance of other marine wildlife (i.e. whales, sea lions, and seals):
□ Better □ Equal □Worse □ Not sure

e) Availability of access to undeveloped open spaces and wilderness areas?
□ Better □ Equal □Worse □ Not sure

9) Did water quality, abundance of birds, fish or other wildlife, or access to open spaces play a role in your decision to spend leisure time in "the Bay"?
□ YES □ NO → If 'NO', please **skip** to Question 10

a) If yes, check the ONE most significant factor in your decision:
□ Water quality □ Fish abundance □ Bird abundance □ Other wildlife abundance
□ Access to undeveloped open spaces □ No preference

10) If you have lived in "the Bay" for 5 years or more, do you think overall environmental quality has improved or declined in that time?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a 5 year resident

11) If you are a long-term resident, do you think the overall working waterfront experience (i.e. working fishing boats, marina atmosphere, etc.) has improved or declined in Morro Bay over the past 5 years?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a 5 year resident

12) Age: _____ years old
13) Are you: □ MALE □ FEMALE
14) Home zip code: _____

15) Are you of Hispanic or Latino origin? □ YES □ NO

16) Race (Choose all that apply):
□ White □ Asian □ Native Hawaiian/Pacific Islander □ American Indian or Alaskan Native
□ African American □ Other _____ □ Decline to answer

17) Education: □ No formal education □ Elementary/Junior High □ High School
□ Vocational School □ Community College □ Some College
□ Four-year College □ Graduate School □ Decline to answer

18) Total annual household income before taxes, from all sources?
□ Less than $15,000 □ $15,000 to under $30,000 □ $30,000 to under $50,000
□ $50,000 to under $75,000 □ $75,000 to under $100,000 □ $100,000 to under $150,000
□ $150,000 to under $300,000 □ more than $300,000 □ Decline to answer

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Respondent ID#_____ Location Completed_____ Surveyor_____ Date_____ I / H Time_____

Figure 11: Page 2 of Final Summer Resident Survey (original size 8.5" x 11").

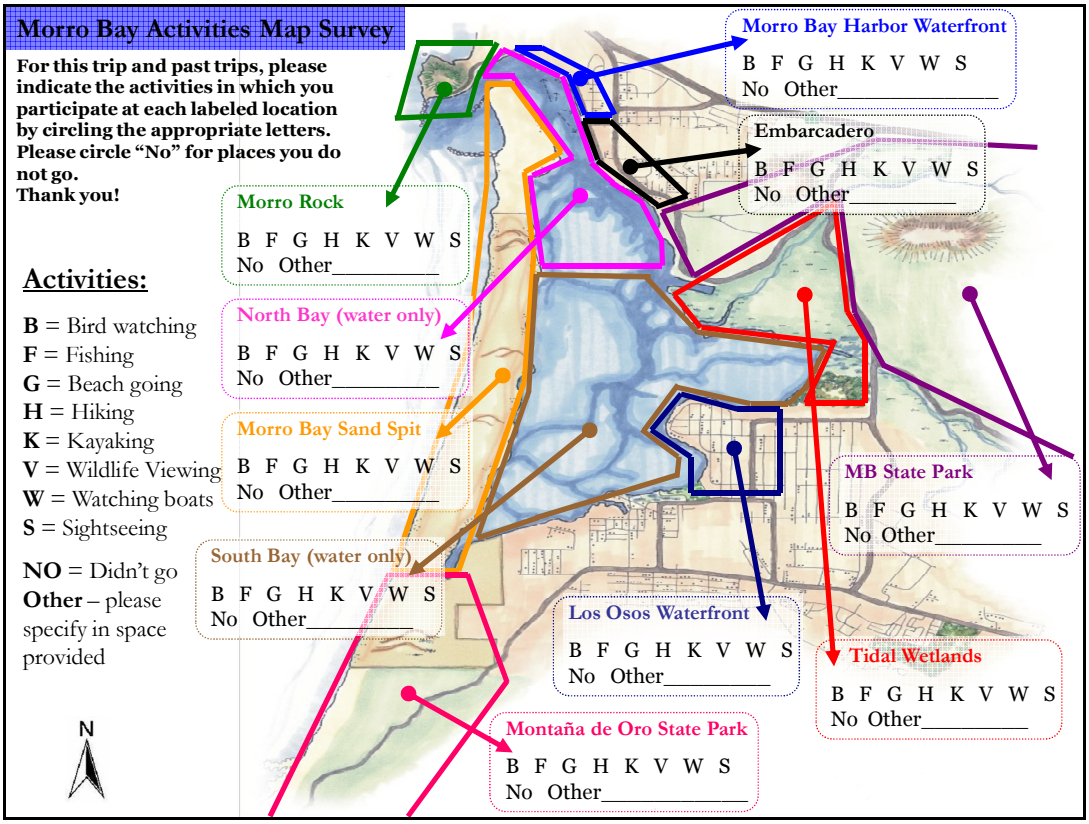

Figure 12: Map Page (Page 3) of Final Summer Visitor and Resident Surveys (original size 8.5" x 11").

Recommended Survey for Future Use: This survey incorporates the priority recommendations that were determined by the Bren Group Project Team to be the most essential to include in future iterations of the Morro Bay Coastal User Survey.

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All responses are confidential and no mailings result from this survey. Your participation is voluntary. Thank you very much for you participation and support!

1) **How many days will you spend in Morro Bay during this trip?** _____ days

2) **How many people are you traveling with (including yourself)?** _____ people

3) **Have you been to "the Bay" before? ("the Bay" = Morro Bay and Los Osos waterfronts, the bay and estuary, and the surrounding state parks)** □ YES □ NO → If 'NO', please **skip** to Question 5c

   a) **If yes, how many times including this trip?** □ less than 5 □ 5-10 □ 10-20 □ more than 20

   b) **Not including this trip, how many times have you visited over the last 12 months?** ____ times/year

4) **Please indicate all activities you will do during this trip to "the Bay":**
   □ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
   □ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
   □ Surfing □ Dining □ Beach going □ Viewing other wildlife
   □ Bicycling □ Camping □ Golfing □ Other _____

5) **For all your visits, indicate which activity most often influences your decision to come to the Bay:**
   □ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
   □ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
   □ Surfing □ Dining □ Beach going □ Viewing other wildlife
   □ Bicycling □ Camping □ Golfing □ Other _____

   a) **Do you come to "the Bay" to fish?** □ YES □ NO → If 'NO', please **skip** to Question 5c

   b) **If so, do you fish from a:** □ Pier or shore □ Private or rental boat □ Chartered boat

   c) **Do you plan to eat locally caught seafood during this trip?**
   □ YES □ NO □ Not sure

6) **Please indicate your main reason for coming to Morro Bay for this trip:**
   □ Visiting family/friends □ Recreation □ Business □ Weather □ Driving through □ Other

7) **How much do you think you will spend *for yourself only in Morro Bay* during this trip:**
   Lodging (total) $_____ Boat rental or charter $_____ Meals (total) $ _____
   Camping or RV (total) $_____ Kayak rental $ _____ Shopping $ _____
   Bait and tackle $ _____ Boat cruise or tour $_____ Gas $ _____
   Other (specify) $ _____ I will not spend any money in Morro Bay: □

8) **Have you ever been to other parts of the Central/Southern California coast (south of Santa Cruz)?**
   □ YES □ NO → If 'NO', please **skip** to Question 9

Figure 13: Page 1 of Recommended Visitor Survey (original size 8.5" x 11").

9) For each of the following factors, how do you feel "the Bay" compares to similar areas on the Central/Southern California coast?

a) Water quality (i.e. pollution or bacterial contamination):
□ Better □ Equal □Worse □ Not sure

b) Fish abundance:
□ Better □ Equal □Worse □ Not sure

c) Bird abundance:
□ Better □ Equal □Worse □ Not sure

d) Abundance of other marine wildlife (i.e. whales, sea lions, and seals):
□ Better □ Equal □Worse □ Not sure

e) Availability of access to undeveloped open spaces and wilderness areas?
□ Better □ Equal □Worse □ Not sure

10) Did water quality, abundance of birds, fish or other wildlife, or access to open spaces play a role in your decision to visit Morro Bay?
□ YES □ NO → If 'NO', please **skip** to Question 10

a) If yes, check the ONE most significant factor in your decision:
□ Water quality □ Fish abundance □ Bird abundance □ Other wildlife abundance
□ Access to undeveloped open spaces □ No preference

11) If you have visited "the Bay" periodically over the past 5 years, do you think overall environmental quality has improved or declined in that time?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a repeat visitor
□ Have been visiting "the Bay" for less than five years

12) If you are a repeat visitor, do you think the overall working waterfront experience (i.e. working fishing boats, marina atmosphere, etc.) has improved or declined in Morro Bay over the past 5 years?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a repeat visitor
□ Have been visiting "the Bay" for less than five years

13) Age: _____ years old
14) Are you: □ MALE □ FEMALE
15) Home zip code: _____

16) Are you of Hispanic or Latino origin? □ YES □ NO
17) Race (Choose all that apply):
□ White □ Asian □ Native Hawaiian/Pacific Islander □ American Indian or Alaskan Native
□ African American □ Other _____ □ Decline to answer

18) Education: □ No formal education □ Elementary/Junior High □ High School
□ Vocational School □ Community College □ Some College
□ Four-year College □ Graduate School □ Decline to answer

19) Total annual household income before taxes, from all sources?
□ Less than $15,000 □ $15,000 to under $30,000 □ $30,000 to under $50,000
□ $50,000 to under $75,000 □ $75,000 to under $100,000 □ $100,000 to under $150,000
□ $150,000 to under $300,000 □ more than $300,000 □ Decline to answer

Official Use Only
Respondent ID#_____ Location Completed_____ Surveyor_____ Date_____ I / H Time_____

1

Figure 14: Page 2 of Recommended Visitor Survey (original size 8.5" x 11").

Donald Bren School of Environmental Science and Management
University of California, Santa Barbara

SLOSEA
San Luis Obispo Science and Ecosystem Alliance

Resident Recreation in Morro Bay

Graduate students from the University of California, Santa Barbara are working with the San Luis Obispo Science and Ecosystem Alliance (SLOSEA) to conduct a survey of coastal users in Morro Bay. We want to learn more about your activities and opinions. Please help us by taking a few minutes to complete our survey!

