A Recreational Boating Characterization of Bay County

Aerial photographs: Faya Gorham

Charles Sidman
Tim Fik
Robert Swett
Bill Sargent
Susan Fann
David Fann
Alisa Coffin

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ICW
Walton County
Bay County
Calhoun County
Gulf County
Lake Powell
Southport
West Bay
North Bay
East Bay Cove
Lynn Haven
Panama City
St. Andrew Bay
Springfield
Callaway
Parker
Panama City Beach
East Bay
Tyndall AFB
Mexico Beach
Gulf of Mexico
N
0
10 miles

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by

Charles Sidman
Associate Director for Research
Florida Sea Grant
University of Florida

Tim Fik
Associate Professor
Department of Geography
University of Florida

Robert Swett
Assistant Professor
Department of Fisheries and Aquatic Sciences
University of Florida

Bill Sargent
Research Scientist
Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
St. Petersburg, Florida

Susan Fann
GIS Specialist
Florida Sea Grant
University of Florida

David Fann
Senior GIS Specialist
Florida Sea Grant
University of Florida

Alisa Coffin
Doctoral Candidate
Department of Geography
University of Florida

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Acknowledgments

This initiative was implemented through a coordinated effort of local, state and federal agencies to help provide for enhanced recreational boating access to the coastal waters of Bay County. This multi-year project was funded by Bay County; by the Florida Fish and Wildlife Conservation Commission through the Florida Boating Improvement Program and with additional support from the United States Fish and Wildlife Service Federal Aid in Sport Fish Restoration Program; and by the Florida Department of Environmental Protection, Florida Coastal Management Program pursuant to National Oceanic and Atmospheric Administration Award numbers NA07NOS4190071, NA06NOS4190129 and NA05NOS4191074.

The success of this project relied upon the individual contributions of various team members. Principal Investigators Charles Sidman and Robert Swett (Florida Sea Grant) were responsible for project administration, overall design of the questionnaire and correspondence, sample selection, the GIS database design, and reporting. Timothy Fik (Department of Geography, University of Florida) performed the statistical analyses. Susan Fann (Florida Sea Grant) conducted the content analysis of the primary detractions and needs questions. Alisa Coffin conducted the spatial analysis of seasonal use. Bill Sargent (FWRI) served as the Florida Wildlife Conservation Commission project liaison and contributed to the questionnaire, survey design, and reporting. David Fann was responsible for the questionnaire map layout and design, assisted with the cartography, and did the general density analysis. Brian Cameron coordinated the ramp surveys. Marcia Price, Diane Bateman, Brian Cameron, Marge Jump, and Randall Akins conducted the ramp surveys, which involved multiple visits over the course of a year. Dick Tudor and James Harrison of Smart Mail Inc. (Alachua, Florida) implemented the mailings. Susan Fann and Corina Guevara managed and processed spatial and attribute data from the returned surveys.

We especially thank the many boaters who donated their time to complete and return the questionnaires. It is our intention that this work will provide information products and outreach support of benefit to boaters who use Bay County waterways.

Abstract

Bay County faces the difficult yet critical management challenge of how to sustain economic viability while maintaining the integrity of its coastal environmental resources. Recreational boating needs and waterway access improvements figure prominently within this multi-faceted challenge. The County recognizes that effective coastal community planning requires the availability of pertinent and accurate information concerning on-water activities, using best technology and scientific methods. To meet this end, a recreational boating use study was recommended to document and map present marine facility and waterway usage. The recreational boating study described by this report resulted from a collaborative partnership between the Florida Fish and Wildlife Conservation Commission (FWC), the Bay County Department of Planning and Zoning, the Bay County Department of Parks and Recreation, the University of Florida Bay County Cooperative Extension Program, and the University of Florida Sea Grant College Program.

This report documents the methods, procedures, and findings of a map-based mail survey that was distributed in three waves (September 2007, January 2008, and May 2008) to 7,026 boaters using Bay County waters (with some participating boaters receiving up to three questionnaires over the year-long study period) to obtain seasonal information about their boating preferences, use profiles, and travel patterns. An additional 1,118 surveys were directly given to out-of-state boaters at Bay ramps at the time of use. For purposes of survey distribution and information analysis, boaters were categorized by waterway access type into marina (wet slip or dry storage), public ramp, or private dock user groups.

