TP-120

# Rookery Bay Estuarine Research Reserve

## VISITOR STUDY

Kristina E. Stephan
Taylor V. Stein
Kristianna J. Lindgren

Sea Grant
Florida

University of Florida
School of Forest Resources and Conservation



This publication was supported by the National Sea Grant College Program of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) under NOAA Grant No. 76 RG-0120. The views expressed are those of the authors and do not necessarily reflect the views of these organizations. Additional copies are available by contacting Florida Sea Grant, University of Florida, PO Box 110409, Gainesville, FL, 32611-0409, (352) 392-2801.

# Rookery Bay
# National Estuarine Research Reserve
# Visitor Study

Kristina E. Stephan
Graduate Research Assistant

Taylor V. Stein
Assistant Professor

Kristianna J. Lindgren
Research Technician

University of Florida
School of Forest Resources and Conservation

TP 120
November, 2002

## TABLE OF CONTENTS

## LIST OF FIGURES

## LIST OF TABLES

## ACKNOWLEDGMENTS

The authors would like to thank all Rookery Bay National Estuarine Research Reserve staff who assisted with this project. In particular, Mike Shirley, Steve Theberge, Leslie Breland, Ed Tiska, and Nancy Olson provided a valuable orientation to the Rookery Bay estuary and support throughout the study. Also, this project would not have been conducted were it not for the early expertise and motivation of Ginger Hinchcliff and Tom Fish, NOAA Coastal Services Center.

A variety of University of Florida researchers assisted in the study. Christine Denny helped lead the nominal group meeting early in the research. Also, Kari Malen, Melinda Fortner, Ralph Ariza, Jennifer DiMartino, and Julie Clark helped collect data and produce the final report. Amy Jewett and Noah Standridge deserve special recognition for the numerous hours they conducted interviews and entered data. Lisa Pennisi also provided valuable advice and needed statistical expertise for this study.

Funding for this research was provided under a grant from the Florida Sea Grant College Program, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. We thank Drs. Marion Clark, James Cato, and William Seaman for their advice, support, and patience. Also Friends of Rookery Bay (FORB) provided important matching funds to conduct this research.

Finally, this study would not exist if it were not for the people who took the time to take part in the interview and fill out the questionnaire. We dedicate this report to our study participants.

## EXECUTIVE SUMMARY

Rookery Bay National Estuarine Research Reserve (RBNERR), located in a heavily populated urban area in Southwest Florida, is a popular site for many types of recreational activities. The seemingly unlimited opportunities and lack of visitor management can both hinder a recreationist's experience and increase environmental impacts. The object of this report was to identify visitor perceptions of impacts and preferred management strategies, and create a helpful guide for managing for recreation.

Visitors to Rookery Bay were interviewed at many popular access points to target as many types of users as possible. From September 2000 to March 2002, a total of 312 visitors were interviewed. Researchers contacted the first 157 study participants at public boat ramps, throughout Naples and Marco Island, which provided access to RBNERR. Researchers conducted the entire interview onsite for these respondents. To ensure researchers interviewed tourists to the RBNERR area, researchers targeted boat rental companies and surveyed 155 RBNERR visitors. To save time onsite, these interviews were divided into a short onsite interview and a longer mail-back questionnaire (46.5% response rate).

### Key Findings

**Socio-demographic Characteristics**

- Survey participants were mostly white males, between the ages of 26 to 55.
- Most were married with children, and many were well educated.
- The household income of respondents was well distributed; many, however, averaged above $96,000 per year.
- Over half were local to the Naples/Marco Island area, and more than three-quarters were repeat visitors.

**Trip Characteristics**

- Visitors spent the most time in and around zones 4, 6, and 7 (Keewaydin/Marco Island area).
- The most common primary activities included fishing, boating, and wildlife viewing or sightseeing.
- Visitors were motivated to come to Rookery Bay to reduce tension, enjoy nature, for achievement or stimulation, and to spend time with their family.

**Managing for Recreation**

Most Common Barriers to a Successful Recreational Experience

- Environmental
  - Littering/trash
  - Overfishing/taking more than the legal limit of fish
  - Damage to sea grass beds
  - Red tide

- Social
    - Traffic
    - Crowding
    - Inconsiderate/Uneducated boaters

Most Supported Management Approaches

- Provide users with informational sources
    - Website
    - Maps
    - Brochures
    - Signs
- Work with local residents when designing management activities for the estuary
    - Estuary clean up days
    - Citizens Advisory Committee
    - Focus groups
- Create partnerships between local groups/constituents
    - Environmental organizations
    - Marinas, boat rental agencies
- Monitoring and Enforcement
    - Improve monitoring of recreational impacts
    - Occasionally close areas to manage for ecological health
    - Create a more visible management presence
    - Maintain more enforcement of existing regulations

Additional research is needed to assess the acceptability of the proposed management strategies and to evaluate the success of suggested communication campaigns. As the population in Collier County grows, steps will need to be taken to minimize the social and ecological impacts associated with high recreational use. Consequently, conflicts between residents and non-residents will be an issue of future concern. Getting input from community stakeholders and organizing those citizens concerned with the conservation of local natural resources will continue to be a vital component of any future initiative.

Ultimately all ecological impacts can affect the recreational experience of visitors to Rookery Bay. Solving problems that harm the delicate balance of the southwest Florida ecosystem will take a comprehensive, countywide effort, an effort that includes citizen involvement, communication strategies, and continued monitoring of ecological impacts.

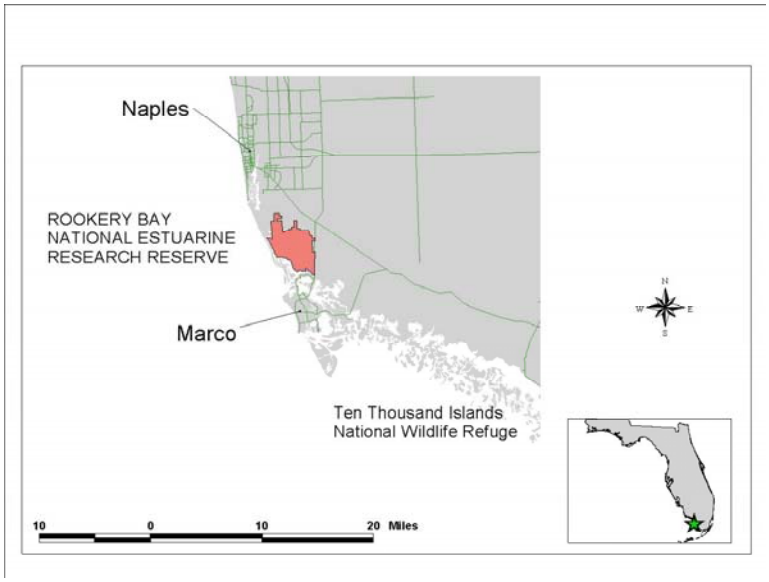
# 1. INTRODUCTION

Rookery Bay National Estuarine Research Reserve (RBNERR) includes over 12,500 acres of diverse habitat, ranging from estuarine seagrass beds and mangroves to coastal marshes and upland stands of pine, cabbage palm (*Sabal palmetto*), and hardwoods (Rookery Bay Research Reserve, 2001). Located five miles south of Naples in southwest Florida (Figure 1), Rookery Bay is the northernmost part of the Ten Thousand Islands, the largest mangrove forested area in the United States. Many protected species have been found at the Reserve including the West Indian manatee (*Trichechus manatus*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), indigo snake (*Drymarchon corais couperi*), wood stork (*Mycteria americana*), and American crocodile (*Crocodylus acutus*), all of which are endangered.

Rookery Bay Reserve is protected and managed by the Florida Department of Environmental Protection, in cooperation with the National Oceanic and Atmospheric Administration (NOAA), specifically for education and research. The National Estuarine Research Reserves (NERR) System, including a network of 25 protected areas that represent different biogeographic regions of the U.S., was established by the Coastal Zone Management Act of 1972. The NERR system helps to fulfill NOAA's stewardship mission to sustain healthy coasts by improving the nation's understanding and stewardship of estuaries.

Estuaries are places where fresh water from rivers mixes with saltwater. These coastal areas are important spawning grounds and nurseries for two-thirds or more of the nation's commercial fish and shellfish, and many, because of their protected status, provide recreational opportunities, such as swimming, boating, and bird watching.

Figure 1. Map of the Rookery Bay Research Area



The unlimited access to the many, varied opportunities enjoyed by visitors to RBNERR has made recreation management of the sensitive coastal areas a high priority for Rookery Bay managers. However, RBNERR managers require specific information about users' characteristics, recreation activities, resource impacts, and appropriate visitor and site management strategies before they can adequately manage for recreation. In order to protect and preserve the sensitive coastal resources managed by Rookery Bay, and to continue to provide recreational benefits to visitors, "humans must be intricately connected in the planning and managing of these ecosystems" (Stein, Anderson, and Kelly, 1999, p. 411). A better understanding of public attitudes can help managers more effectively manage recreational activities and the natural resources that support them (Bright, 1997). This involves understanding diverse opinions about an issue and predicting public support of management policies. Studies have been done to assess the perceptions and attitudes about recreation, environmental problems, and estuarine health in New Jersey (Burger, 1998). Rookery Bay, which has had much ecological research, (Mumme, 1999; Twilley and Chen, 1998), knows little about its visitors.

This report presents the results of a survey given to visitors of RBNERR from Summer 2000 to Spring 2002. It was designed with three objectives: 1) identify and describe the types of visitors to RBNERR based on socio-demographic information, activity preference, and motivations, 2) determine visitors' conflicts and perceived impacts to the resource and recreation experience, and 3) determine acceptable strategies to manage for impacts. This report will provide managers with a useful tool when designing management activities including the research results and suggestions for management options based on the findings.