All responses are confidential and you will not receive any mailings as a result of completing this survey. Your participation is voluntary. Thank you very much for you participation and support!

1) Are you a resident of:
□ Morro Bay □ Los Osos □ Cayucos □ Nearby unincorporated areas

a) How long have you been a resident?_____years

2) How many days do you spend some leisure time in "the Bay" ("the Bay" = Morro Bay and Los Osos waterfronts, the bay and estuary, and the surrounding state parks):
Summer (June-August)? ___ days/week **Fall (September-November)?** ___ days/week
Winter (December-February)? ___ days/week **Spring (March-May)?** ___ days/week

3) How many people are in your party today (including yourself)? _____ people

4) Please indicate all activities you will do today in "the Bay":
□ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
□ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
□ Surfing □ Dining □ Beach going □ Viewing other wildlife
□ Bicycling □ Golfing □ Other _____

5) Please indicate which activity most often influences your decision spend leisure time in "the Bay":
□ Fishing □ Kayaking □ Watching fishing boats □ Bird watching
□ Hiking/Walking □ Boating □ Shopping □ Whale/wild marine mammal viewing
□ Surfing □ Dining □ Beach going □ Viewing other wildlife
□ Bicycling □ Golfing □ Other _____

a) Do you fish in "the Bay"? □ YES □ NO → If 'NO', please **skip** to Question 5c

b) If so, do you fish from a: □ Pier or shore □ Private or rental boat □ Chartered boat

c) Have you eaten locally caught seafood?
□ YES □ NO □ Not sure

6) How much do you think you will spend *for yourself only in Morro Bay* today:
Meals (total) $ _____ Boat rental or charter $_____ Kayak rental $ _____
Shopping $ _____ Bait and tackle $ _____ Boat Cruise or tour $_____
Gas $ _____ Other (specify) $ _____
I will not spend any money in Morro Bay: □

7) Have you ever been to other parts of the Southern/Central California coast (south of Santa Cruz)?
□ YES □ NO → If 'NO', please **skip** to Question 9

Figure 15: Page 1 of Recommended Resident Survey (original size 8.5" x 11").

8) For each of the following factors, how do you feel "the Bay" compares to similar areas on the Southern/Central California coast?

a) Water quality (i.e. pollution or bacterial contamination):
□ Better □ Equal □Worse □ Not sure

b) Fish abundance:
□ Better □ Equal □Worse □ Not sure

c) Bird abundance:
□ Better □ Equal □Worse □ Not sure

d) Abundance of other marine wildlife (i.e. whales, sea lions, and seals):
□ Better □ Equal □Worse □ Not sure

e) Availability of access to undeveloped open spaces and wilderness areas?
□ Better □ Equal □Worse □ Not sure

9) Did water quality, abundance of birds, fish or other wildlife, or access to open spaces play a role in your decision to spend leisure time in "the Bay"?
□ YES □ NO → If 'NO', please **skip** to Question 10

a) If yes, check the ONE most significant factor in your decision:
□ Water quality □ Fish abundance □ Bird abundance □ Other wildlife abundance
□ Access to undeveloped open spaces □ No preference

10) If you have lived in "the Bay" for 5 years or more, do you think overall environmental quality has improved or declined in that time?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a 5 year resident

11) If you are a long-term resident, do you think the overall working waterfront experience (i.e. working fishing boats, marina atmosphere, etc.) has improved or declined in Morro Bay over the past 5 years?
□ Improved □ Hasn't changed □ Worsened □ Not sure □ Not a 5 year resident

12) Age: _____ years old
13) Are you: □ MALE □ FEMALE
14) Home zip code: _____

15) Are you of Hispanic or Latino origin? □ YES □ NO
16) Race (Choose all that apply):
□ White □ Asian □ Native Hawaiian/Pacific Islander □ American Indian or Alaskan Native
□ African American □ Other _____ □ Decline to answer

17) Education: □ No formal education □ Elementary/Junior High □ High School
□ Vocational School □ Community College □ Some College
□ Four-year College □ Graduate School □ Decline to answer

18) Total annual household income before taxes, from all sources?
□ Less than $15,000 □ $15,000 to under $30,000 □ $30,000 to under $50,000
□ $50,000 to under $75,000 □ $75,000 to under $100,000 □ $100,000 to under $150,000
□ $150,000 to under $300,000 □ more than $300,000 □ Decline to answer

Official Use Only
Respondent ID#_____ Location Completed_____ Surveyor_____ Date_____ I / H Time_____

Figure 16: Page 2 of Recommended Resident Survey (original size 8.5" x 11").

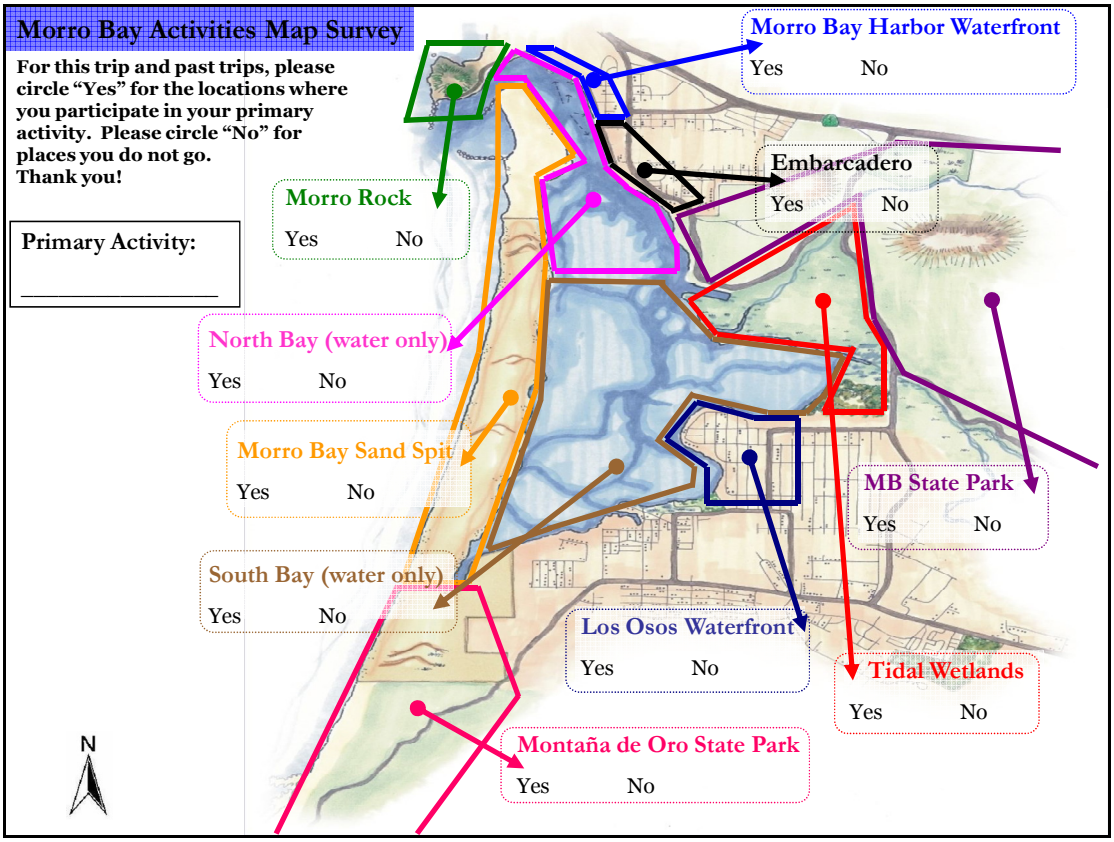

Figure 17: Map Page (Page 3) of Recommended Resident and Visitor Surveys (original size 8.5" x 11").

Appendix III: Survey Results and Statistics

Summary Statistics: Collected Surveys

A total of 681 surveys were collected from June 25, 2007 to September 3, 2007. After removing 14 surveys and 1 Spanish survey that were not fully completed, 666 surveys remained for statistical analysis. Summary statistics regarding the number of surveys collected by surveyor, time block, respondent type, date and location are presented in the Tables 1-4 and Figure 1 below.

Table 1: Number of surveys by Respondent Type and Survey Mode.

Survey Mode by Respondent Type			
Survey Mode	Resident	Visitors	Total
Interview	70	357	427
Handout	37	202	239
Total	**107**	**559**	**666**

Table 2: Number of surveys collected by surveyor.

Number of Surveys by Surveyor			
Surveyor	Resident	Visitor	Total
Emily	22	215	237
Lexie	85	344	429
Total	**107**	**559**	**666**

Table 3: Number of surveys collected during each time block.

Time Block by Respondent Type			
Time Block	Resident	Visitor	Total
1 (10-12pm)	40	200	240
2 (1-3pm)	39	262	301
3 (4-6pm)	28	97	125
Total	**107**	**559**	**666**

Table 4: Number of surveys collected each survey day.