Questionnaire recipients were asked to mark the start and end points of their two most recent recreational boating trips, draw the associated travel routes, and identify boating destinations and activities along these routes. They were also asked to mark all areas of perceived congestion within the study area. Data collected from 1,787 returned surveys (86.3% of all returns from the three survey waves) were digitized into the ESRI ArcGIS geographic information system (GIS). This translated to a sample of 3,510 travel routes, 3,510 trip departure sites (origins), 5,630 boating destinations, and 1,645 congestion locations.

It is this spatial representation that serves to distinguish this study from previous efforts to characterize (i.e., profile and describe) boating patterns. Boaters drew hundreds of individual boating trips on provided maps. This spatial information and linked attributes were then entered into a GIS. Further descriptive data about the mapped trips, such as timing and vessel type, and independent data about the respondent's typical boating trips, including preferences determining departure sites and travel routes, frequency, and usual activities, can be linked to the data within the GIS, for further analysis.

Information products generated from this study include:

1. A profile of boaters who use Bay County waterways for recreation
2. A profile of the types of recreational vessels operated on Bay County waterways
3. A description and location of the types of recreational activities that take place on Bay County waterways

4. A description of boater preferences as to waterway access facility amenities
5. A summary of principal Bay waterway problems and needs perceived by Bay County boaters
6. Spatial data formatted within a GIS that can be used to map:
    a. service areas for Bay County boating facilities
    b. departure or launch sites
    c. water-based boating destinations and associated activities
    d. trip routes that define where Bay County boaters travel on the water
    e. areas of perceived waterway congestion;
7. An evaluation of seasonal aspects for many of the information products listed above.

This report is divided into three parts. Part 1 discusses the survey design, mailing implementation, and data collection. Part 2 presents the results of a statistical analysis of survey questions and compares seasonal differences in use among users of marinas (wet slips and dry storage facilities), ramps, and private docks. In addition, a content analysis of the two open-ended questions that ask about "detractions" and "needs" identifies issues important from the perspective of the Bay County boating community. Part 3 presents the results of spatial analyses of land-side and water-side use patterns. Overall ramp facility patronage is evaluated and mapped, as well as independent land-side patronage mapping for two of the busiest Bay ramps. In addition, a GIS density function identifies travel corridors, favorite destination locales and areas of perceived congestion.

Part 1-Study Design

1.1 Introduction

Background

Boating is a key element in Florida's coastal lifestyle and growth phenomena. Florida ranks first in the nation in recreational boat registrations, with 991,680 registered in 2007, according to the Florida Fish and Wildlife Conservation Commission (myfwc.com/law/boating/). On average, this represents approximately one boat for every 18 residents. Of equal note, Florida is the number one U.S. destination for marine recreation—including saltwater boating—with an estimated 4.3 million participants (Leeworthy & Wiley, 2001). Coastal development, the ever-increasing number of boaters, and the diversity of recreational boating activities that now take place within Florida's coastal bays, estuaries, and waterways have had positive economic impacts, but have also profoundly altered the coastal estuarine environment (Letson, 2002; Antonini, Fann & Roat, 1999). As demand for the use of Florida's waterways increases, so does the need for enhanced public access, maintenance of waterway infrastructure, public safety, and environmental protection. There is, however, little information available to resource managers and planners that describes the actual use patterns and preferences of the boating community.

Bay County, Florida's 27th most populous county, is a microcosm of Florida's growth phenomena. The County faces the difficult yet critical management challenge of sustaining economic viability while maintaining the integrity of coastal environmental resources. Recreational boating and waterway access figure prominently in this multi-faceted challenge. With 19,890 registered recreational boats in 2007 (myfwc.com/law/boating/), Bay County has almost one boat for every eight residents[1]. A projected population growth of 7.1% by 2020[2] foretells more demands for coastal access and marine resources, and its location in the western Florida Panhandle makes Bay County a likely destination for trailer boats from neighboring states. Given that recreational boating is a major contributor to Florida's economy (an estimated $18 billion annually[3]), a decline in access becomes a particularly pressing issue in the management challenge.

As demand for access to and use of Bay County waterways increases, so then does the need for a better understanding and detailing of present usage and its impacts. Bay County realizes that effective coastal planning requires the availability of pertinent and accurate information concerning on-water activities, using best technology and scientific methods.