The study presented here involves an onsite, recreational-use survey that was developed using the Recreation Opportunity Spectrum (ROS), Limits of Acceptable Change (LAC), and Visitor Experience and Resource Protection (VERP) frameworks as guides. These frameworks are successful due to the extensive integration of social and ecological sciences that were part of their development (Driver, Brown, Stankey, and Gregoire, 1987; Stankey, Cole, Lucas, Peterson, and Frissell, 1985).

The next section of this report describes the survey methodology. Survey results are presented in Section 3, with a discussion of these results included in Section 4. A discussion of how visitor management and planning of RBNERR might be affected by this study's findings will also be presented in Section 4, along with suggestions for appropriate management strategies.

## 2. METHODOLOGY

### 2.1 Staff Nominal Group Meeting

In March 2000, University of Florida researchers met with staff at RBNERR to identify what managers consider to be the:

- activities visitors are participating in;
- experiences and benefits visitors hope to attain from their visit to Rookery Bay;
- potential environmental and social impacts resulting from recreation; and
- management activities to mitigate these impacts.

In order to determine answers to these questions a nominal-group workshop was used. Nominal-group workshops are one form of group dynamics in which a representative group of people who are concerned with a project or issue identify virtually all of the problems associated with a project or issue, and make the individual compromises that are necessary for determining a single list of priorities or preferences (Institute for Participatory Planning, 1978). In this case, the staff at RBNERR was brought together and briefed on the Rookery Bay visitor study project. Each person in the group was asked to offer their opinions on each of the above issues. After a preliminary list was created a vote was taken. The top rated issues were used to compile a comprehensive list for each question during the nominal group meeting (Appendix 1).

### 2.2 Interview Locations

In coordination with RBNERR personnel, researchers identified 15 interview sites (Table 1); beginning in Naples to the north, and extending as far south as Marco Island, and east to Port of the Islands, touching the westernmost boundary of Everglades National Park. The interview locations are adjacent to water-based recreation areas, and include piers, boat ramps, and a barrier island used by visitors to RBNERR and surrounding coastal areas managed by Rookery Bay. The most frequently interviewed spots are highlighted in Figure 2. Most people interviewed were using boats as their mode of transport.

Researchers at the University of Florida also designed a zoning system, whereby RBNERR and surrounding coastal areas were divided into 10 zones (Figure 3), encompassing all of the interview locations. This zoned map was used during the interview to determine spatial recreation-use information and served as a visual cue to participants.

Researchers conducted the most interviews at two privately owned Marco Island marinas, which are popular with tourists for boat rentals: Marco River Marina, and Cedar Bay Marina. Keewaydin Island, a barrier island located at the heart of Rookery Bay was also a highly used interview site. The 12 remaining interview locations were chosen because of their proximity to coastal areas managed by RBNERR. They are all public access boat ramps/piers or private marinas.

Table 1. Interview Locations

| Interview Locations | Percent (%)[1] |
|---|---|
| Marco River Marina | 26.6 |
| Cedar Bay Marina | 21.8 |
| Keewaydin | 10.4 |
| Caxambas/Marco Pier | 8.8 |
| Bayview | 7.1 |
| 951 Boat Ramp | 7.1 |
| Rookery Bay Lab | 3.6 |
| City Docks | 3.2 |
| Naples Pier/Boat Ramp | 2.3 |
| Goodland | 2.3 |
| Port of the Islands | 1.9 |
| Isles of Capri | 1.6 |
| Cannon Island | 1.6 |
| Calusa Point | 1.0 |
| Collier State Park | 0.6 |

[1]n =308

Figure 2. Locations Where Most Interviews Were Conducted

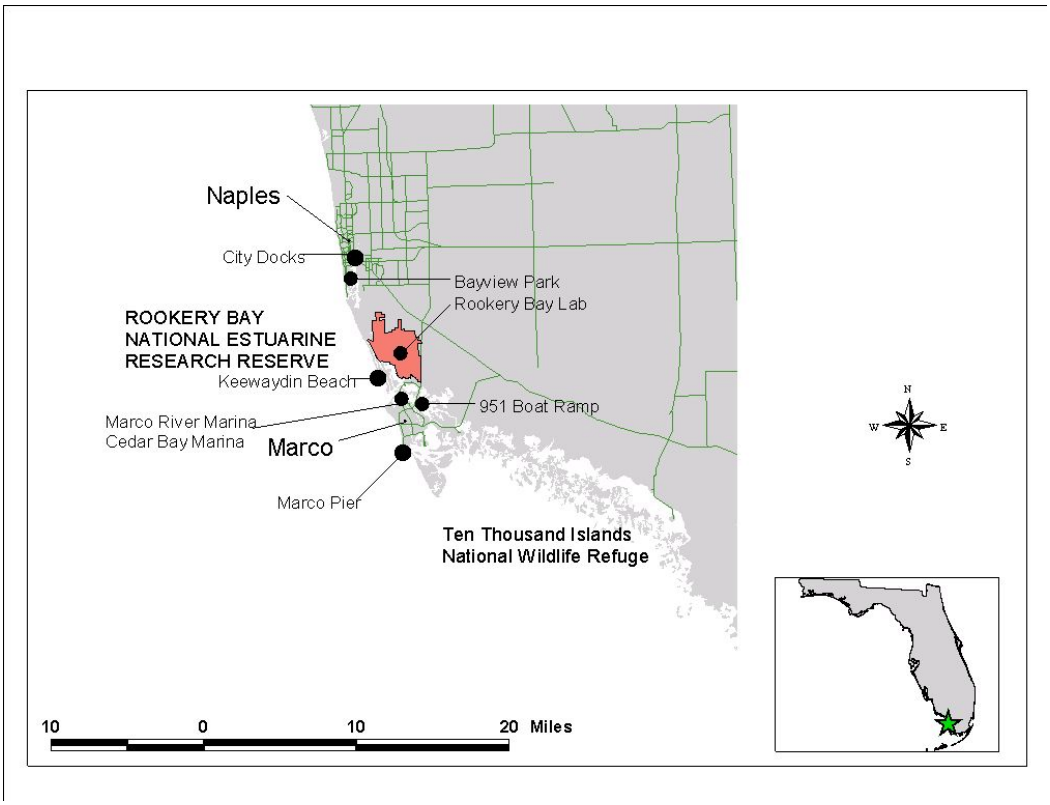
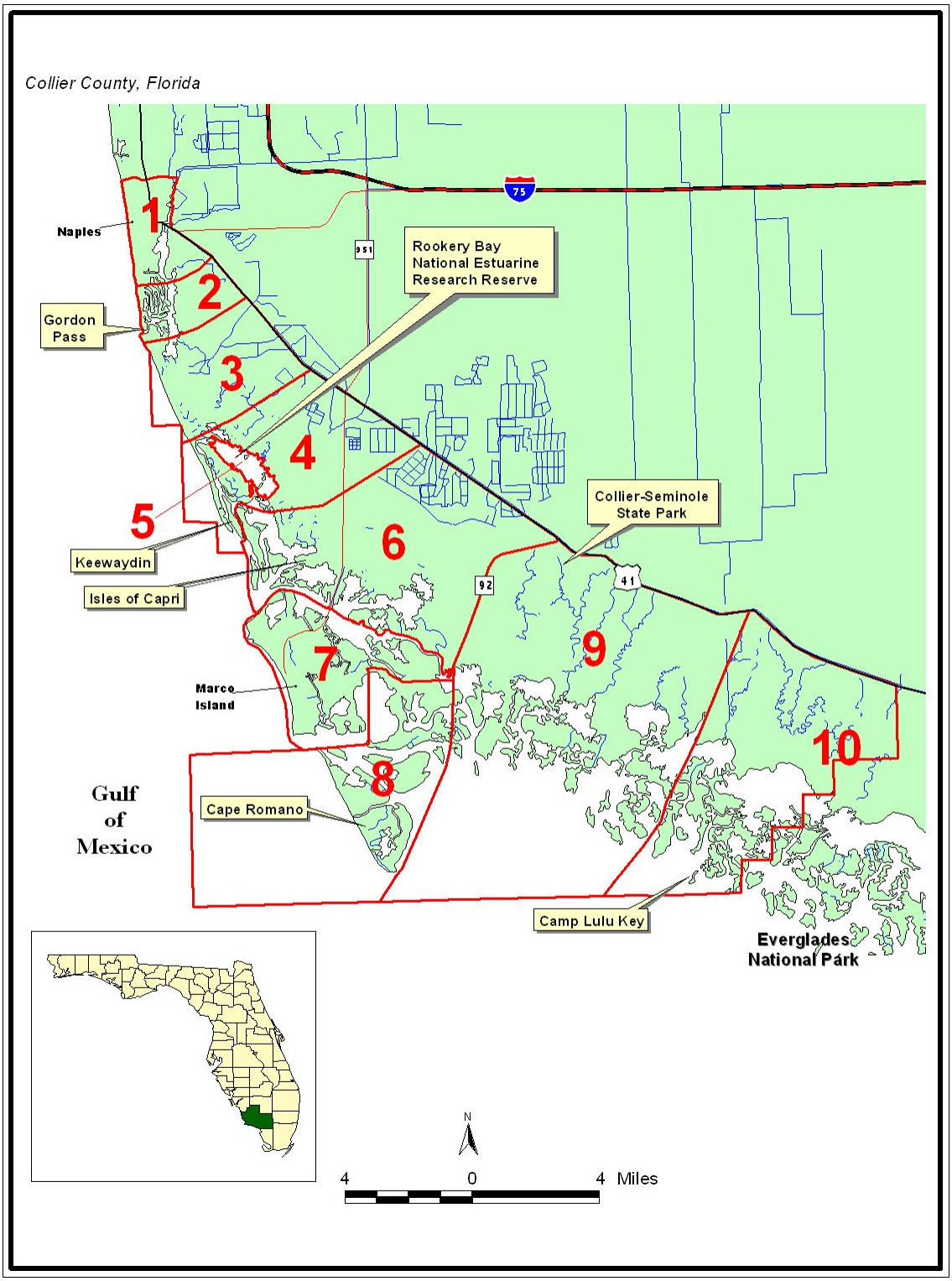


Figure 3. Map of Rookery Bay National Estuarine Research Reserve Recreation Zones



## 2.3 Questionnaire Development

Using the information compiled during the nominal group meeting in March 2000, a survey instrument was developed. In July 2000, the 25-question survey was submitted to managers of Rookery Bay and researchers from the University of Florida for review. Another meeting was held in July with staff at RBNERR to discuss changes and/or additions to the questionnaire. In September 2000, the survey was field tested and finalized (Appendix 2). A formalized version of the questionnaire was administered by University of Florida researchers to a selective sample of 312 respondents, from September 2000 to March 2002. Table 2 describes the timeline of the research conducted at RBNERR.