Number of Surveys by Date			
Date	Number of Surveys	Percent of Total Surveys	Cumulative Percent of Total Surveys
6/25/2007	18	2.7	2.7
6/27/2007	25	3.75	6.46
6/29/2007	20	3	9.46
6/30/2007	24	3.6	13.06
7/1/2007	15	2.25	15.32
7/10/2007	14	2.1	17.42
7/12/2007	20	3	20.42
7/13/2007	10	1.5	21.92
7/17/2007	13	1.95	23.87
7/18/2007	6	0.9	24.77
7/2/2007	33	4.95	29.73
7/20/2007	10	1.5	31.23
7/24/2007	10	1.5	32.73
7/25/2007	19	2.85	35.59
7/26/2007	14	2.1	37.69
7/28/2007	20	3	40.69
7/30/2007	10	1.5	42.19
7/31/2007	22	3.3	45.5
7/4/2007	26	3.9	49.4
7/6/2007	24	3.6	53
7/7/2007	5	0.75	53.75
7/8/2007	16	2.4	56.16
8/11/2007	19	2.85	59.01
8/12/2007	11	1.65	60.66
8/13/2007	17	2.55	63.21
8/15/2007	21	3.15	66.37
8/16/2007	21	3.15	69.52
8/2/2007	21	3.15	72.67
8/21/2007	11	1.65	74.32
8/22/2007	20	3	77.33
8/23/2007	16	2.4	79.73
8/25/2007	13	1.95	81.68
8/27/2007	5	0.75	82.43
8/30/2007	19	2.85	85.29
8/4/2007	12	1.8	87.09
8/7/2007	11	1.65	88.74
8/8/2007	20	3	91.74
8/9/2007	21	3.15	94.89
9/1/2007	19	2.85	97.75
9/2/2007	15	2.25	100
Total	**666**	**100**	

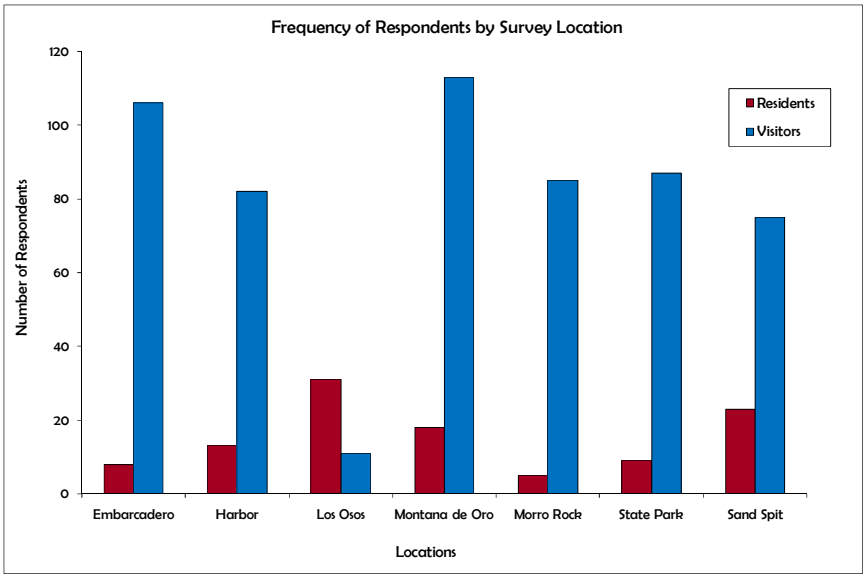

Figure 1: Number of surveys collected by location.

Summary Statistics: Demographics

Demographic characteristics of respondents were collected to provide information about the representativeness of the survey sample. A total of 559 (84%) visitor surveys and 107 (16%) resident surveys were collected. Females composed approximately 52% (342 individuals) of the sample and the average age of a respondent was 47.8 years, with a standard deviation of 15.39 and a maximum age of 92 years. The age distribution was truncated by the Office of Research requirement that set the minimum age at 18 years. Information regarding the race, income, and education levels of respondents is presented below in Figures 2-4.

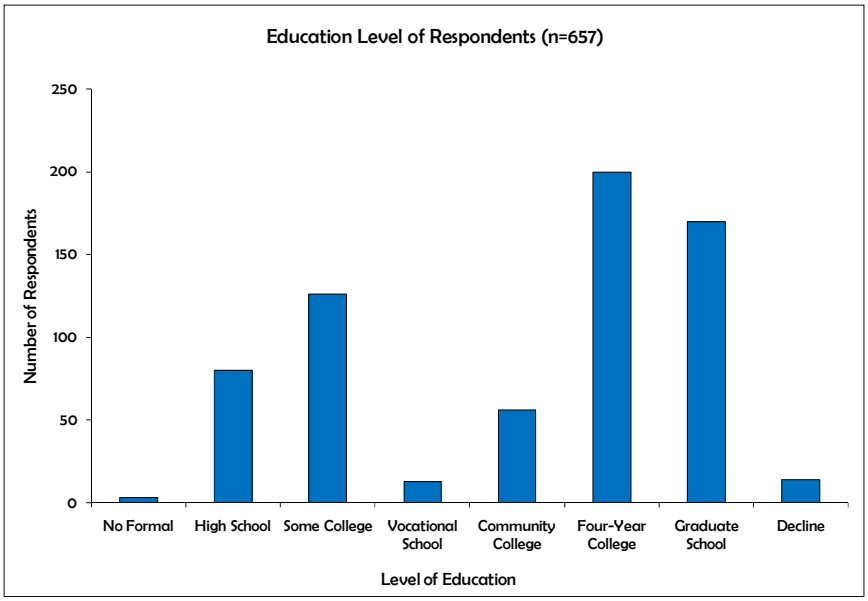

Figure 2: Distribution of education level of respondents.

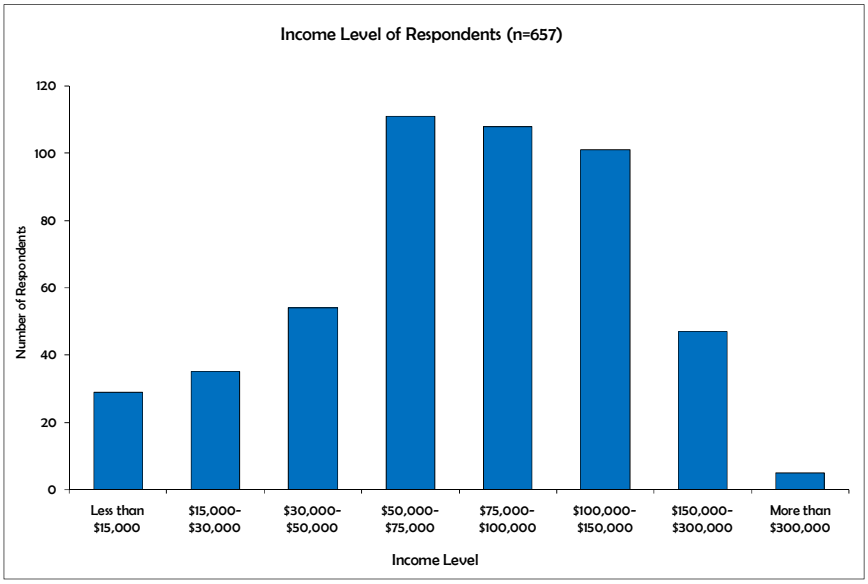

Figure 3: Distribution of income level of respondents.

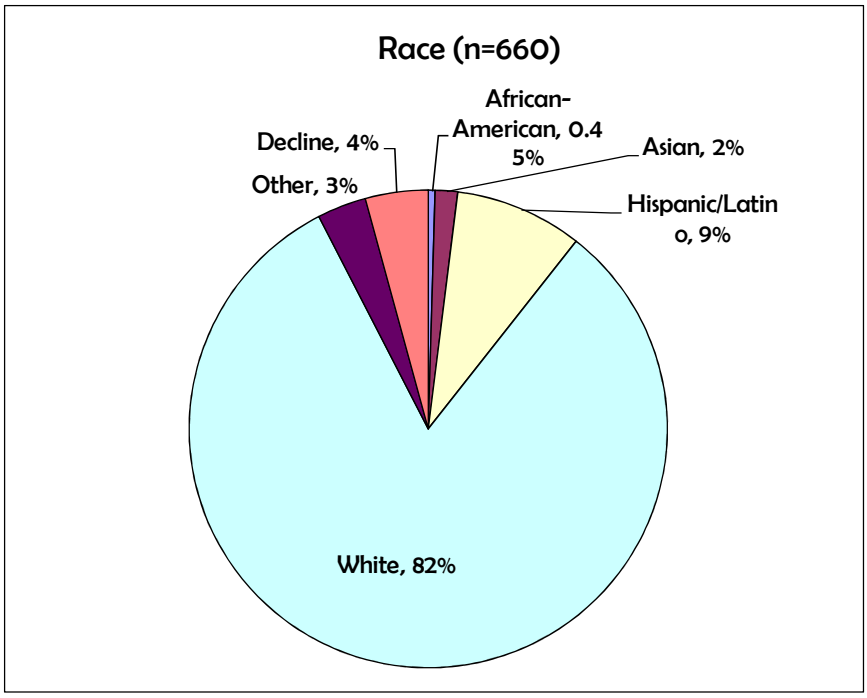

Figure 4: Distribution of race of respondents. There were two different versions of questions regarding race. The first version included Hispanic/Latino as a choice within the race question. The second version asked about Hispanic/Latino origin as a separate question, and was not included as a choice in the race question. Respondents from the second version were grouped with the Hispanic/Latino group from the first version if they indicated they were of Hispanic/Latino origin and left the following race question blank.

Survey Results

The response rate for each question on both the resident and visitor surveys is specified in Tables 5-7 below. The high response rates were most likely due to the survey methodology, which gave respondents the ability to clarify confusing questions or other concerns with the surveyor. The questions with the lowest response rates are subset questions and those that address race and ethnicity. These problematic questions have been addressed in the recommendations for future iterations of the Morro Bay Coastal User Survey (see Sections 17-23 of the main report for a description of the recommendations and Figures 13-17 in Appendix II for the recommended survey).

Table 5: Response rate by individual questions. "Version" indicates whether the question was present on the visitor or resident survey, and "total responses" indicates the number of responses for that question. Questions that follow up a previous question may have a smaller number of responses that the rest of the survey (n=666). Response rate was not calculated for questions 4 and 5 because respondents could choose multiple answers.

Question	Version	Blanks	Total Response	Response Rate
1	Visitor	2	559	99.6%
1	Resident	0	107	100.0%
1a	Resident	1	107	99.1%
2	Visitor	2	559	99.6%
2	Resident	3	107	97.2%
3	Visitor	0	559	100.0%
3a	Visitor	2	559	99.6%
3b	Visitor	3	559	99.5%
3	Resident	1	107	99.1%
4	Visitor/Resident			
5	Visitor/Resident			
5a	Visitor/Resident	52	666	92.2%
5b	Visitor/Resident	4	666	99.4%
6	Visitor/Resident	81	666	87.8%
6a	Visitor/Resident	124	666	81.4%
7	Visitor/Resident	0	666	100.0%
8a	Visitor/Resident	23	666	96.5%
8b	Visitor/Resident	23	666	96.5%
8c	Visitor/Resident	22	666	96.7%
8d	Visitor/Resident	22	666	96.7%
8e	Visitor/Resident	22	666	96.7%
9	Visitor/Resident	0	666	100.0%
9a	Visitor/Resident	40	295	86.4%
10	Visitor	0	559	100.0%
10	Resident	1	107	99.1%
11	Visitor	10	559	98.2%
11	Resident	0	107	100.0%
12	Visitor	20	559	96.4%

Table 6: Response rate for demographic questions. "Version" indicates whether the question was present on the visitor or resident survey, and "total responses" indicates the number of responses for that question. Questions where respondents could choose to decline to answer have a smaller number of responses that the rest of the survey (n=666). The number of respondents that declined to answer is indicated in the "Note" column.