For optimum utility, science-based data pertaining to recreational boating patterns should include spatially referenced detail. For example, an analysis of boat trip origins that includes the type of access facility, facility location, and number of users is necessary for informed policy decisions as to siting infrastructure (e.g., public ramps). The knowledge of boater activities and destinations facilitates planning with respect to both impact considerations and optimal waterway

[1] According to the Florida Legislature Office of Economic and Demographic Research (EDR.state.fl.us), the estimated Bay County population was 167,631 in 2007.
[2] According to the Bureau of Economic and Business Research (Florida Statistical Abstract 2007), the Bay County population is projected to reach 179,600 by 2020.
[3] Murray, T.J. Virginia Institute of Marine Science, Gloucester Point, Virginia. Personal communication on behalf of the Marine Industries of Florida (www.boatflorida.org).

use (e.g., dedicated water-sport areas). Finally, spatial analyses of boat traffic from origin through destination locales figure in such determinations as waterway service levels (e.g., dredging), and appropriate regulatory input. A scientific approach provides information for rational and objective planning to assure that future economic viability and environmental protection needs are balanced.

Study Goals and Objectives

The goals of the study were (1) to quantify and map public access facility use through an initial inventory of marina patrons and repeated identification of boat ramp users over the course of a year, and (2) to obtain information from boaters who use Bay County access facilities (including residential docks) and waterways regarding their preferences, activities, and water-use patterns. Specific objectives included (1) the development of spatial data sets within a geographic information system (GIS) to map boating patterns, and (2) the analysis of trip information provided by boaters to describe the preferences and behaviors of boaters who use Bay County waterways. Examples of the information products derived from the study are as follows:

1. A profile of boaters who use Bay County waterways for recreation, and characteristics of their trips (e.g. timing, frequency, and duration);
2. A profile of the types of recreational vessels operated on Bay County waterways;
3. A description of the types of recreational activities that take place on Bay County waterways;
4. A ranking of specific features and amenities which determine access facility and travel route selection by Bay waterway boaters;
5. An analysis of the principal waterway detractions and needs perceived by Bay boaters;
6. A compilation of spatial boating trip data within a GIS that can be used to map;
    a. departure or launch sites
    b. water and land-side service areas for Bay County boating facilities
    c. water-based boating destinations and associated activities
    d. trip routes on Bay County waters as reported by boaters
    e. areas of perceived waterway congestion
7. An evaluation of seasonal aspects for many of the information products listed above.

Information obtained from this analysis of recreational boating patterns can serve to advance objectives pertaining to a variety of waterway management issues. Examples of ways that boating pattern information can be used to improve public waterway access and aquatic resource management and to address boaters' concerns include the following:

1. Categorization and spatial representation of boater departure sites, routes, and destinations to address community concerns regarding waterway access, maintenance, signage, and facility siting;

2. Comparison of boating information with other spatial (GIS) data layers (e.g., environmental features, development patterns) to help guide resource and public safety management;
3. Identification of temporal and activity-derived spatial profiles to map boating pressure "hot-spots" on county waterways;
4. Identification of problems and needs in the Bay boater's experience, as input to management strategies, education programs, and communications products, targeting available resources to issues of greatest concern;
5. Determination of service areas for public launching facilities and the demand placed on those facilities from county residents and visitors.

The study process involved (1) the development of a survey instrument and accompanying correspondence; (2) the identification of boater groups by waterway access facility type; (3) the implementation of seasonal mail surveys to the targeted boater groups; (4) the construction of spatial databases from returned mail surveys identifying trip departure sites, destinations, travel routes, and congested areas, and (5) the determination of seasonal boating profiles. The process was consistent with previous boating pattern studies conducted by Florida Sea Grant and the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute for Tampa and Sarasota Bays (Sidman & Flamm, 2001; Sidman, Fik & Sargent, 2004); the Greater Charlotte Harbor (Sidman, Swett, Fik, S. Fann, D. Fann & Sargent, 2005); Sarasota County (Sidman, Swett, Fik, Fann & Sargent, 2006) and Brevard County (Sidman, Fik, Swett, Sargent, Fletcher, D. Fann, S. Fann, Coffin, 2007).

Study Region

The Bay County study region extends from the ICW confluence with East Bay (just outside the east county line), south to include many popular Gulf fishing reefs, west to the county line at Lake Powell, and north to creeks feeding West Bay and Deer Point Lake. This study region, as represented on the survey map, comprises roughly 1,276 square miles of the Gulf of Mexico, and another 106 square miles of interior Bay waters, Lake Powell, and the Deer Point Lake Reservoir (Figure 1). In addition to the 19,890 boats registered in the county[4], many thousands of boaters travel to the area from other Florida counties and from neighboring states. Recreational boaters are attracted to this region's protected waters, which provide excellent opportunities for small-craft boating, fishing and nature viewing, and picnicking/socializing along barrier island beaches and exposed sand spits. Access to the Gulf of Mexico offers further boating, fishing, and diving opportunities.