Table 2. Timeline of Research

| Date | Research |
|---|---|
| March 2000 | Nominal Group meeting with Rookery Bay staff |
| June – July 2000 | Development of questionnaire, involvement of RBNERR staff in survey finalization, and initial field test |
| September 2000 | Start of onsite field surveys |
| October 2001 | Completion of onsite field surveys |
| January 2002 | Start of combination onsite and mail back survey method |
| March 2002 | Completion of survey |

The population sampled were all visitors to Rookery Bay and surrounding estuarine and coastal areas. The sample framework was one of convenience; such a framework was required because of the need to gain a significant number of surveys in a reasonable amount of time. Researchers weighted sites based on visitation patterns. Since most recreation was concentrated on the weekends, this was an opportune period to acquire the most amount of information in a short amount of time.

Interviewers approached recreationists while beaching at Keewaydin Island or disembarking after a boating trip through Rookery Bay Estuary and vicinity. The majority of people asked to participate agreed to take part in the survey. The research team spoke mostly English; therefore, visitors who were not fluent in English (e.g., Latinos, European tourists) are not highly represented in the study.

The first 157 surveys were completed onsite, with interviewers spending approximately 10 to 30 minutes with respondents. To ensure tourists were represented in the study, during the next phase of questionnaires researchers targeted boat rental companies, conducting the survey using a combination onsite interview and mail-back questionnaire. Of the 155 additional surveys conducted using the mail-back questionnaire, 72 were returned (response rate of 46.5%). The survey instrument gathered the following information:

- visitor characteristics/socio-demographic information
- preferred activities and zones (according to the zoned map, see Figure 3)
- problems experienced and related zones
- motivations/desired experiences of visitors

- ranking of perceived impacts
- ranking of support for management activities
- exposure and effectiveness of wildlife educational information

Open-ended questions such as: "What are the desired experiences you hope to attain from participating in recreational activities at Rookery Bay?" were asked. Other, more quantitative questions were asked that required the interviewee to rate their preference of management activities on a Likert scale from one to five. In addition to socio-demographic information, specific questions, which included the zoned map, were asked to determine preferred recreation areas (as well as areas with perceived conflicts).

## 3. RESULTS

The survey results are presented in the following six sections: socio-demographic profile; trip characteristics; activity preference and motivations; respondents' perception of impacts as problems; respondents' support for management activities; respondents' exposure to and perceived effectiveness of wildlife educational information.

### 3.1 Socio-demographic Profile

The majority of survey participants were male (73.0%) (Table 3). Table 4 shows the ages of respondents to be fairly evenly distributed with 18.6% between the ages of 26-35, 20.4% between the ages of 46-55, and 18.1% in the grouping of ages 36-45. Fewer respondents were under 26 years of age (10.0%) or over the age of 65 (13.6%) with the majority (57.1%) representing the 26-55 age range.

Table 3. Respondents' Gender

| Gender | Percent (%)[1] |
|---|---|
| Male | 73.0 |
| Female | 27.0 |

[1]n =222

Table 4. Respondents' Age Groups

| Age range | Percent (%)[1] |
|---|---|
| 25 and under | 10.0 |
| 26-35 | 18.6 |
| 36-45 | 18.1 |
| 46-55 | 20.4 |
| 56-65 | 19.5 |
| 66-75 | 10.0 |
| Over 75 | 3.6 |

[1]n =221

Most respondents were married (70.1%) and over half (59.8%) were married with children (Table 5). Almost half (41.6%) of respondents were married with children over 18 years of age, and 21.0% were single with no children. Most survey participants were white (94.6%) (Table 6). This study likely missed a percentage of non-English speaking visitors to Rookery Bay, since the interviews were conducted in English. The results should be interpreted with the bias of an English-speaking sample.

Table 5. Respondents' Life Situation

| Situation | Percent (%)[1] |
|---|---|
| Single, no children | 21.0 |
| Married, no children | 10.3 |
| Married with children under 18 | 18.2 |
| Married with children 18 or over | 41.6 |
| Single parent with children under 18 | 4.2 |
| Single parent with children 18 or over | 4.7 |

[1]n =214

Table 6. Respondents' Ethnicity

| Ethnicity | Percent (%)[1] |
|---|---|
| White | 94.6 |
| Hispanic/Latino | 1.4 |
| Native American | 2.3 |
| Black/African American | 0.9 |
| Other | 0.9 |

[1]n =221

A large majority of the respondents' had attended college (82.7%), with 52.3% holding a degree (Table 7). The income level of the survey participants was fairly well distributed as shown in Table 8. However, more than one-quarter (27.5%) of respondents had an income above $96,000.

Table 7. Respondents' Education Level

| Education level | Percent (%)[1] |
|---|---|
| Eighth grade or less | 1.4 |
| Some high school | 1.9 |
| High school graduate or GED | 14.0 |
| Some college | 30.4 |
| College graduate | 28.5 |
| Some graduate school | 6.5 |
| Graduate degree or above | 17.3 |

[1]n =214

Table 8. Respondents' Income Level

| Income range | Percent (%)[1] |
|---|---|
| Below $15,000 | 6.2 |
| $16,000-$25,000 | 5.1 |
| $26,000-$35,000 | 6.7 |
| $36,000-$45,000 | 8.4 |
| $46,000-$55,000 | 13.5 |
| $56,000-$65,000 | 9.6 |
| $66,000k-$75,000 | 10.1 |
| $76,000-$85,000 | 6.2 |
| $86,000-$95,000 | 6.7 |
| Above $96,000 | 27.5 |

[1]n =178

Over half of survey respondents were local Naples/Marco Island residents (59.3%), with two-thirds of these local residents residing in Naples and one-third from Marco Island (Table 9). However, many of the participants were new to the area, with 48.8% indicating they had lived at their current residence for 5 years or less (Table 10).

Table 9. Respondents' Residence

| Residence | Percent (%)[1] |
|---|---|
| Marco Island local | 20.3 |
| Naples local | 39.0 |
| Non-local Florida resident | 7.9 |
| U.S. state (not Florida) | 30.3 |
| Outside the U.S. | 2.4 |

[1]n = 290

Table 10. Respondents' Number of Years at Current Residence

| Number of Years | Percent (%)[1] |
|---|---|
| 1-5 years | 48.8 |
| 6-10 years | 18.7 |
| 11-20 years | 17.2 |
| 21-30 years | 11.5 |
| 31 years and over | 3.8 |

[1]n = 209

## 3.2 Trip Characteristics

Close to half (44.9%) of survey participants had visited the estuary and surrounding coastal areas 10 or more times (Table 11), while 48.4% had traveled to RBNERR five times or less. Respondents were traveling with family (42.8%), friends (23.5%), or a combination of friends and family (20.3%) most of the time, but other survey participants were either traveling alone (5.8%), or with an organized group (5.8%) (Table 12). One-third (34.1%) of the respondents were traveling with children under the age of 16, while most survey participants (65.9 %) were traveling with other adults or children over 16 years of age (Table 13).

Table 11. Respondents' Previous Visits to Recreation Areas

| Previous site visits | Percent (%)[1] |
|---|---|
| First time | 24.7 |
| 2-5 times | 23.7 |
| 6-10 times | 6.7 |
| 10 or more times | 44.9 |

[1]n = 312

Table 12. Respondents' Type of Group

| Type of group | Percent (%)[1] |
|---|---|
| Family | 42.8 |
| Friends | 23.5 |
| Friends and family | 20.3 |
| Alone | 5.8 |
| Organized group | 5.8 |
| Group of two or more families | 1.9 |

[1]n = 311

Table 13. Percentage of Respondents Traveling with Children Under Age 16

| Children under age 16 | Percent (%)[1] |
|---|---|
| Yes | 34.1 |
| No | 65.9 |

[1]n = 305

## 3.3 Travel Patterns

Over one-quarter (26.8%) of survey participants spent the most time in Zone 4 (Figure 3, Table 14), or Keewaydin, and 29.5% of respondents indicated this zone as their favorite (Table 15). The Marco Island region, Zone 7, is the second most visited, with 20.7% indicating this was where they are spent the most time. Most respondents (72.4%) indicated that their favorite recreation area was between zones 4 and 7.