Demographic Characteristic	Blanks	Total Response	Response Rate	Note
Age	8	666	98.8%	
Gender	3	666	99.5%	
Zip code	16	666	97.6%	
Education	4	666	99.4%	14 Decline to Answer
Income	9	666	98.6%	167 Decline to Answer
Race	39	372	89.5%	14 Decline to Answer
Ethnicity	3	294	99.0%	13 Decline to Answer
Hispanic/Latino Origin	8	372	97.8%	

Table 7: Response rate by locations on the map section of the survey. "Version" indicates whether the question was present on the visitor or resident survey, and "total responses" indicates the number of responses for that question.

Location	Blanks	Response Rate
Morro Rock	17	97%
Sand Spit	33	95%
North Bay	40	94%
South Bay	33	95%
Montana de Oro	25	96%
Los Osos	37	94%
Tidal Wetlands	31	95%
Morro Bay State Park	23	97%
Embarcadero	21	97%
Harbor Waterfront	22	97%

The results of the survey are illustrated in the graphs below. Activities were separated in the survey by those completed during the current trip to the Bay (question 4) and those completed in past trips to the Bay (question 5). The composite results from these questions are presented in Figures 5 and 6 below. The results from these questions were combined because there was no analytical value in differentiating between past trips and current trips with regard to activities. Figure 7 illustrates the responses to the question regarding locally caught seafood.

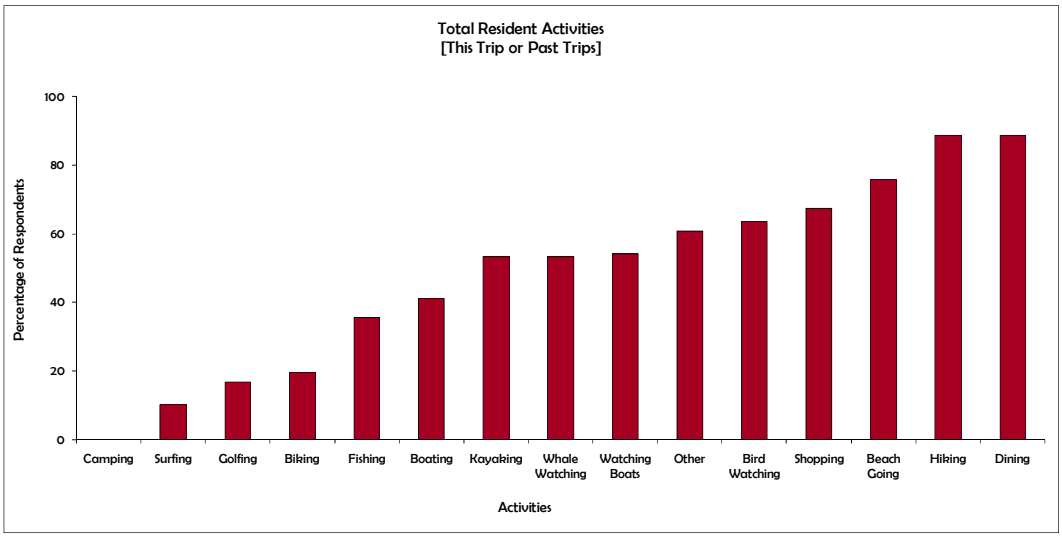

Figure 5: Activities of resident respondents.

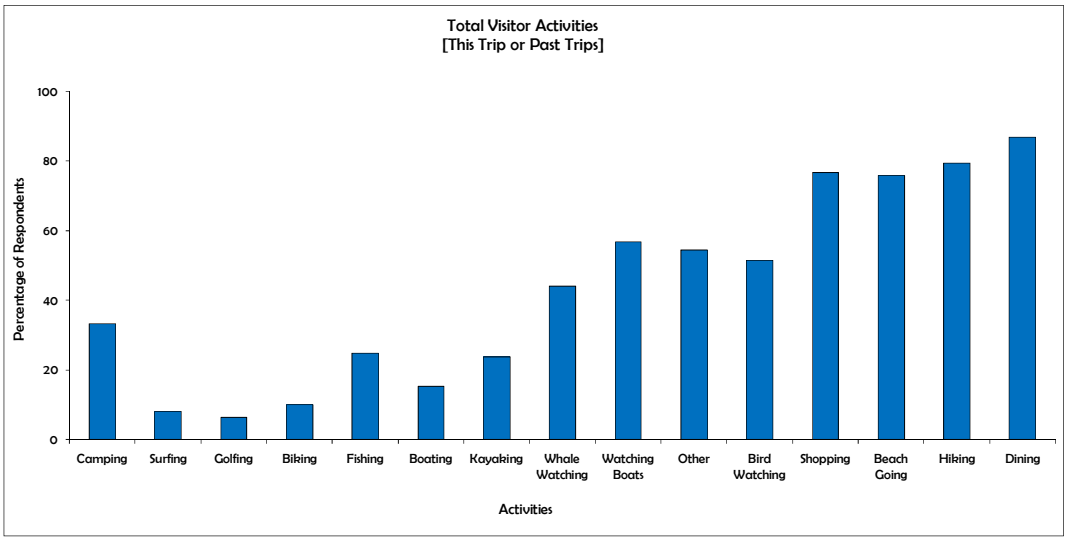

Figure 6: Activities of visitor respondents.

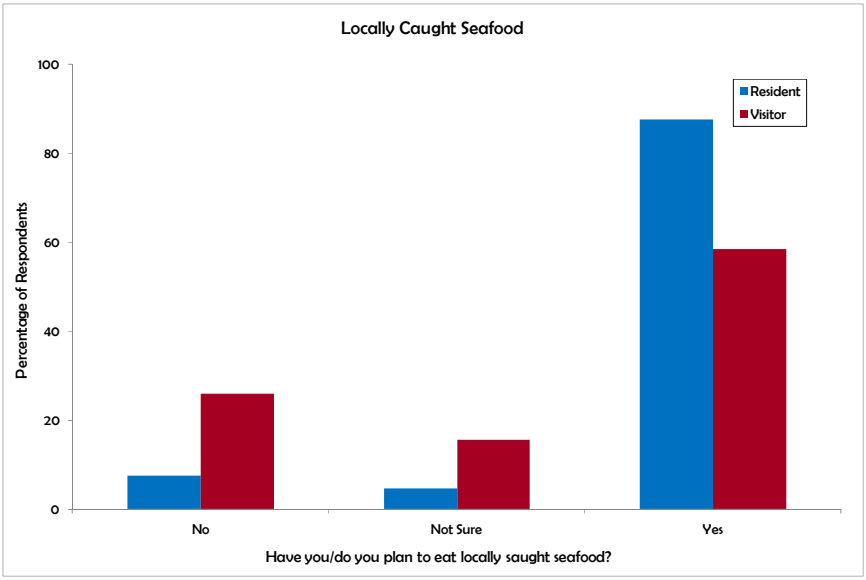

Figure 7: Responses to local seafood question.
Resident question: Have you ever eaten locally caught seafood?
Visitor question: Do you plan on eating locally caught seafood during this trip?

The following data presented in Table 5 and Figures 8-12 were derived from the responses to question 8 on the survey. Question 8 addressed environmental perceptions of Morro Bay compared to other similar areas on the Central and Southern California coast. The question asked about five different environmental factors: water quality, fish abundance, bird abundance, other marine wildlife abundance, and access to open space. The respondent was asked to rate Morro Bay compared to other areas as "better", "equal", "worse" or "not sure." All respondents that chose "not sure" did not state an opinion and are not included in the responses graphed in Figures 8-12. Table 5 details the number and percentage of responses that did and did not state an opinion on each environmental factor.

Table 5: Number of stated opinions for each environmental factor by respondent type.

Residents				
Environmental Factor	**Not Sure/No Opinion**		**Stated Opinion**	
	Number	*Percent*	*Number*	*Percent*
Water Quality	27	25.71	78	74.29
Fish Abundance	62	59.62	42	40.38
Bird Abundance	12	11.43	93	88.57
Other Marine Wildlife Abundance	19	18.27	85	81.73
Open Space Access	9	8.57	96	91.43
Visitors				
Environmental Factor	**Not Sure/No Opinion**		**Stated Opinion**	
	Number	*Percent*	*Number*	*Percent*
Water Quality	174	33.14	351	66.86
Fish Abundance	375	71.29	151	28.71
Bird Abundance	135	25.62	392	74.38
Other Marine Wildlife Abundance	149	28.22	379	71.78
Open Space Access	122	23.11	406	76.89

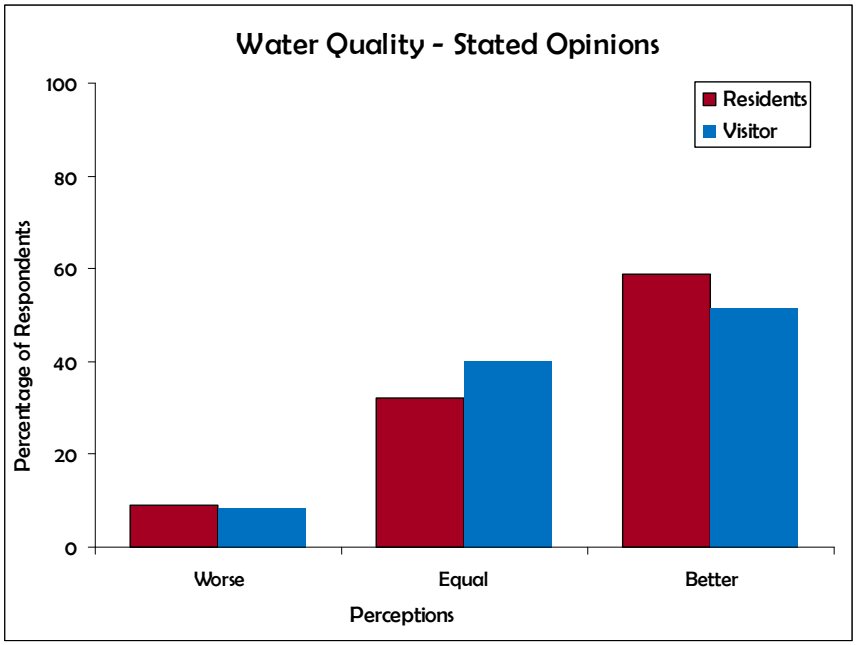

Figure 8: Environmental perceptions concerning water quality in Morro Bay compared to other similar areas from respondents with a stated opinion.