[4] Florida Fish and Wildlife Conservation Commission (myfwc.com/law/boating/).

Figure 1. Bay County Study Area

1.2 Mail Survey

Survey Instrument

The survey questionnaire developed for this study was patterned after similar, previous studies (Falk, Graefe, Drogin, Confer & Chandler, 1992; Sidman & Flamm, 2001; Sidman, et al. 2004; West, 1982; Sidman, et al. 2007) and was designed to (1) capture spatial information regarding trip departure sites, boating destinations, intervening travel routes, and congested areas; (2) characterize boaters with respect to the types of vessels owned and used, activity preferences, and the timing, frequency and duration of their recreational outings; and (3) identify problems and needs from the perspective of the boating community (see Appendix A for the survey instrument and associated correspondence).

The primary survey instrument was a two-sided 22 X 34 inch questionnaire that folded to 8.5 X 11 inches. Sequence numbers were appended that identified the user access group to which the recipient was linked. The questionnaire contained a map (~1:110,000 scale) of the Bay County boating region on one side; the reverse side consisted of 22 questions divided into the following topical areas:

1. Description of last two pleasure boating trips
2. Description of typical boating trips
3. Description of survey respondent

The following additional items were included with each mailed questionnaire:

1. A cover letter that explained the study
2. A postage paid return envelope with postal permit indicium
3. A mailing envelope that included return address and postage permit indicium

In addition, a 4 X 6 card was mailed approximately two weeks after each mailing as a reminder to survey recipients to complete and return the questionnaire.

The questionnaire asked survey recipients to mark, on the map-side, the location of departure sites, travel routes, and destination/activity sites associated with their last two pleasure boating trips. In addition, survey recipients were to mark locations at which they had experienced the most congestion, defined as “more boaters than they preferred.” Complementary questions on the text side of the survey allowed recipients to characterize their last two trips according to vessel type, the departure weekday, month, and time, and the time spent on the water. In addition, recipients were asked to characterize and name the departure sites for their last two trips and to rank reasons for departure site selection, where this differed from a home dock. With respect to typical trips, respondents were asked to give the number of days per month that they had operated their boats during the past year and the typical activities they had pursued. They were also asked to identify and rank reasons for selecting travel routes. Finally, a series of questions sought to characterize the respondent in terms of age and boating experience. This section also included two open-ended questions giving the Bay boater the opportunity to discuss detractions and needs in their boating experience.

A shortened secondary survey was sent in the second and third mail waves to those boaters who had returned the first survey. Survey size and map were unchanged in the short

version. However, the questions addressing typical boating trips and the respondent descriptors were omitted, as these responses were already known from the primary (long) survey. Only the questions pertinent to the last two pleasure boating trips were included.

Sample Design

The sample design was developed to include a diverse representation of recreational boaters, by targeting access facilities of three types: (1) marina wet slips and dry storage facilities, (2) private docks, and (3) public boat ramps. The design was also intended to provide group-specific information that could be used to compare and contrast use patterns among these three Bay boater groups.

A gross sample of 2,000 boaters for each of the three user groups was targeted, based on statistical analyses from previous surveys of southwest Florida boaters (Antonini, Zobler, Sheftall, Stevely & Sidman, 1994, Antonini, West, Sidman & Swett, 2000; Sidman & Flamm, 2001; Sidman, et al. 2004; Sidman, et al. 2006). Due to the relatively smaller number of marina patrons in Bay County, the minimum sample of 2,000 users was not achieved for this group. Ramp user numbers were also below target if the large number of out-of-state patrons were not included. Because this out-of-state subset could not be matched in the Florida VTRS identification (see "Identifying Ramp Patrons" below), we elected to give them surveys at the time of ramp observation, for a total of 1,118 surveys. An adequate sample, exceeding the 2,000 minimum, was identified for the home dock access group.

Mailed questionnaires were distributed to area boaters in three waves (see Table 3). The first, made up entirely of the long surveys, was mailed in early September 2007, the second in January 2008, and the third in May 2008. The second wave (January 2008) consisted of two survey types, both the long and the short versions. The latter went to those boaters from each of the three user groups who had completed and returned the first survey.[5] The original long survey was sent to ramp users newly observed during the months comprising the second seasonal ramp observation period. The third wave of surveys (May 2008) also consisted of two survey types. Again, the first consisted of the short survey to the same marina and dock users who had returned the original survey, as well as to the new second wave ramp users who had returned the long version for fall. The long survey went to those ramp users newly identified during the winter/spring months.