Table 14. Zone Where Respondents Spent the Most Time (see Figure 3)

| Zone | Percent (%)[1] |
|---|---|
| 1 | 9.6 |
| 2 | 3.9 |
| 3 | 2.9 |
| 4 | 26.8 |
| 5 | 4.6 |
| 6 | 17.5 |
| 7 | 20.7 |
| 8 | 6.1 |
| 9 | 4.3 |
| 10 | 3.6 |

[1]n = 280

Table 15. Respondents' Most Preferred Zone (see Figure 3)

| Zone | Percent (%)[1] |
|---|---|
| 1 | 6.7 |
| 2 | 2.6 |
| 3 | 2.2 |
| 4 | 29.5 |
| 5 | 6.7 |
| 6 | 18.7 |
| 7 | 17.5 |
| 8 | 8.2 |
| 9 | 4.1 |
| 10 | 3.7 |

[1]n = 268

## 3.4 Activity Preferences and Motivations

More than one-third of all survey participants (36.3%) listed sport fishing as their primary activity while visiting Rookery Bay Estuary (Table 16). Other activities were boating (15.1%), while some respondents participated in wildlife viewing or sightseeing (13.5%), or shelling (6.1%).

Table 16. Respondents' Primary Activities

| Activity | Percent (%)[1] |
|---|---|
| Fishing | 36.3 |
| Boating | 15.1 |
| Wildlife Viewing/Sightseeing | 13.5 |
| Shelling | 6.1 |
| Beach Related Passive Rec. | 4.2 |
| Water Related Passive Rec. | 3.5 |
| Water Sports | 3.5 |
| Relaxation | 3.5 |
| Partying/Drinking | 2.9 |
| Transiting/Passing Through | 1.9 |
| Socializing/Bonding/Group Activities | 1.9 |
| Other | 7.3 |

[1]n = 311

When asked what other activities they participated in, respondents listed fishing (17.6%), wildlife viewing or sightseeing (13.1%), socializing, such as family bonding and camping (13.1%), and water-related passive recreation (12.8%) most frequently (Table 17).

Table 17. Respondents' Other Activities

| Activity | Percent (%)[1] |
|---|---|
| Fishing | 17.6 |
| Wildlife Viewing/Sightseeing | 13.1 |
| Socializing/Bonding/Group Activities | 13.1 |
| Boating | 12.5 |
| Shelling | 11.2 |

[1]n = 312

Using an open-ended question, survey participants were asked to state the reasons they recreate at Rookery Bay Estuary. In particular, they were asked to share the experiences they hoped to attain from their visit to these coastal areas. A large percentage of respondents (32.1%) stated that reducing tension was a main motivation for their trip (Table 18). Enjoying nature (18.6%) and escaping physical stressors (12.5%) were also frequently mentioned motivations.

Table 18. Respondents' Motivations for Visiting Rookery Bay

| Motivation | Frequency | Percent (%)[1] |
|---|---|---|
| Reduce Tension | 100 | 32.1 |
| Enjoy Nature | 58 | 18.6 |
| Escape Physical Stressors | 39 | 12.5 |
| Achievement/Stimulation | 25 | 8.0 |
| Family Relations | 23 | 7.4 |

[1]n=245

## 3.5 Respondents' Perception of Impacts as Problems

Rookery Bay survey participants were asked to rank each of 20 social/environmental impacts, relating to RBNERR and surrounding coastal areas, on a Likert scale from one to five, with one being not a problem and five being a very serious problem. Respondents reported that water, noise, and litter pollution (3.5); taking more than the legal limit of fish (3.1); damages by motorboats to seagrass beds (3.1); disturbance or destruction of vegetative habitat (3.1); and beach or soil erosion (3.0) to be moderate to very serious problems (Table 19). Alternatively, respondents' perceived over collection of shells (2.1); damage from campfires (2.1); spread of exotic animals (2.3); hiking trails through sensitive areas (2.3); and damage to habitat by boat anchorage (2.4) as the least severe impacts.

Table 19. Respondents' Perception of Impacts as Problems

| IMPACTS | Sample Size | Mean[1] | Percent | | | | |
|---|---|---|---|---|---|---|---|
| | | | Not a Problem | Minor Problem | Moderate Problem | Serious Problem | Very Serious Problem |
| Water, noise, litter pollution | 223 | 3.5 | 12.1 | 14.3 | 20.2 | 22.0 | 31.4 |
| Taking more than the legal limit of fish | 216 | 3.1 | 18.5 | 19.4 | 20.4 | 16.7 | 25.0 |
| Damages, by motorboats, to sea grass beds | 218 | 3.1 | 16.5 | 17.9 | 28.4 | 17 | 20.2 |
| Disturbance/destruction of habitat (vegetation) | 213 | 3.1 | 20.7 | 17.8 | 20.2 | 15.5 | 25.8 |
| Beach or soil erosion | 179 | 3.0 | 20.7 | 15.1 | 25.1 | 21.8 | 17.3 |
| Damages, by motorboats, to marine animals (manatees, turtles, dolphins) | 222 | 3.0 | 24.3 | 16.2 | 19.8 | 17.1 | 22.5 |
| Harassment of tortoises, snakes, or nesting sea turtles | 214 | 2.7 | 36.9 | 14.0 | 13.6 | 15.9 | 19.6 |
| Disturbances to nesting or foraging shorebirds such as least terns | 215 | 2.7 | 32.1 | 14.0 | 24.2 | 14.9 | 14.9 |
| Spread of exotic plants | 177 | 2.7 | 33.9 | 14.1 | 16.4 | 19.2 | 16.4 |
| Vandalism | 212 | 2.6 | 36.8 | 18.9 | 14.2 | 4.2 | 25.9 |
| Harassment of animals by motorboat operators (chasing, following to close) | 221 | 2.6 | 32.1 | 20.4 | 16.7 | 14.0 | 16.7 |
| Human created boating trails through mangroves | 199 | 2.6 | 34.7 | 15.6 | 21.1 | 14.6 | 14.1 |
| Collection of plants or animals | 216 | 2.6 | 36.6 | 14.8 | 15.7 | 15.7 | 17.1 |
| Feeding marine animals | 220 | 2.5 | 37.3 | 16.8 | 19.1 | 12.7 | 14.1 |
| Disturbances to historic resources | 212 | 2.5 | 36.8 | 12.7 | 24.1 | 14.2 | 12.3 |
| Damage to habitat by boat anchorage | 211 | 2.4 | 34.6 | 22.3 | 21.8 | 13.3 | 8.1 |
| Hiking trails through sensitive areas | 194 | 2.3 | 40.2 | 20.6 | 21.1 | 8.8 | 9.3 |
| Spread of exotic animals | 165 | 2.3 | 44.2 | 15.2 | 21.2 | 9.7 | 9.7 |
| Damage from campfires | 215 | 2.1 | 43.3 | 22.8 | 18.6 | 8.4 | 7.0 |
| Over collection of shells | 221 | 2.1 | 50.2 | 14.5 | 16.3 | 10.9 | 8.1 |

[1]1=Not a Problem … 5=Very Serious Problem

**3.6 Respondents' Support for Management Activities**

Using a scale of one to five (1=strongly against to 5= strongly support), Rookery Bay survey participants were asked to rank their support for the twenty-three management options derived in the nominal group meeting held with RBNERR managers (Appendix 1). Respondents showed strong support for working with residents when designing management activities for the estuary (4.4) (Table 20). Survey participants also indicated support for developing workshops or outreach programs to educate about marine wildlife (4.3), developing a website to provide information to people interested in the estuary (4.1), providing more signs and brochures about marine wildlife (4.1), and developing maps of the estuary for visitors (4.1). Results indicate that those interviewed showed strong support for increased communication between Rookery Bay staff and visitors to the estuary. Section 5 will propose strategies to increase effective communication between managers and recreational users of RBNERR.

Table 20. Respondents' Agreement with Management Options

| MANAGEMENT OPTIONS | Sample Size | Mean[1] | Percent | | | | |
|---|---|---|---|---|---|---|---|
| | | | Strongly Against | Mildly Against | Neither Support or Against | Mildly Support | Strongly Support |
| Work with local residents when designing management activities for the estuary | 224 | 4.4 | 3 | 2 | 21 | 59 | 139 |
| Develop workshops or outreach programs to educate people about marine wildlife | 219 | 4.3 | 3 | 5 | 27 | 65 | 119 |
| Develop a website to provide information to people interested in the estuary | 224 | 4.1 | 12 | 4 | 43 | 65 | 100 |
| Provide more signs and brochures about marine wildlife | 219 | 4.1 | 11 | 10 | 25 | 74 | 99 |
| Develop maps of the estuary for visitors | 222 | 4.1 | 14 | 8 | 30 | 57 | 113 |
| Provide information on areas' mission and function | 219 | 4.0 | 7 | 6 | 50 | 64 | 92 |
| Improve monitoring of recreational impacts to the ecosystem | 219 | 3.9 | 17 | 12 | 38 | 69 | 83 |
| Provide more informational signs regarding the area's natural and cultural resources | 222 | 3.8 | 21 | 12 | 43 | 58 | 88 |
| Develop a 1-800 phone number to provide information to potential visitors | 219 | 3.7 | 15 | 11 | 60 | 66 | 67 |
| Occasionally close areas in order to manage for ecological health | 217 | 3.7 | 28 | 22 | 27 | 41 | 99 |

| **MANAGEMENT OPTIONS** (Continued) | Sample Size | Mean[1] | Percent | | | | |
|---|---|---|---|---|---|---|---|
| | | | Strongly Against | Mildly Against | Neither Support or Against | Mildly Support | Strongly Support |
| Post boundaries of estuary preserve along highways | 217 | 3.6 | 23 | 9 | 57 | 68 | 60 |
| Coordinate partnerships with local hotels and tourism providers | 217 | 3.5 | 31 | 21 | 45 | 56 | 64 |
| Provide waste collection facilities and bathrooms/toilets throughout the estuary | 222 | 3.5 | 43 | 22 | 25 | 52 | 80 |
| Learn more about the type of people who visit Rookery Bay | 219 | 3.4 | 17 | 21 | 89 | 38 | 54 |
| Provide more enforcement of existing regulations | 219 | 3.4 | 43 | 20 | 39 | 50 | 67 |
| Establish a more visible management presence in the area | 220 | 3.3 | 39 | 25 | 47 | 58 | 51 |
| Restrict specific recreation activities to certain areas (i.e., special use zones) | 217 | 3.3 | 55 | 17 | 27 | 50 | 68 |
| Provide mooring buoys | 217 | 3.2 | 43 | 21 | 57 | 49 | 47 |
| Provide more areas to camp | 203 | 3.0 | 49 | 25 | 43 | 45 | 41 |
| Provide more signs to areas where visitors can access the estuary | 217 | 3.3 | 41 | 23 | 40 | 58 | 55 |
| Make Rookery Bay more visible in the local media | 219 | 3.2 | 40 | 30 | 47 | 53 | 49 |
| Provide more hiking trails | 207 | 3.1 | 29 | 25 | 83 | 39 | 31 |
| Provide greater boat access to the estuary | 217 | 2.8 | 59 | 35 | 45 | 38 | 40 |