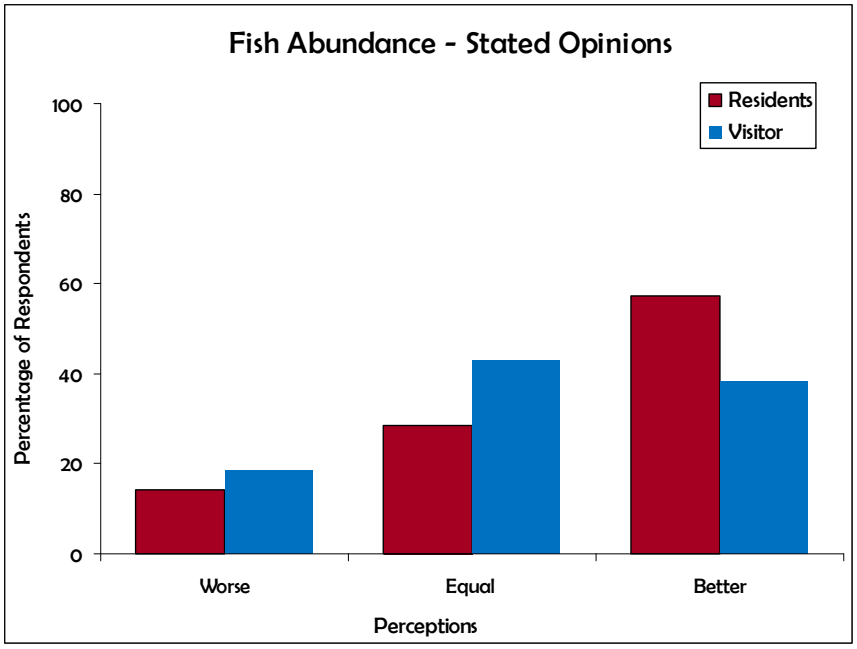

Figure 9: Environmental perceptions concerning fish abundance in Morro Bay compared to other similar areas from respondents with a stated opinion.

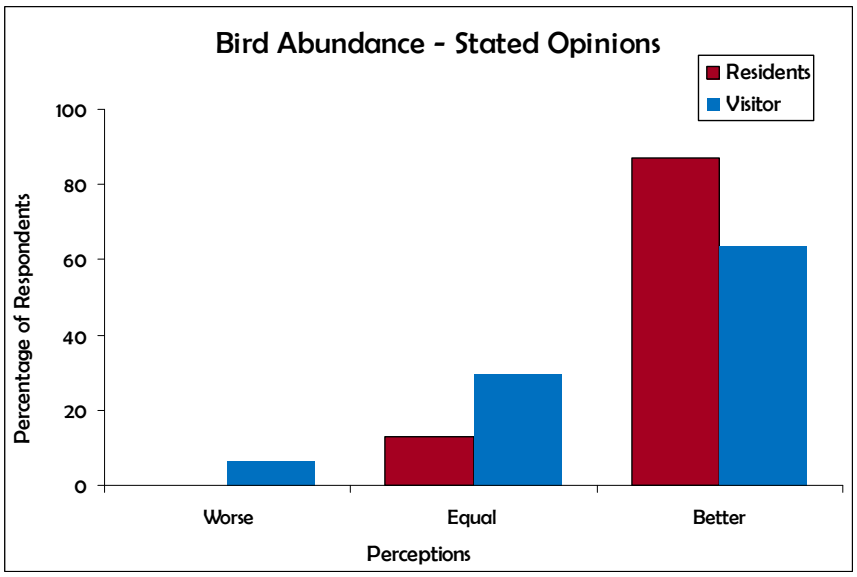

Figure 10: Environmental perceptions concerning bird abundance in Morro Bay compared to other similar areas from respondents with a stated opinion.

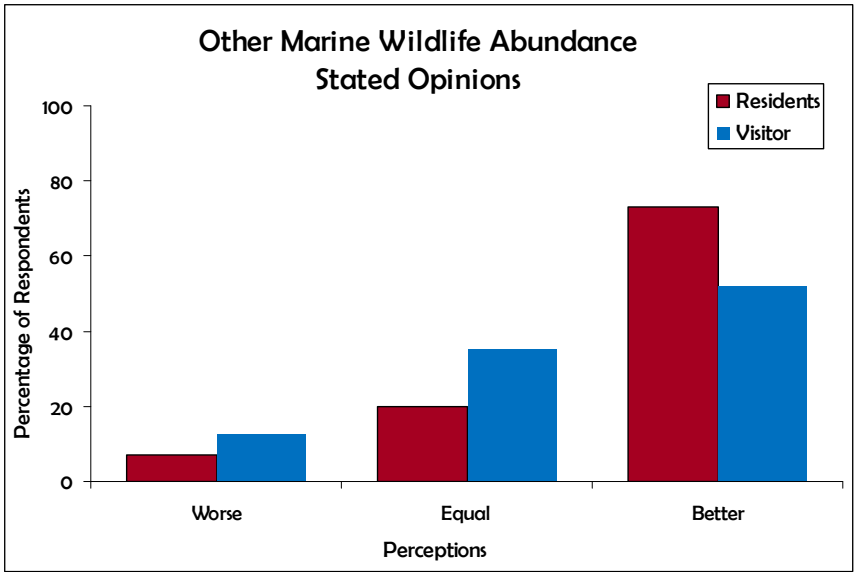

Figure 11: Environmental perceptions concerning marine wildlife in Morro Bay compared to other similar areas from respondents with a stated opinion.

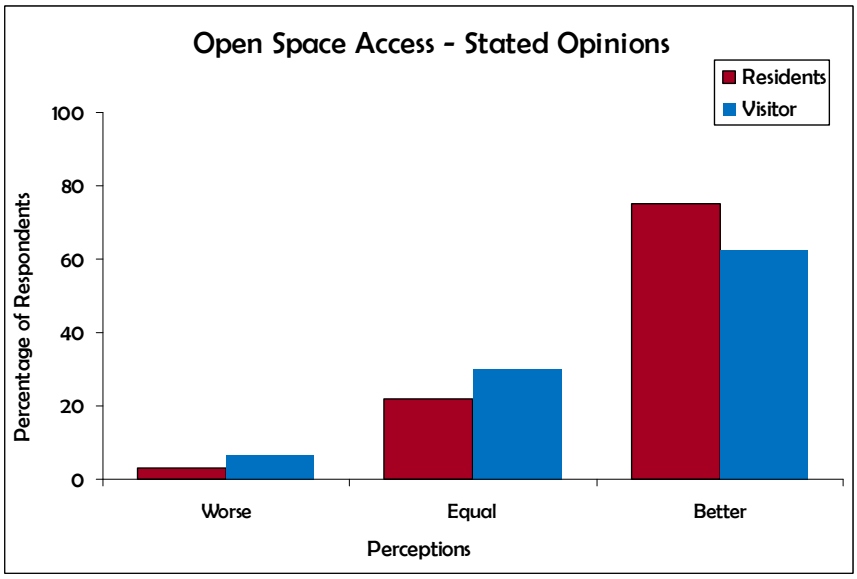

Figure 12: Environmental perceptions concerning open space access in Morro Bay compared to other similar areas from respondents with a stated opinion.

Figure 13 shows the results of question 11 of the survey, which asked respondents to express their opinion of change in environmental quality in Morro Bay over the past five years. If respondents were residents for at least five years, or repeat visitors, then they could choose from the following answers: "improved," "no change," "worsened," or "not sure."

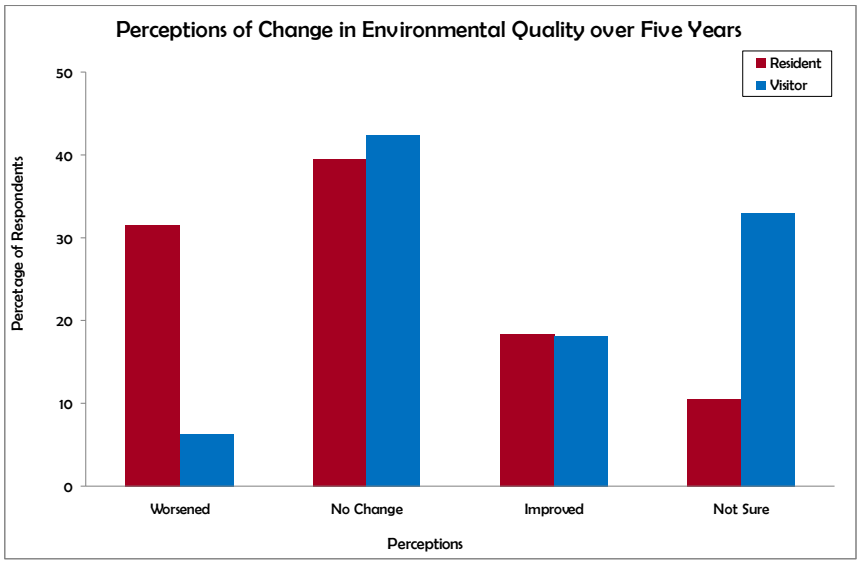

Figure 13: Perceptions of change in environmental quality in Morro Bay over the last five years from repeat visitors and residents for five years or more.

Question 9 asked respondents if any of the environmental factors listed (water quality, fish abundance, bird abundance, other marine wildlife abundance, or access to open space) played a role in their decision to visit Morro Bay or spend their leisure time in Morro Bay. Table 6 shows the number of respondents that answered "yes" (TRUE) or "no" (FALSE) to this question. The preferences of those individuals that chose "yes" are shown in Figures 14 and 15 below.

Table 6: Influence of environmental factors on decision to visit or spend leisure time.