[5] It was determined that an abridged version of the survey, mailed to respondents who had already completed the longer version, would adequately capture seasonal trip information and reduce redundancy from answering certain general questions more than once.

Identifying Marina Patrons

In June 2007, Florida Sea Grant personnel visited dock masters and/or staff at twelve Bay County marinas (Figure 2) to promote study participation, and to learn by what means the survey distribution to respective patrons could be conducted. The wet slip and dry storage capacity for each marina was ascertained (Table 1), as well as current occupancy numbers. The Panama City Marina was able to provide patron names and addresses for FSG personnel to oversee mailings for all three seasonal waves. In the first mailing, 223 of the Panama City Marina addresses were validated as deliverable by US Postal Service software. Of these, 30.9%, or 69 surveys were completed and returned for further seasonal participation. The remainder of the marinas, primarily for privacy reasons, mailed surveys to their wet slip and dry storage patrons themselves. This meant that marina staff addressed and mailed a total of 1,205 stamped survey packets, which FSG had hand-delivered to the marinas (Table 1). These survey packets included a return postcard requesting the name and address of those respondents willing to participate in the two remaining seasonal mail outs, to be conducted by FSG. Of the 1,205, 14.2% were completed and returned, and half of these included name and address information for subsequent mailings.

Table 1. Bay County Surveyed Marina Occupancies and Survey Numbers

Surveyed Bay County Marinas/Yacht Clubs	Existing Berths		Current Use		Survey Distribution Number
	Wet	Dry	Wet	Dry	
Bay Point Marina	185	0	160	0	150
Bayside Marina	2	118	0	118	40
Mexico Beach Municipal	56	0	31	0	25
Laid Back Boat Club	50	0	45	0	45
Lighthouse Marina	30	300	20	280	225
Marquardt's Marina	33	0	22	0	40
Panama City Marina	240	0	225	0	223
Pier 98 Marina	26	0	22	0	25
Pirates Cove Marina	40	330	20	275	225
St. Andrew Marina	104	0	104	0	100
Sun Harbor Marina	100	0	90	0	80
Treasure Island	80	500	76	400	250
TOTALS	**946**	**1,248**	**815**	**1,073**	**1,428**

Figure 2. Bay County Marinas Surveyed

Identifying Ramp Patrons

FSG extension faculty and local individuals hired by FSG visited 33 area ramps (Figure 3) to collect license plate numbers associated with boat trailers and corresponding tow vehicles that were observed in ramp parking areas. An effort was made to sample all ramps on two to three weekend days per month. Using two to three data collectors on weekend days ensured that collection times at the multiple ramps could be concentrated in the high use period (mornings and early afternoons). Random weekday visits were also included but were more variable as to ramps visited and time of day. The collection period ran for one year (July 2007 – June 2008). 8 new and repeat users were observed (Table 2). Trailer and tow vehicle information was compared to vessel trailer and vehicle registration databases, to yield corresponding names and mailing addresses for ramp patrons. A total of 1,703 unique (non-repeat) ramp patrons, of 3,244 total tag entries (trailer/tow alone or in combination) recorded at ramps were identified for the first mailing conducted in September 2007 (Table 2). Another 663 unique (with respect to all users identified to that point) ramp patrons received a first time survey in January 2008, out of 1,108 total tag entries made from visits during September through December. Finally, 1,232 unique users received a first time survey in May 2008, identified from 2,108 total tag entries made from January 2008 through May 10, 2008. A total of 3,598 ramp users (from 6,460 tag entries) received a first time questionnaire. The subsets that returned surveys also received short surveys in fall and/or spring, for a total of 624.

Recognizing that out-of-state boaters are not included in the Florida VTRS, and anticipating a significant number of boaters coming from neighboring states to Bay area ramps, additional long surveys in plastic wraps were given directly to out-of-state boaters by the ramp data recorders when possible, or, more frequently, were placed on the windshield of vehicles with non-Florida tags. 1,118 were distributed in this manner. This group could not be sent follow-up short surveys, since name and address were not known.