[1]1=Strongly Against … 5=Strongly Support

## 3.7 Respondents' Exposure to and Perceived Effectiveness of Wildlife Educational Information

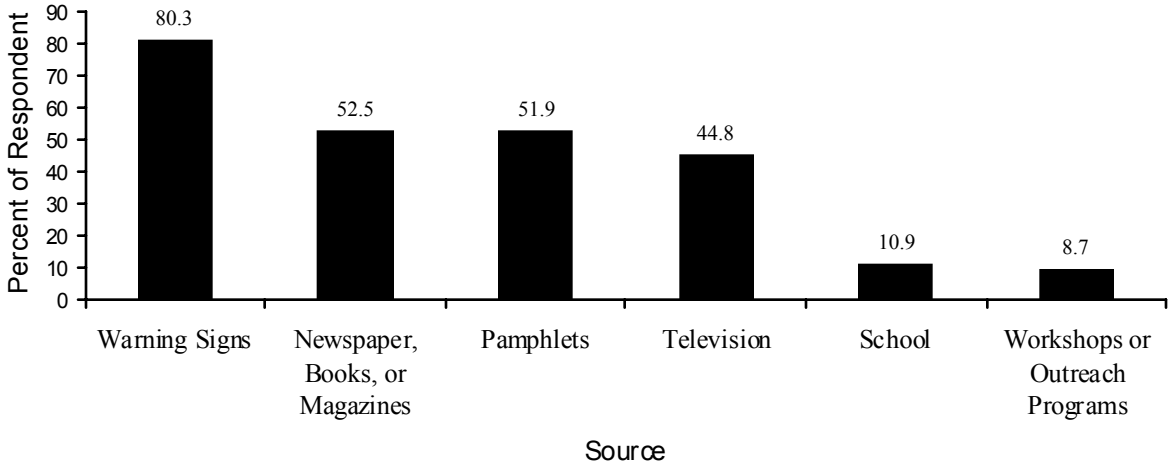
Rookery Bay respondents were asked to indicate the type and effectiveness of wildlife educational material they had been exposed to. When asked if they have come across any educational information regarding manatees, 82.8% indicated *yes* (Table 21). They were asked what form of educational information they had been exposed to and 80.3% of respondents indicated they had come across *warning signs*, 51.9% had noticed *pamphlets* with manatee information, and 97.3% had come across manatee educational information in *newspapers, books, and magazines* or on *television* (Figure 4).

Table 21. Respondents' Exposure to Manatee Educational Information

| | Percent[1] |
|---|---|
| Yes | 82.8 |
| No | 17.2 |

[1]n = 221

Figure 4. Type of Manatee Educational Information Rookery Bay Survey Respondents Had Received (n=183)



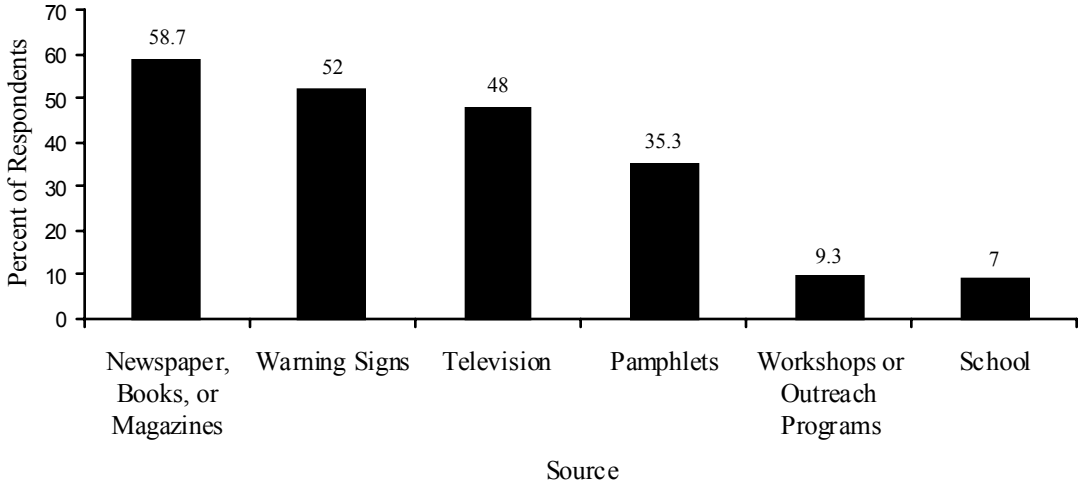

As opposed to people who reported seeing manatee education, fewer survey participants had been exposed to educational materials regarding sea turtles (67.6%) with almost one-third (32.4%) indicating that they had not received this type of information (Table 22). For those respondents who had been exposed to sea turtle information, 58.7% said they read about sea turtles in *newspaper, books, or magazines*, 52.0% saw sea turtle *warning signs*, and 48.0% watched sea turtle educational programs on *television* (Figure 5).

Table 22. Respondents' Exposure to Sea Turtle Educational Information

| | Percent[1] |
|---|---|
| Yes | 67.6 |
| No | 32.4 |

[1]n = 222

Figure 5. Type of Sea Turtle Educational Information Rookery Bay Survey Respondents Had Recieved (n=150)




Rookery Bay survey participants were asked to rank the effectiveness of the wildlife educational information they had received on a scale of one to four (with one being not at all effective; and four being very effective). Over half (69.0%) indicated that the wildlife educational information had been somewhat to very effective (Table 23), while 18.7% perceived the information to be not at all effective.

Table 23. Respondents' Perceived Effectiveness of Educational Information

| **Effectiveness** | **Percent (%)[1]** |
|---|---|
| Not at all effective | 18.7 |
| Moderately effective | 12.3 |
| Somewhat effective | 19.3 |
| Very effective | 49.7 |

[1]n = 187

**3.8 Amount and Types of Problems Experienced by Respondents**

Rookery Bay respondents were asked during the onsite survey if they had experienced any problems. The majority of the respondents had no problems (67%), while the remainder (26.0%) (Table 24) listed littering (5.4%), uneducated or inconsiderate boaters (4.5%), and traffic or crowding (3.2%) as the top three problems (Table 25). Respondents were also asked to identify the zone where the problem or problems occurred. The most problems occurred in the most visited areas, those being zones 4, 6, and 7 (Table 26). The most problems were reported in Zone 4, the top three being the same as the primary problems experienced. Zone 6 had several complaints about red tide and dead fish, and also more conflicts with nature (e.g., tidal change, rain) than any other zone. Litter and red tide were also problems in Zone 7, along with conflicts with personal watercraft.

Table 24. Percent of Respondents' Who Said They Experienced Problems

| | Frequency | Percent (%)[1] |
|---|---|---|
| Yes | 81 | 26.0 |
| No | 209 | 67.0 |

[1]n=290

Table 25. Respondents' Primary Problems

| Problem | Percent (%)[1] |
|---|---|
| Littering/trash | 5.4 |
| Rude boaters/uneducated users | 4.5 |
| Traffic/crowding | 3.2 |

[1]n = 312

Table 26. Respondents' Most Common Problems by Most Visited Zones

| Zone | Top Three Problems For Each Zone | Frequency | Percent (%) For Each Zone |
|---|---|---|---|
| 4 | Littering/trash | 11 | 23.9 |
| | Rude boaters/ Uneducated users | 10 | 21.7 |
| | Traffic/crowding | 5 | 10.9 |
| | | Total n=46[1] | |
| 6 | Red tide/dead fish | 5 | 22.5 |
| | Rude boaters/ uneducated users | 4 | 18.2 |
| | Conflict with nature | 4 | 18.2 |
| | | Total n=22[1] | |
| 7 | Littering/trash | 6 | 16.2 |
| | Red tide | 5 | 13.5 |
| | Personal watercraft | 5 | 13.5 |
| | | Total n=37[1] | |

[1] total sample size for each zone includes responses to the three most often mentioned problems and problems that only a small number of people listed.

## 4. DISCUSSION AND RECOMMENDATIONS

### 4.1 Visitors to Rookery Bay

The socio-demographic characteristics of the Rookery Bay survey participants are fairly consistent with other research studies concerning recreation in natural areas (Cordell, 1999). The majority of respondents were white males, between the ages of 26-55. Most were well educated and married with children. The range of household income was well distributed; however, many respondents (24.4%) averaged above $96,000 per year. Over half were local to the Naples/Marco

Island area, but the majority of respondents were new to the area, having lived at their current residence five years or less. More than three-quarters of the respondents were not first-time visitors. Visitors were traveling with family and/or friends; however, many visitors did not travel with children under 16 years old.