Environmental Quality as a Factor in Decision to Visit					
	Resident		Visitor		Total
	Number	*Percent*	*Number*	*Percent*	
FALSE	39	36.45	332	59.39	371
TRUE	68	63.55	227	40.61	295

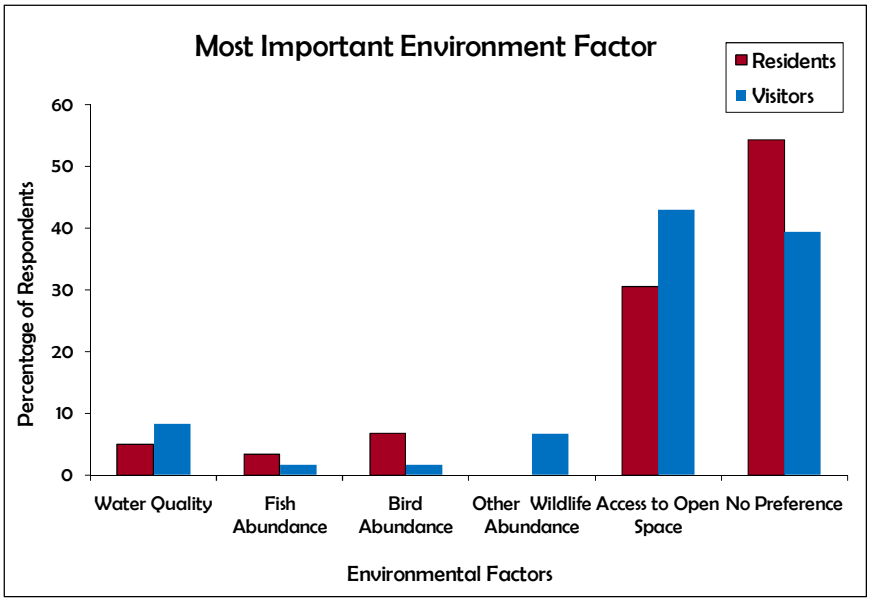

Figure 14: Most important environmental factor influencing the decision to visit Morro Bay (visitors) or the decision to spend leisure time in Morro Bay (residents).

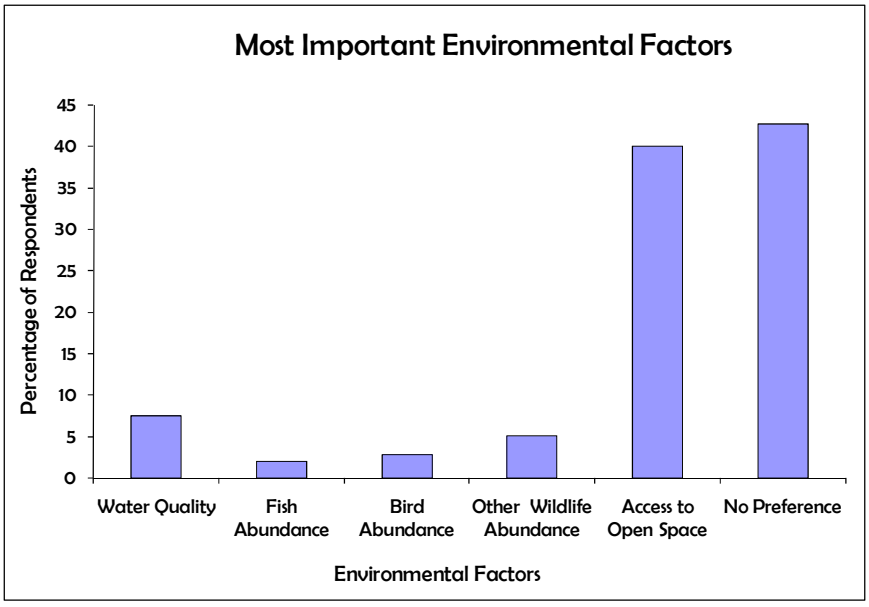

Figure 15: Summation of visitors and residents for the most important environmental factor influencing the decision to visit Morro Bay (visitors) or the decision to spend leisure time in Morro Bay (residents).

Figure 16 shows the perceptions of Morro Bay's working waterfront from respondents that stated an opinion. Of those that were able to answer this question (question 12 on the survey) because they were repeat visitors or residents for at least five years, 34% of visitors and 14% of residents did not state an opinion (chose "not sure" for an answer). Those who chose "worsened," "hasn't changed," or "improved" were categorized as having stated opinion and were included in the figure below.

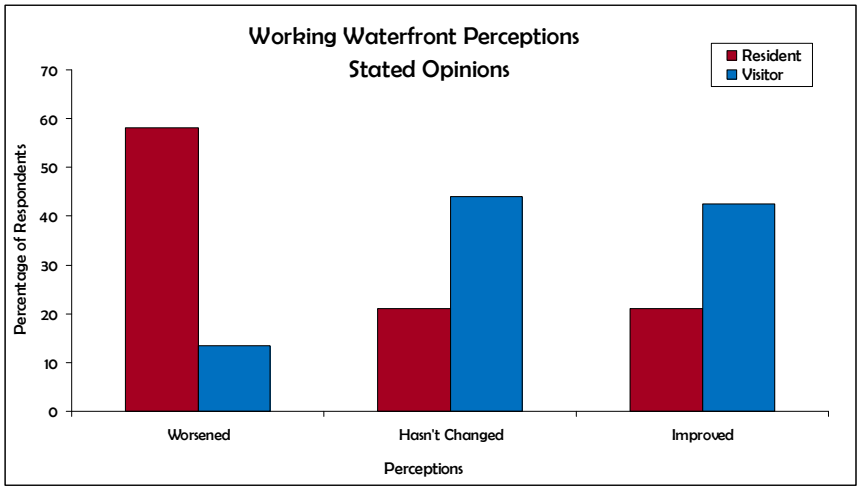

Figure 16: Perceptions of Morro Bay's working waterfront from repeat visitors and residents for five years or more with a stated opinion.

Appendix IV: Data Analysis Results

Analysis of Survey Bias

The following analysis explored potential biases related to the mode of the survey and the interviewer administering the survey. A Wilcoxon Mann-Whitney test was used to assess the null hypothesis that responses to perception questions are not significantly different across survey modes (H_o = Interview = Handout). The same hypothesis was then tested across interviewers (H_o = Interview #1 = Interviewer #2), only including surveys administered while both interviewers were at the same location. A t-test identified differences in responses to expenditures across survey modes and across interviewers. P-values less than 0.1 (alpha = 0.1) indicated the presence of bias in the results. The p-value denotes the probability that the deviation of the data is explained by chance rather than bias from the survey mode or interviewer, so small p-values indicates a very small chance that deviation is due to chance.

Table 1: Perceptions of Environmental Quality Over Five Years by Survey Location.

Location	Number of Surveys Administered	Perceptions of Change in Environmental Quality (% of Respondents)		
		Worsened	No Change	Improved
EM	64	5%	58%	38%
HA	51	10%	59%	31%
LO	28	36%	61%	4%
MO	76	21%	57%	22%
MR	43	2%	65%	33%
SP	54	13%	67%	20%
SS	50	20%	56%	24%
Total	366	14%	60%	26%

Table 2: Ratio of Surveys Administered by Interviewer #1 to Interviewer #2 by Location.

Interviewer	Survey Locations							Total
	EM	HA	LO	MO	MR	SP	SS	
1	33	30	6	48	25	39	18	199
2	41	31	15	68	24	30	27	236
Ratio of 1 to 2	0.80	0.97	0.40	0.71	1.04	1.30	0.67	0.84

Perceptions and Recreational Activities

A Wilcoxon Mann-Whitney test assessed the null hypothesis that respondents who participated in the activity had the same perceptions as respondents who had not. Respondents' perceptions of environmental quality in Morro Bay over the last five years were also compared by activity participation, using a Wilcoxon Mann-Whitney test to examine the relationship for each activity. In the tables below, Z represents the standard score, which indicates how many standard deviations an observation is above or below the mean. The number of surveys that had completed answers for question being tested is n, and P is the p-value.

Table 3a: Results of Wilcoxon-Mann-Whitney test to determine relationship between activity choice and environmental perceptions of Morro Bay compared to other similar areas.

PERCEPTIONS COMPARED TO OTHER SIMILAR COASTAL AREAS					
Activity	***z***	***p***	***Significant Effect (α = 0.10)***	***Difference in Perceptions for Water Quality***	***n***
Fishing	-0.21	0.833	NO	More Positive	441
Hiking/Walking	-0.18	0.861	NO	More Positive	441
Mountain Biking	-0.24	0.833	NO	More Positive	441
Kayaking	-1.32	0.813	NO	More Positive	441
Boating	-0.17	0.188	NO	More Positive	441
Dining	-1.53	0.864	NO	More Positive	441
Watching Boats	0.65	0.127	NO	More Negative	441
Shopping	2.64	0.518	NO	More Negative	441
Beach Going	1.12	0.008	YES	More Negative	441
Bird Watching	-1.23	0.220	NO	More Positive	441
Whale/ Marine Mammal Viewing	-0.40	0.687	NO	More Positive	441
Other Wildlife Viewing	0.03	0.974	NO	More Negative	441
Surfing	-0.44	0.657	NO	More Positive	251
Golfing	0.81	0.416	NO	More Negative	251
Camping	-1.12	0.261	NO	More Positive	362

Table 3b: Results of Wilcoxon Mann-Whitney test of comparative perceptions continued.