## 4.2 Managing for the Most Desired Recreation Experiences

Visitors to the Rookery Bay area are coming to participate in a multitude of activities, and are also seeking various benefits. To best provide quality recreation opportunities, recreation resource managers and planners must understand the benefits, which motivate people to take time out of their daily routines, travel to difficult areas, and participate in sometimes rigorous and expensive activities (Manning, 1999; Stein, 2001; Wagar, 1966); therefore, this section of the report will have implications for providing quality recreation opportunities. Specifically, it will focus on the motivations survey participants listed as the reasons why they visited Rookery Bay. Survey respondents included reducing tension or escaping physical stressors, enjoyment of nature, achievement or stimulation, and family bonding as motivations for their visit.

As opposed to simply listing activities recreationists participate in the RBNERR, these activities will be discussed in terms of how they help people achieve their desired motivations. Also, environmental and social impacts will be discussed in terms of how they act as barriers to achieving specific motivations. Finally, management activities that this study identified as acceptable by RBNERR visitors, will be discussed as ways to alleviate the barriers and provide opportunities to help people achieve their desired motivations.

### 4.2.1 Reduce Tension and Escape Physical Stressors

Many Rookery Bay respondents were seeking an escape from their everyday responsibilities. Activities that participants most mentioned were their primary activity and are related to attaining these experiences include fishing, boating, and beach related passive recreation (Table 27). A common complaint by respondents was inconsiderate or uneducated boaters, especially those who were using boats for the first time. These inconsiderate boaters, along with increased boater traffic and crowding of areas such as Keewaydin, threaten the ability of visitors to attain their goal of reducing tension.

Information should be provided that lets visitors know where to take part in recreation opportunities that help them achieve their desired experiences. For visitors hoping to reduce tension and avoid physical stressors, information should be provided that warns them of crowded areas or areas that are hard to access. Providing more information was highly supported by respondents (73.7%). Specifically, it is suggested that managers *develop a website to provide information to people interested in the estuary* that has information such as tidal charts, boating and weather conditions, time of sunrise and sunset, available facilities, and downloadable maps of the area. This can give users a highly versatile means of acquiring information about the area any time, so visitors can plan their trip accordingly. It is also recommended to *develop maps of the estuary for visitors* that will give users multiple options of areas to visit in the estuary in case their first choice does not meet their needs. These maps and/or brochures could be available on the Internet or at boat ramps, marinas, and other locations frequented by boaters.

Along with this supplemental information, boaters should be informed not only of appropriate behavior, but also why it is important to be a considerate and safe boater. Rookery Bay personnel could work with private rental boat companies to offer classes to promote safe boating. By *coordinating partnerships with local hotels and tourism providers* which was supported by survey participants (55.3%), Rookery Bay managers could work with a variety of local tourism stakeholders to offer the programs to a diversity of people who need training. If needed Rookery Bay could make these training programs mandatory for all new boaters to the estuary, or work with the companies to offer incentives to participants (e.g., free maps, interpretive brochures, or rental discounts).

Due to the level of concern with irresponsible boaters, managers might want to continue to *provide more enforcement of existing regulations*, and *establish a more visible management presence in the area*, especially those areas that experience the largest amount of use. Since education alone will not solve the problem of inconsiderate boaters, more heavy-handed management might be acceptable to encourage appropriate conduct. Management strategies may include posting new regulations and increasing fines for irresponsible behavior.

Table 27. Managing for the Motivation Reduce Tension

| | |
|---|---|
| Activities to attain motivation | • Fishing<br>• Boating<br>• Beach-related recreation |
| Impacts that are barriers to motivation | • Inconsiderate/uneducated boaters<br>• Traffic<br>• Crowding |
| Management strategies to help provide opportunities to attain motivation | • Provide users with informational sources<br>  ▪ Website<br>  ▪ Maps<br>  ▪ Brochures<br>  ▪ Signs<br>• Partnerships with local businesses and user groups<br>  ▪ Safe boating classes<br>• Enforcement<br>  ▪ More visible presence<br>  ▪ Greater enforcement of existing regulations |

**4.2.2 Enjoy Nature**

In addition to seeking stress relief, many Rookery Bay respondents were also visiting the area to enjoy its natural qualities. The most common activities that respondents participated in to enjoy nature were wildlife viewing and sightseeing (Table 28). Most of these people were

viewing wildlife in their own boats, or were on some sort of boat tour. Some of those people were also participating in fishing.

An impact directly related to enjoying nature rated relatively high was water, noise, litter pollution, and was ranked the most serious by respondents. Other impacts that might impede visitors' ability to enjoy nature were motorboats' impacts to sea grass beds, wildlife, and beaches.

To help reduce these problems and to maximize visitors' experiences, managers should first *improve the monitoring of recreational impacts to the ecosystem*. In many cases RBNERR staff already do this, but specific monitoring of recreation-related impacts (e.g., littering, motorboat pollution, crowding, conflicts) is needed. Understanding the frequency of impacts and how they are changing (i.e., getting worse, staying the same, or getting better), will allow managers to effectively manage for impacts before they become serious problems.

According to this study, RBNERR visitors heavily supported communication and collaboration with local residents and visitors. The most highly supported management activity, *work with local residents when designing management activities for the estuary,* can help instill responsible environmental behavior among local residents who use the estuary regularly (Wondolleck and Yaffee, 2000). Through estuary cleanup days, citizens advisory committees, and focus groups, Rookery Bay managers can help local residents feel a better connection with the estuary.

Also, RBNERR staff are already skilled in educating local residents, but education programs should be developed that specifically focus on reducing recreation-related impacts. People who know how to recognize environmental impacts will be more likely to not engage in harmful activities and in turn be more supportive of other types of management (Hammit and Cole, 1998). This educational material can be in the form of pamphlets and signs that are readily available. This material should make impacts easy to identify, explain why they are harmful, and discuss what can be done to minimize the impacts. Some of these impacts could be included in the boat safety course mentioned earlier, and can be particularly effective in helping new boaters maneuver through the estuary, reducing impacts to marine wildlife (e.g., manatees) and vegetation (e.g., sea grass beds).

Finally, more restrictive management actions might be necessary to reduce environmental impacts. As recommended earlier, a more visible management presence and increased enforcement of existing regulations could discourage littering. Also, managers might have to *occasionally close areas in order to manage for ecological health*. Although this might seem extreme, it was an option that received some support by participants.

Table 28. Managing for the Motivation Enjoy Nature

| | |
|---|---|
| Activities to attain motivation | • Wildlife viewing<br>• Sightseeing<br>• Fishing<br>• Boating |
| Impacts that are barriers to motivation | • Littering/trash<br>• Damage to sea grass beds<br>• Red tide<br>• Traffic<br>• Crowding |
| Management strategies to help provide opportunities to attain motivation | • Work with local residents when designing management activities for the estuary<br>▪ Estuary clean up days<br>▪ Citizens advisory committee<br>▪ Focus groups<br>• Create/expand partnerships with local environmental organizations such as Keep Collier County Beautiful<br>• Increase awareness of impacts through educational pamphlets, signs<br>• Monitoring and enforcement<br>▪ Improve monitoring of recreational impacts<br>▪ Occasionally close areas to manage for ecological health<br>▪ More visible management presence<br>▪ More enforcement of existing regulations |

**4.2.3 Achievement/Stimulation**

Many visitors to the Rookery Bay area were participating in activities such as fishing and water sports to feel stimulated physically and mentally and to feel a sense of achievement (Table 29). A major concern that respondents' had was that people might be *taking more than the legal limit of fish*, which could hinder the ability of anglers to catch fish and attain a sense of achievement. Crowding in areas could also prevent visitors from being able to participate in their preferred form of water sport, and could create dangerous situations for swimmers and other users.

Due to the high concern of taking more than the legal limit of fish, there is a need to increase the public's knowledge about the harvest limitations of this important ecological and recreational resource. In order to ensure sustainable populations of fish species in the Rookery Bay ecosystem, visitors must be aware of their role in the conservation of this resource. Encouraging catch-and-release fishing through education might prove effective. Also, workshops and outreach groups are a highly effective and supported means to educate anglers. More signs

and brochures about marine wildlife explaining why the species are important to the ecosystem and how overfishing can devastate fisheries could be extremely effective. Finally, more enforcement may still be necessary to ensure people obey fishing regulations.

As more people visit Rookery Bay and surrounding areas, high densities of visitors are likely to limit peoples' ability to participate in activities that help them feel a sense of achievement or stimulation. For example, crowding of people on the beach coupled with high densities of boats and jet skis surrounding Keewaydin Island could limit visitors' ability to fish, sightsee, view wildlife, and other similar activities that help them. Maps with suggestions as to the most appropriate area to participate in certain activities (i.e., water sports) give visitors the ability to choose between a diversity of recreation areas. This will help alleviate crowding and allow users to more easily navigate the estuary.

Table 29. Managing for the Motivation Achievement/Stimulation

| | |
|---|---|
| Activity to attain motivation | • Fishing<br>• Water sports |
| Impacts that are barriers to motivation | • Overfishing/taking more than the legal limit of fish<br>• Crowding |
| Management strategies to help provide opportunities to attain motivation | • Provide users with informational sources<br>▪ Website<br>▪ Maps<br>▪ Brochures<br>▪ Signs<br>• Encourage catch and release fishing through education and partnerships<br>▪ Workshops and outreach groups<br>▪ Provide more signs and brochures about marine wildlife<br>• Enforcement<br>▪ More visible management presence<br>▪ More enforcement of existing regulations |

**4.2.4 Family Relations**

A smaller number of visitors to the Rookery Bay area were seeking to improve family relations by participating in group activities such as camping, picnicking, beach-related passive activities, and fishing (Table 30). The most common barriers that could prevent achievement of family bonding include inconsiderate or unsafe boaters, crowding, and unavoidable conflicts with nature.