Activity	***z***	***p***	***Significant Effect (a = 0.10)***	***Difference in Perceptions for Fish Abundance***	***n***
Fishing	0.97	0.330	NO	More Negative	204
Hiking/Walking	0.69	0.488	NO	More Negative	204
Mountain Biking	-0.73	0.465	NO	More Positive	204
Kayaking	0.64	0.524	NO	More Negative	204
Boating	0.61	0.544	NO	More Negative	204
Dining	0.52	0.602	NO	More Negative	204
Watching Boats	-0.08	0.397	NO	More Positive	204
Shopping	0.85	0.397	NO	More Negative	204
Beach Going	0.32	0.397	NO	More Negative	204
Bird Watching	-2.60	0.009	YES	More Positive	204
Whale/Marine Mammal Viewing	-0.55	0.581	NO	More Positive	204
Other Wildlife Viewing	-0.47	0.635	NO	More Positive	204
Surfing	-0.42	0.672	NO	More Positive	139
Golfing	0.67	0.506	NO	More Negative	139
Camping	-0.70	0.485	NO	More Positive	161
Activity	***z***	***p***	***Significant Effect (a = 0.10)***	***Difference in Perceptions for Bird Abundance***	***n***
Fishing	1.44	0.149	NO	More Negative	496
Hiking/Walking	-0.63	0.526	NO	More Positive	496
Mountain Biking	0.40	0.692	NO	More Negative	496
Kayaking	-2.51	0.012	YES	More Positive	496
Boating	-2.89	0.004	YES	More Positive	496
Dining	-1.65	0.098	YES	More Positive	496
Watching Boats	-0.90	0.367	NO	More Positive	496
Shopping	-0.95	0.344	NO	More Positive	496
Beach Going	0.21	0.838	NO	More Negative	496
Bird Watching	-3.58	0.000	YES	More Positive	496
Whale/Marine Mammal Viewing	-1.47	0.143	NO	More Positive	496
Other Wildlife Viewing	-1.52	0.128	NO	More Positive	496
Surfing	-1.59	0.113	NO	More Positive	295
Golfing	-0.99	0.322	NO	More Positive	295
Camping	-0.22	0.827	NO	More Positive	402

Table 3c: Results of Wilcoxon Mann-Whitney test of comparative perceptions continued.

Activity	***z***	***p***	***Significant Effect (α = 0.10)***	***Difference in Perceptions for Other Marine Wildlife Abundance***	***n***
Fishing	-0.20	0.840	NO	More Positive	474
Hiking/Walking	-0.70	0.486	NO	More Positive	474
Mountain Biking	-0.67	0.502	NO	More Positive	474
Kayaking	-2.31	0.021	YES	More Positive	474
Boating	-2.21	0.027	YES	More Positive	474
Dining	0.34	0.732	NO	More Negative	474
Watching Boats	1.07	0.283	NO	More Negative	474
Shopping	-0.33	0.745	NO	More Positive	474
Beach Going	-0.84	0.404	NO	More Positive	474
Bird Watching	-0.55	0.582	NO	More Positive	474
Whale/Marine Mammal Viewing	-0.79	0.429	NO	More Positive	474
Other Wildlife Viewing	-0.47	0.638	NO	More Positive	474
Surfing	-3.02	0.003	YES	More Positive	281
Golfing	-1.42	0.157	NO	More Positive	281
Camping	-3.13	0.755	NO	More Positive	388

Activity	***z***	***p***	***Significant Effect (α = 0.10)***	***Difference in Perceptions for Access to Open Space***	***n***
Fishing	1.38	0.167	NO	More Negative	513
Hiking/Walking	-1.98	0.048	YES	More Positive	513
Mountain Biking	-0.23	0.817	NO	More Positive	513
Kayaking	-3.40	0.001	YES	More Positive	513
Boating	-1.41	0.159	NO	More Positive	513
Dining	-2.80	0.005	YES	More Positive	513
Watching Boats	1.03	0.300	NO	More Negative	513
Shopping	-1.10	0.271	NO	More Positive	513
Beach Going	-0.85	0.398	NO	More Positive	513
Bird Watching	-1.70	0.089	YES	More Positive	513
Whale/Marine Mammal Viewing	-1.91	0.056	YES	More Positive	513
Other Wildlife Viewing	-2.35	0.019	YES	More Positive	513
Surfing	-2.96	0.003	YES	More Positive	302
Golfing	-0.68	0.498	NO	More Positive	302
Camping	0.18	0.858	NO	More Negative	416

Table 4a: Results of Wilcoxon-Mann-Whitney test comparing activity choice and change in environmental perceptions over time

PERCEPTIONS OVER TIME (LAST 5 YEARS)					
Activity	***z***	***p***	***Significant Effect (a = 0.10)***	***Difference in Perceptions of Environmental Conditions***	***n***
Fishing	-1.78	0.076	YES	More Positive	366
Hiking/Walking	0.52	0.604	NO	More Negative	366
Mountain Biking	1.22	0.223	NO	More Negative	366
Kayaking	3.33	0.001	YES	More Negative	366
Boating	2.49	0.013	YES	More Negative	366
Dining	-1.74	0.083	YES	More Positive	366
Watching Boats	-1.44	0.149	NO	More Positive	366
Shopping	-2.40	0.016	YES	More Positive	366
Beach Going	-1.35	0.176	NO	More Positive	366
Bird Watching	0.18	0.858	NO	More Negative	366
Whale/Marine Mammal Viewing	1.26	0.207	NO	More Negative	366
Other Wildlife Viewing	0.43	0.670	NO	More Negative	366
Surfing	0.20	0.841	NO	More Negative	229
Golfing	1.53	0.126	NO	More Negative	229
Camping	-3.24	0.001	YES	More Positive	298
Activity	***z***	***p***	***Significant Effect (a = 0.10)***	***Difference in Perceptions of Working Waterfront***	***n***
Fishing	-0.06	0.955	NO	More Positive	323
Hiking/Walking	0.68	0.495	NO	More Negative	323
Mountain Biking	2.27	0.024	YES	More Negative	323
Kayaking	2.96	0.003	YES	More Negative	323
Boating	1.92	0.054	YES	More Negative	323
Dining	-0.12	0.905	NO	More Positive	323
Watching Boats	-1.73	0.084	YES	More Positive	323
Shopping	-2.40	0.016	YES	More Positive	323
Beach Going	0.26	0.795	NO	More Negative	323
Bird Watching	-0.51	0.610	NO	More Positive	323
Whale/Marine Mammal Viewing	-0.49	0.626	NO	More Positive	323
Other Wildlife Viewing	-0.13	0.901	NO	More Positive	323
Surfing	-0.81	0.420	NO	More Positive	196
Golfing	2.17	0.030	YES	More Negative	196
Camping	-0.38	0.706	NO	More Positive	261

Perceptions and Habitat Experience

The analysis of perceptions by habitat experience used a Wilcoxon Mann-Whitney test to determine the relationship between environmental perceptions (across similar coastal areas and over time) and habitats with which respondents interacted. Perceptions were ranked Worse = 0, Equal = 1, and Better = 2. The corresponding ranks of the two samples were then summed. In the table below, the z-score represents the number of standard deviations the actual sum is away from the expected sum. The number of surveys with completed answers for question tested is n, and P is the p-value.

Table 5a: Results of Wilcoxon Mann-Whitney test to determine the relationship between habitat experience and environmental perceptions.

PERCEPTIONS COMPARED TO OTHER SIMILAR COASTAL AREAS					
Location (Habitat)	***z***	***P***	***Significant Effect (α = 0.10)***	***Difference in Perceptions for Water Quality***	***n***
Morro Rock	0.741	0.4585	NO	More Negative	441
North Bay	-0.932	0.3515	NO	More Positive	441
Sand Spit	-2.119	0.0341	YES	More Positive	441
South Bay	-1.974	0.0483	YES	More Positive	441
Montaña de Oro	-1.032	0.302	NO	More Positive	441
Los Osos	-1.214	0.2246	NO	More Positive	441
Tidal Wetlands	-2.183	0.029	YES	More Positive	441
Morro Bay State Park	-1.975	0.0483	YES	More Positive	441
Embarcadero	-0.119	0.905	NO	More Positive	441
Morro Bay Harbor Waterfront	0.192	0.8479	NO	More Negative	441
Location (Habitat)	***z***	***P***	***Significant Effect (α = 0.10)***	***Difference in Perceptions for Fish Abundance***	***n***
Morro Rock	0.063	0.9496	NO	More Negative	204
North Bay	-0.565	0.5717	NO	More Positive	204
Sand Spit	-0.263	0.7923	NO	More Positive	204
South Bay	-0.912	0.3616	NO	More Positive	204
Montaña de Oro	0.582	0.5608	NO	More Negative	204
Los Osos	-0.557	0.5778	NO	More Positive	204
Tidal Wetlands	-0.217	0.828	NO	More Positive	204
Morro Bay State Park	1.072	0.2835	NO	More Negative	204
Embarcadero	1.566	0.1174	NO	More Negative	204
Morro Bay Harbor Waterfront	0.04	0.9682	NO	More Negative	204

Table 5b: Results of Wilcoxon Mann-Whitney test of perceptions over time.

Location (Habitat)	*z*	*P*	*Significant Effect (α = 0.10)*	*Difference in Perceptions for Bird Abundance*	*n*
Morro Rock	-1.985	0.0472	YES	More Positive	496
North Bay	-0.951	0.3414	NO	More Positive	496
Sand Spit	-1.815	0.0695	YES	More Positive	496
South Bay	-1.815	0.0696	YES	More Positive	496
Montaña de Oro	0.002	0.9982	NO	More Negative	496
Los Osos	-2.716	0.0066	YES	More Positive	496
Tidal Wetlands	-1.771	0.0766	YES	More Positive	496
Morro Bay State Park	-2.755	0.0059	YES	More Positive	496
Embarcadero	-0.553	0.5802	NO	More Positive	496
Morro Bay Harbor Waterfront	-1.051	0.2933	NO	More Positive	496
Location (Habitat)	*z*	*P*	*Significant Effect (α = 0.10)*	*Difference in Perceptions for Other Marine Wildlife Abundance*	*n*
Morro Rock	-0.012	0.9903	NO	More Positive	474
North Bay	-1.468	0.1421	NO	More Positive	474
Sand Spit	-0.011	0.9912	NO	More Positive	474
South Bay	-2.723	0.0065	YES	More Positive	474
Montaña de Oro	-1.162	0.2451	NO	More Positive	474
Los Osos	-1.513	0.1304	NO	More Positive	474
Tidal Wetlands	-0.786	0.432	NO	More Positive	474
Morro Bay State Park	-2.045	0.0408	YES	More Positive	474
Embarcadero	0.08	0.9364	NO	More Negative	474
Morro Bay Harbor Waterfront	2.17	0.03	YES	More Negative	474
Location (Habitat)	*z*	*P*	*Significant Effect (α = 0.10)*	*Difference in Perceptions for Access to Open Space*	*n*
Morro Rock	0.386	0.6993	NO	More Negative	513
North Bay	-0.475	0.6351	NO	More Positive	513
Sand Spit	-1.268	0.2048	NO	More Positive	513
South Bay	-1.73	0.0835	YES	More Positive	513
Montaña de Oro	-2.668	0.0076	YES	More Positive	513
Los Osos	-2.851	0.0044	YES	More Positive	513
Tidal Wetlands	-2.758	0.0058	YES	More Positive	513
Morro Bay State Park	-1.594	0.111	NO	More Positive	513
Embarcadero	0.121	0.9034	NO	More Negative	513
Morro Bay Harbor Waterfront	-0.187	0.8519	NO	More Positive	513

Table 6: Results of Wilcoxon Mann-Whitney test to determine the relationship between habitat experience and environmental perceptions over time.