Unsafe boaters present a risk not only to themselves, but to others as well. The safe use of personal watercraft (i.e., Jet Ski, Wave Runner) was also a concern of some respondents.

Encouraging appropriate boating behavior is recommended through safety classes. It may also be beneficial to encourage similar user groups to use the same area. For example, Keewaydin Island is the most visited zone, and has many users coming to participate in different activities for different purposes. Potential user conflict could be avoided between certain groups (i.e., personal watercraft users and swimmers, or families and partiers) by separating these groups. This can be achieved indirectly, through placement of signs, increased enforcement in certain areas, or other items that will appeal to one user group and not others.

Conflicts with nature may be unavoidable, but visitors can incorporate natural events into their trip planning. Some of these conflicts include severe sunburn, rain, tide changes, and the resultant grounding or beaching of boats. Families desire safe and secure recreation opportunities, and any information they can use to help plan for safe recreational engagements would help them achieve positive family experiences (Anderson, Lime, and Wang, 1998). A Rookery Bay website or interpretive signs at popular entry points into the estuary addressing potential natural hazards would be the most effective methods to help families prepare for their trip. For example, regularly updated tidal charts for Rookery Bay could be displayed on a website and at popular boat ramps alerting visitors of inappropriate areas to visit during low tide.

Table 30. Managing for the Motivation Family Relations

| | |
|---|---|
| Activities to attain motivation | • Socializing/group activities<br>• Beach related passive activities<br>• Fishing |
| Impacts that are barriers to motivation | • Inconsiderate/uneducated boaters<br>• Crowding<br>• Conflict with nature |
| Management Strategies to help provide opportunities to attain motivation | • Partnerships with local businesses and user groups<br>▪ Safe boating classes<br>• Zone for activities or motivations<br>• Provide users with informational sources<br>▪ Website<br>▪ Maps<br>▪ Brochures<br>▪ Signs |

# 5. CONCLUSIONS

This study was designed to provide information about the type of people who visit the Rookery Bay National Estuarine Research Reserve, and their attitudes towards impacts and management. It serves as a starting point to better understand the social elements of managing the coastal resources of Rookery Bay for recreational purposes. Although the results of this study cannot be extended to other estuaries throughout the United States, estuary managers throughout the country should be able to identify general implications for planning and management. For example, this study's survey showed a strong support for collaboration and communication. Research throughout the country is showing people want a say in how their public resources are being managed (Wondolleck and Yaffee, 2000), and this is no different for coastal environments. Coastal managers must begin to focus on communication as a means to manage the resource and incorporate their constituencies into decision making. Also, this study supports other research (Hammitt and Cole, 1998) that shows recreationists do not readily perceive impacts as problems, but they are willing to accept management to proactively manage those impacts. Coastal managers will have to determine for themselves what impacts are current or potential problems in their areas, and take appropriate and acceptable strategies to manage for those impacts.

Since this was an exploratory study, additional research is needed to identify specific issues about recreation management in Rookery Bay. As the population in Collier County grows, recreation use of the estuary will also grow. Planning is necessary to minimize the social and ecological impacts associated with high recreational use. Consequently, conflicts between residents and non-residents will be an issue of future concern. Also, other social impacts will begin to become more of an issue for managers. Personal watercraft crowding, vandalism to coastal resources, and other social impacts will occur. Research can help identify and solve these problems before they occur. Getting input from community stakeholders and organizing those citizens concerned with the conservation of local natural resources will continue to be a vital component of any future initiative.

# 6. REFERENCES


Anderson, D.H., D.W. Lime, and T.L. Wang, 1998. *Maintaining the Quality of Park Resources and Visitor Experiences: A Handbook for Managers*. University of Minnesota Extension Service: St. Paul, Minnesota.

Bright, A. D. 1997. Attitude-strength and support of recreation management strategies. *Journal of Leisure Research*, 29(4): 363-379.

Burger, J. 1998. Attitudes about recreation, environmental problems, and estuarine health along the New Jersey shore, USA. *Environmental Management,* 22(6): 869-876.

Cordell, H.K.1999. *Outdoor Recreation in American Life: A National Assessment of Demand and Supply Trends*. Sagamore Publishing: Champaign, IL.

Driver, B.L., P.J. Brown, G.H. Stankey, and T.G. Gregoire. 1987. The R.O.S. planning system: Evolution, basic concepts, and research needed. *Leisure Sciences* 9, 201-212.

Hammit, W.E. and D.N. Cole. 1998. *Wildland Recreation: Ecology and Management.* John Wiley & Sons, INC.: NY.

Institute for Participatory Planning. 1978. *Citizen Participation Handbook*. (Sixth edition, 1989, Institute for Participatory Management and Planning, Monterey, CA.

Manning, R.E. 1999. *Studies in Outdoor Recreation*. Oregon State University Press: Corvallis, OR.

Mumme, R.L. and T.H. Below. 1999. Evaluation of translocation for the threatened Florida scrub-jay. *Journal of Wildlife Management*, 63(3): 833-842.

Rookery Bay Research Reserve, 2001, http://inlet.geol.sc.edu/RKB/site_des.html. March 26.

Stankey, G.H., D.N. Cole, R.L. Lucas, M.E. Petersen, and S.S. Frissell. 1985. The Limits of Acceptable Change (LAC) System for Wilderness Planning. *U.S.D.A Forest Service, General Technical Report* INT-176.

Stein, T.V. 2001. Making ecotourism a reality: An integrated approach. *Renewable Resources Journal*, 19(3): 6-12

Stein, T.V., D.H. Anderson, and T. Kelly. 1999. Using stakeholders' values to apply ecosystem management in an Upper Midwest landscape. *Environmental Management*, 24(3): 399-413.

Twilley, R.R. and R.H. Chen. 1998. A water budget and hydrology model of a basin mangrove forest in Rookery Bay, Florida. *Marine and Freshwater Research,* 49(4): 309-323.

Wagar, J.A. 1966. Quality in outdoor recreation. *Trends in Parks and Recreation*, 3(3): 9-12.

Wondolleck, J.M. and S.L. Yaffee, 2000. *Making Collaboration Work: Lessons From Innovation in Natural Resource Management*. Island Press, Washington, D.C.

## 7. APPENDIX 1. RESULTS OF NOMINAL GROUP MEETING

**Rookery Bay Estuary**
**Staff Perceptions of Visitor Use**

*Why do people visit Rookery Bay?*
Watch wildlife
Go to the beach
Fish
Boat (motorized)
Party
View Scenery
Explore Nature
Bird watch
Swim
Picnic
Camp
Water-ski
Hike/Walk
Take Photos
Collect Shells
Canoe/Kayak
Sail
Jet ski
Take part in educational programs
Socialize
Sunbathe
Research
Paint/draw
Snorkel
Take a boat tour
Learn about history
Learn about nature
Take part in educational field trips
Ultralites (future)
Parasailing (future)

*What experiences/benefits do people attain at Rookery Bay?*
Be with family
Character development - improve your character
Experience wilderness adventure
Experience solitude
Enjoy sunsets

*How do visitors impact the resource?*

Disturb nesting shorebirds
Disturb osprey/osprey disturbance
Disturb rookery birds
Disturb resting birds
Disturb foraging birds
Collect an overabundance of shells
Take more fish than your legal limit
Disturb archaeological/historic resources
Boat impacts to
    Seagrass beds
    Marine animals (manatees, turtles, dolphins)
Motorboat operators purposely harassing animals (chasing, following too close)
People feeding marine animals
Harassment of
    Tortoises
    Snakes
    Nesting sea turtles
Collection of
    Plants
    Animals
    Hunting/poaching
Release of plants and animals
Disturbance/destruction of habitat (vegetation)
Personal boat, vehicle and human trails
Water, litter, noise pollution
Illegal construction of camps, homes, or other personal facilities
Habitat damage (car accidents)
Erosion caused by human disturbance
Anchorage damage
Human waste (from camping, day use, anchorage)
Fire damage
Vandalism
Property damage from boats (crashes)

*What are negative impacts to visitors' experiences due to other recreation activities?*

Noise disturbance
Conflicts with other user groups
Canoe, personal watercraft, airboat, swampbuggies, fishing, speedboats, bird watching, windsurfers
Crowding/solitude conflict
Safety issues (submerged hazards)

Perception of risk (user groups conflict, safety)
Dogs
Nudity (partial and full)
Lack of information for education
Insufficient orientation information
    Safety zones, rental boats
Viewing restoration process/management activities
Litter/waste concerns
Lack of fish (depends on individual species)
Red tide (natural)
Dead fish – naturally occurring
Overcollection of shells
    Visitors can't find/worried about illegal collection

*What are potential management activities to reduce recreation impacts in Rookery Bay?*
Examine user conflicts
    Put together appropriate use zones
Get information from the public
Establish good signs
Enforce existing/posted regulations
Coordinate/enhance relationship with enforcement
Prioritize enforcement issues
Monitor impacts
    Surveys, volunteers
Inform the visitor
    Entry site (with vendors)
    On water (outreach, maps)
    Hotline – information about site
Provide and market trails and campsites
Survey user needs to best provide for visitor and environmental needs
Provide information on areas' mission and function
Provide outreach initiatives on management activities
Interact with users in area – Establish a management presence in the area
Provide waste collection facilities and bathrooms/toilets
Provide suitable boat access
Provide mooring buoys
Plant "ouch" plants
Make Rookery Bay more visible in the local media
Occasionally close trails for restoration
Post boundaries of estuary preserve along highways
Partner with local businesses
    To discuss property use
    To coordinate with hotels and other tourism providers

## APPENDIX 2. ROOKERY BAY ESTUARY RECREATIONAL VISITOR SURVEY

### RECREATIONAL - USE SURVEY FOR ROOKERY BAY NATIONAL ESTUARINE RESEARCH RESERVE

This study will be asking various questions based on your visit to Rookery Bay National Estuarine Research Reserve, and vicinity. Your answers will help guide estuary managers and planners in the development of appropriate strategies to allow visitors, like yourself, the best possible recreational experience, while still protecting the valuable natural resources of the area. Your cooperation in this project is greatly appreciated!

1. Over the last 12 months, how many times have you visited Rookery Bay Estuary and adjacent coastal areas?

( ) first time ( ) 6-10 times
( ) 2-5 times ( ) 10 or more times

2. Who are you traveling with on this trip?

( ) no one ( ) group of family and friends
( ) my family ( ) organized group or club
( ) group of two or more families
( ) unrelated friends

3. Are you traveling with children under the age of 16?

( ) yes ( ) no

4. According to the zoned map, through which zones have you traveled? Please indicate the route you took (place the zone numbers in order). Ex.) 1,2,3…

5. In which zone did you spend the most time?

6. In which zone was your most preferred location?

7. What was your primary activity while visiting the Rookery Bay area?

8. What other activities have you participated in here?

9. Did you experience problems in any zone? (provide examples if they need help)
( )yes ( )no

10. If yes, what types of problems did you encounter and what zone did you experience those in?

Zone _____
Problem:

Zone _____
Problem:

Zone _____
Problem:

Zone _____
Problem:

11. People have different reasons for visiting water-based recreation sites in Florida. In the space below please share with us some of the reasons (or desired experiences) you recreate at Rookery Bay (e.g., physical fitness, stress relief, and so on). Try not to list activities that you are taking part in. Explain the experiences you want to attain through participating in those activities in Rookery Bay. Include as many reasons/experiences as you can think of.

12. I am going to give you a list of potential impacts to the Rookery Bay ecosystem, vegetation, and wildlife how much of a problem do you believe each of these impacts are in the Rookery Bay area: 1, not a problem; 2, a minor problem; 3, a moderate problem; 4, a serious problem; or 5, a very serious problem. (Interviewer: circle the corresponding number in the column under the degree to which they believe the impact to be a problem.)

| **IMPACTS** | Not a Problem | Minor Problem | Moderate Problem | Serious Problem | Very Serious Problem |
|---|---|---|---|---|---|
| Disturbances to nesting or foraging shorebirds such as least terns | 1 | 2 | 3 | 4 | 5 |
| Over collection of shells | 1 | 2 | 3 | 4 | 5 |
| Beach or soil erosion | 1 | 2 | 3 | 4 | 5 |
| Disturbances to historic resources | 1 | 2 | 3 | 4 | 5 |
| Damages, by motorboats, to sea grass beds | 1 | 2 | 3 | 4 | 5 |
| Damages, by motorboats, to marine animals (manatees, turtles, dolphins) | 1 | 2 | 3 | 4 | 5 |
| Harassment of animals by motorboat operators (chasing, following to close) | 1 | 2 | 3 | 4 | 5 |
| Feeding marine animals | 1 | 2 | 3 | 4 | 5 |
| Harassment of tortoises, snakes, or nesting sea turtles | 1 | 2 | 3 | 4 | 5 |
| Collection of plants or animals | 1 | 2 | 3 | 4 | 5 |
| Spread of exotic plants | 1 | 2 | 3 | 4 | 5 |
| Disturbance/destruction of habitat (vegetation) | 1 | 2 | 3 | 4 | 5 |
| Human created boating trails through mangroves | 1 | 2 | 3 | 4 | 5 |
| Water, noise, litter pollution | 1 | 2 | 3 | 4 | 5 |
| Taking more than the legal limit of fish | 1 | 2 | 3 | 4 | 5 |
| Damage to habitat by boat anchorage | 1 | 2 | 3 | 4 | 5 |
| Damage from campfires | 1 | 2 | 3 | 4 | 5 |
| Vandalism | 1 | 2 | 3 | 4 | 5 |
| Hiking trails through sensitive areas | 1 | 2 | 3 | 4 | 5 |
| Spread of exotic animals | 1 | 2 | 3 | 4 | 5 |
| Other _____ | 1 | 2 | 3 | 4 | 5 |

13. To better serve visitors to Rookery Bay and decrease possible negative impacts, the following management activities have been suggested. We would like to know which of these activities you would support. For each item tell me if you are 1, Strongly Against; 2, Mildly Against; 3, Neither Support or Against; 4, Mildly Support; or 5, Strongly Support. (Interviewer: Circle the number corresponding to how strongly you support or against each management option.)

| MANAGEMENT OPTIONS | Strongly Against | Mildly Against | Neither Support or Against | Mildly Support | Strongly Support |
|---|---|---|---|---|---|
| Provide more informational signs regarding the area's natural and cultural resources | 1 | 2 | 3 | 4 | 5 |
| Establish a more visible management presence in the area | 1 | 2 | 3 | 4 | 5 |
| Provide mooring buoys | 1 | 2 | 3 | 4 | 5 |
| Provide more enforcement of existing regulations | 1 | 2 | 3 | 4 | 5 |
| Restrict specific recreation activities to certain areas (i.e., special use zones) | 1 | 2 | 3 | 4 | 5 |
| Improve monitoring of recreational impacts to the ecosystem | 1 | 2 | 3 | 4 | 5 |
| Develop maps of the estuary for visitors | 1 | 2 | 3 | 4 | 5 |
| Provide information on areas' mission and function | 1 | 2 | 3 | 4 | 5 |
| Provide more signs and brochures about marine wildlife | 1 | 2 | 3 | 4 | 5 |
| Learn more about the type of people who visit Rookery Bay | 1 | 2 | 3 | 4 | 5 |
| Provide more hiking trails | 1 | 2 | 3 | 4 | 5 |
| Develop a website to provide information to people interested in the estuary | 1 | 2 | 3 | 4 | 5 |
| Work with local residents when designing management activities for the estuary | 1 | 2 | 3 | 4 | 5 |
| Develop a phone 1-800 number to provide information to potential visitors | 1 | 2 | 3 | 4 | 5 |
| Make Rookery Bay more visible in the local media | 1 | 2 | 3 | 4 | 5 |
| Provide waste collection facilities and bathrooms/toilets throughout the estuary | 1 | 2 | 3 | 4 | 5 |
| Provide greater boat access to the estuary | 1 | 2 | 3 | 4 | 5 |
| Provide more signs to areas where visitors can access the estuary | 1 | 2 | 3 | 4 | 5 |

| MANAGEMENT OPTIONS | Strongly Against | Mildly Against | Neither Support or Against | Mildly Support | Strongly Support |
|---|---|---|---|---|---|
| Occasionally close areas in order to manage for ecological health | 1 | 2 | 3 | 4 | 5 |
| Develop workshops or outreach programs to educate people about marine wildlife | 1 | 2 | 3 | 4 | 5 |
| Post boundaries of estuary preserve along highways | 1 | 2 | 3 | 4 | 5 |
| Coordinate partnerships with local hotels and tourism providers | 1 | 2 | 3 | 4 | 5 |
| Provide more areas to camp | 1 | 2 | 3 | 4 | 5 |
| Other: _____ | 1 | 2 | 3 | 4 | 5 |

We would like to get some specific information regarding major wildlife issues in the area.

14. a) Have you come across educational information regarding manatees?
( ) yes ( ) no

b) If yes, in what form (check all that apply)?
( ) newspaper, books, magazines ( ) school ( ) television ( ) pamphlets

( )warning signs ( ) workshops or outreach programs

( )other_____

15. a) Have you come across educational information regarding sea turtles?
( ) yes ( ) no

b) If yes, in what form (check all that apply)?
( ) newspaper, books, magazines ( ) school ( ) television ( ) pamphlets

( )warning signs ( ) workshops or outreach programs

( )other_____

16. How effective was this information in influencing your recreational behavior?

1 = Not at all effective 2=Moderately effective 3=Somewhat effective 4=Very effective

**GENERAL INFORMATION**

For research purposes, we would like to learn a little about you. If you feel uncomfortable or do not want to answer any of the questions, please let me know, and I will skip to the next question.

17. Are they:
( ) Male
( ) Female

18. What is your age group?
( ) under 18
( ) 18-25
( ) 26-35
( ) 36-45
( ) 46-55
( ) 56-65
( ) 66-75
( ) over 75

19. How would you describe your race or ethnicity? Choose one or more.
( ) Asian
( ) Black/African American
( ) Hispanic/Latino
( ) Native American
( ) White
( ) Other_____

20. What is the highest level of education you have completed? (Mark one)
( ) Eighth grade or less
( ) Some high school
( ) High school graduate or GED recipient
( ) Some college
( ) College graduate
( ) Some graduate school
( ) Graduate degree or above

21. Which of the following describes your current situation?
( ) Single, no children
( ) Married, no children
( ) Married with children under 18
( ) Married with children 18 or older
( ) Single parent with children under 18
( ) Single parent with children 18 or older

22. What is the range in which your 1999 annual household income falls?

( ) below 15,000
( ) 16,000 - 25,000
( ) 26,000 - 35,000
( ) 36,000 - 45,000
( ) 46,000 - 55,000
( ) 56,000 - 65,000
( ) 66,000 - 75,000
( ) 76,000 - 85,000
( ) 86,000 - 95,000
( ) above 96,000

23. How long have you lived at your current residence?

_____

24. What is your zip code?

_____

25. Do you have any things to add that you believe are important but we have not covered?

Please include, in the space below, any comments you may have regarding your visit to Rookery Bay National Estuarine Research Reserve. Thank you again for your time and assistance in this important project.

**THANK YOU FOR YOUR HELP!!!**


Science Serving
Florida's Coast

www.FLSeaGrant.org