PERCEPTIONS OVER TIME (LAST 5 YEARS)					
Location (Habitat)	***z***	***P***	***Significant Effect (α = 0.10)***	***Difference in Perceptions of Environmental Conditions***	***n***
Morro Rock	1.635	0.102	NO	More Negative	366
North Bay	0.103	0.9179	NO	More Negative	366
Sand Spit	1.839	0.066	YES	More Negative	366
South Bay	0.583	0.5597	NO	More Negative	366
Montaña de Oro	2.957	0.0031	YES	More Negative	366
Los Osos	0.87	0.3842	NO	More Negative	366
Tidal Wetlands	3.113	0.0019	YES	More Negative	366
Morro Bay State Park	1.466	0.1427	NO	More Negative	366
Embarcadero	-1.438	0.1504	NO	More Positive	366
Morro Bay Harbor Waterfront	-1.27	0.204	NO	More Positive	366

Visitor Expenditure Determinants – Regression Models

The effect of recreational activity choices on overall expenditures was analyzed using visitor expenditure data. To analyze total expenditure determinants, the team used a linear regression model with the following general form (please see Section 17.1 for a description of each variable):

$$\text{Total Expenditures} = \beta_0 + \beta_1 \text{Activities} + \beta_2 \text{EConscious} + \beta_3 \text{Controls} + \varepsilon$$

Expenditure determinants were evaluated with three regression models: a linear model (Linear I), a linear model using only observations with positive expenditures (Linear II), and a log-linear model to account for observed pattern in the variance of the residuals of the linear models. The second linear model allowed for comparative observations with the log-linear model, since log(0) is undefined.

The coefficients and p-values (P) for the models are reported in the tables below. In the table, the F value indicates the statistical significance of the regression as a whole, with a value greater than 4 generally indicating significance. The adjusted R^2 indicates how well the model explains variation present in the data, with a value of 1 indicating perfect correlation between the model and the data. The t values represent the standard score, which

indicates how many standard deviations an observation is above or below the sample mean.

Table 7a: Results of Linear Regression Model – Linear I Model characteristics.

Source	Sums of Squares	Degrees of freedom	Mean Squares	Number of observations	365
Model	95416804.6	30	3180560	**F(30, 334)**	12.82
Residual	82891517.9	334	248178.2	**Prob > F**	< 0.001
Total	178308323	364	489858	**R-squared**	0.5351
				Adj R-squared	0.4934
				Root MSE	498.17

See the following page for the results of the Linear I Model (Table 7b).

Table 7b: Results of Linear Regression Model – Linear I.

		Coef.	Std. Dev.	t	P
	EConscious	129.52	57.22	2.26	0.024
Activities	Fishing	401.89	93.99	4.28	0.000
	Mountain Biking	-305.41	128.00	-2.39	0.018
	Kayaking	165.53	82.67	2.00	0.046
	Boating	-216.98	137.65	-1.58	0.116
	Watching Fishing Boats	76.92	67.26	1.14	0.254
	Beach Going	190.46	68.27	2.79	0.006
	Camping	-406.02	74.14	-5.48	0.000
	Bird Watching	-92.53	73.26	-1.26	0.208
	Whale and Other Marine Mammal Viewing	81.86	70.81	1.16	0.248
	Other Wildlife Viewing	38.93	67.04	0.58	0.562
Income	$15,000-$30,000	10.01	143.16	0.07	0.0985
	$30,000-$50,000	5.59	115.24	0.05	
	$50,000-$75,000	-87.27	78.86	-1.11	
	$75,000-$100,000	-147.42	78.12	-1.89	
	$100,000-$150,000	22.49	97.32	0.23	
	$150,000-$300,000	96.64	311.37	0.31	
	More than $300,000	32.84	321.25	0.10	
Location	Morro Bay Harbor Waterfront	-311.41	102.46	-3.04	0.0817
	Los Osos	62.46	279.68	0.22	
	Montaña de Oro	-92.75	91.22	-1.02	
	Morro Rock	-198.16	89.91	-2.20	
	State Park	-119.11	95.84	-1.24	
	Sand Spit	-120.96	103.78	-1.17	
	Handout Survey	-39.27	59.88	-0.66	0.512
Time Block	Block 2	28.69	68.89	0.42	0.5620
	Block 3	-54.18	82.94	-0.65	
	Weekend	32.55	67.01	0.49	0.627
	# of People included in expenditures	98.53	10.33	9.54	0.000
	Length of Trip (days)	65.81	6.85	9.61	0.000
	Intercept	-132.93	152.33	-0.87	0.383

Table 8a: Linear Regression Model – Linear II Model Characteristics.

Source	SS	df	MS	Number of observations	351
Model	94025261.7	30	3134175	**F(30, 320)**	12.33
Residual	81360722.6	320	254252.3	**Prob > F**	0
Total	175385984	350	501102.8	**R-squared**	0.5361
				Adj R-squared	0.4926
				Root MSE	504.23

See the following page for the results of the Linear II Model (Table 8b).

Table 8b: Linear Regression Model – Linear II.

		Coef.	Std. Dev.	t	P
	EConscious	128.41	58.91	2.18	0.030
Activities	Fishing	404.28	96.34	4.20	0.000
	Mountain Biking	-311.64	130.16	-2.39	0.017
	Kayaking	158.24	83.87	1.89	0.060
	Boating	-217.39	139.64	-1.56	0.121
	Watching Fishing Boats	78.79	69.21	1.14	0.256
	Beach Going	199.32	71.13	2.80	0.005
	Camping	-401.51	77.40	-5.19	0.000
	Bird Watching	-108.83	75.57	-1.44	0.151
	Whale and Other Marine Mammal Viewing	70.03	72.17	0.97	0.333
	Other Wildlife Viewing	48.69	69.63	0.70	0.485
Income	$15,000-$30,000	-23.34	149.43	-0.16	0.0992
	$30,000-$50,000	27.22	123.38	0.22	
	$50,000-$75,000	-74.66	81.81	-0.91	
	$75,000-$100,000	-173.15	80.31	-2.16	
	$100,000-$150,000	44.53	99.38	0.45	
	$150,000-$300,000	77.64	315.94	0.25	
	More than $300,000	45.04	325.60	0.14	
Location	Morro Bay Harbor Waterfront	-305.71	106.16	-2.88	0.1064
	Los Osos	47.41	284.86	0.17	
	Montaña de Oro	-90.68	93.60	-0.97	
	Morro Rock	-202.17	93.03	-2.17	
	State Park	-130.55	98.49	-1.33	
	Sand Spit	-145.24	108.31	-1.34	
	Handout Survey	-47.39	62.21	-0.76	0.447
Time Block	Block 2	15.30	71.64	0.21	0.6932
	Block 3	-52.63	85.84	-0.61	
	Weekend	36.64	70.58	0.52	0.604
	# of People that expenditures were for	100.52	10.61	9.48	0.000
	Length of Trip (days)	65.53	6.94	9.44	0.000
	Intercept	-119.55	155.65	-0.77	0.443

Table 9a: Linear Regression with Log Transformed Dependent – Model Characteristics.

Source	SS	df	MS	Number of observations	351
Model	292.015763	30	9.733859	F(30, 320)	9.61
Residual	324.112784	320	1.012852	Prob > F	0
Total	616.128547	350	1.760367	R-squared	0.474
				Adj R-squared	0.4246
				Root MSE	1.0064

See the following page for the results of the Log-Linear Model (Table 9b).

Table 9b: Linear Regression with Log Transformed Dependent.

		Coeff.	Std. Dev.	t	P
	EConscious	0.17	0.12	1.45	0.149
Activities	Fishing	0.46	0.19	2.41	0.016
	Mountain Biking	-0.28	0.26	-1.07	0.285
	Kayaking	0.12	0.17	0.74	0.461
	Boating	-0.18	0.28	-0.65	0.514
	Watching Fishing Boats	0.34	0.14	2.45	0.015
	Beach Going	0.61	0.14	4.30	0.000
	Camping	-0.36	0.15	-2.35	0.020
	Bird Watching	-0.04	0.15	-0.30	0.767
	Whale and Other Marine Mammal Viewing	0.05	0.14	0.38	0.703
	Other Wildlife Viewing	0.16	0.14	1.18	0.238
Income	$15,000-$30,000	0.01	0.30	0.03	0.000
	$30,000-$50,000	-0.15	0.25	-0.62	
	$50,000-$75,000	-0.34	0.16	-2.07	
	$75,000-$100,000	-0.42	0.16	-2.61	
	$100,000-$150,000	0.19	0.20	0.98	
	$150,000-$300,000	-0.05	0.63	-0.08	
	More than $300,000	1.31	0.65	2.01	
Location	Morro Bay Harbor Waterfront	-0.35	0.21	-1.67	0.0148
	Los Osos	0.06	0.57	0.11	
	Montaña de Oro	-0.43	0.19	-2.29	
	Morro Rock	-0.61	0.19	-3.27	
	State Park	-0.61	0.20	-3.08	
	Sand Spit	-0.48	0.22	-2.24	
	Handout Survey	0.20	0.12	1.61	0.108
Time Block	Block 2	-0.30	0.14	-2.08	0.1043
	Block 3	-0.10	0.17	-0.60	
	Weekend	-0.17	0.14	-1.22	0.222
	# of People that expenditures were for	0.14	0.02	6.61	0.000
	Length of Trip (days)	0.10	0.01	7.33	0.000
	Intercept	3.42	0.31	11.01	0.000