Figure 3. Bay County Public Boat Ramps Surveyed

Table 2. Surveyed Bay County Ramps: Visit Numbers and Recorded Tag Counts

Ramp Name	Total Visits	Total Weekend Visits	Total Tag Count*	Total Weekend Tag Count	Avg. Tag Count per Weekend Visit
37th Street	36	33	156	138	4.2
Bayhead North	30	29	110	110	3.8
Bayhead South	30	29	95	95	3.3
Bob George Park	32	30	251	249	8.3
Bonita Bay Tyndall AFB	33	31	126	121	3.9
Burnt Mill Creek	30	22	169	130	5.9
BV Buchanan Park	21	17	85	79	4.7
Carl Gray Park	46	27	649	486	**18.0**
Cherokee Landing	30	29	332	324	11.2
Cook Bayou Marina	30	29	43	41	1.4
Davis Beach	32	31	317	317	10.2
Deer Point Draw Down	34	30	198	190	5.3
Dolphin Drive	47	29	176	101	3.5
Donaldson Point	32	31	80	80	2.6
Donald Penny	30	27	61	60	2.2
Earl Gilbert Park	33	31	196	188	6.1
High Point Landing	34	29	477	462	**15.9**
Howard	35	26	67	60	2.3
Ira Hutchinson	33	29	316	300	10.3
John B Gore Park	32	31	278	271	8.7
Lake Powell Recreation Area**	15	11	64	28	2.6
Leslie Porter Wayside Park**	40	31	403	332	10.7
Marina Civic Center	62	33	1,306	986	**29.9**
Maude Holmes	29	28	110	108	3.9
McCall-Everitt	35	31	145	126	4.1
McKenzie	32	28	79	69	2.5
Miramar	31	30	142	136	4.5
Overstreet	17	17	38	38	2.2
Safari Street	39	28	56	46	1.6
Shoreline Circle	33	27	146	132	4.9
St Andrew Marina	58	32	788	576	**18.0**
St Andrew SRA	55	30	1,372	792	**26.4**
Tharp's Landing	27	25	30	30	1.2
TOTALS	**1,133**	**921**	**8,861**	**7,201**	**7.8**

*Total number of trailer/tow vehicle observations at ramps over the entire survey period. If both trailer and tow tags were available for a given patron, this counted as a single "tag entry."

** Ramps where visits and/or tag counts were compromised by construction during significant portion of study period.

Identifying Home Dock Users

A sample of residential dock users was selected by matching owner names and mailing addresses contained in the VTRS to waterfront parcel owner and address information obtained from Bay County Property Tax records. Matches ensured that only those waterfront parcel owners who also owned boats were identified. A GIS 'select by location' analysis used a detailed shoreline to identify 9,711 waterfront properties from the Bay County tax assessor's parcel database. A GIS database operation that evaluated owner last name, street name, and the mailing street number yielded 2,137 matches between the VTRS records and waterfront parcels (Figure 4). A random sample of 2,000 private residences was selected to receive a survey from these 2,137 parcel-to-VTRS matches. Of the 412 returned surveys, 368 were appropriate for subsequent short survey mailings, to capture seasonal patterns.

Figure 4. Spatial Distribution of the Bay County Dock Sample

Survey Return Breakdown

Questionnaires were mailed in three waves, over a one-year period, to capture seasonal use patterns. Smart Mail Services Inc. validated boater addresses and conducted each mailing (apart from the first mailing conducted by marinas to their own patrons). Table 3 is a breakdown, by waterway access group, of the number of surveys mailed and returned for each seasonal mailing. While the marina and dock survey recipients were static for the 2nd and 3rd waves, the ramp group included repeat and first time recipients, along with out-of-state users who received long surveys at respective ramps. A total of 2,070 surveys were returned by August 8, 2008, which represented a 21.1% overall return rate.

Table 3. Survey Return Breakdown

September 2007 Survey Wave			
Facility Type	Total Mailed	Total Return	Return Rate (%)
Marina	1,428	240	16.8
Dock	2,000	414	20.7
Ramp (Short Survey)	N/A	N/A	N/A
Ramp (Long Survey)	1,703	282	16.6
Ramp (Out of State)*	500	41	8.2
Total	**5,631**	**977**	**17.4**
January 2008 Survey Wave			
Facility Type	Total Mailed	Total Return	Return Rate (%)
Marina	154	78	50.6
Dock	368	222	60.3
Ramp (Short Survey)	271	119	43.9
Ramp (Long Survey)	663	83	12.5
Ramp (Out of State)*	133	7	5.3
Total	**1,589**	**509**	**32.0**
May 2008 Survey Wave			
Facility Type	Total Mailed	Total Returns	Return Rate (%)
Marina	154	70	45.5
Dock	368	197	53.5
Ramp (Short Survey)	353	130	36.8
Ramp (Long Survey)	1,232	156	12.7
Ramp (Out of State)*	485	31	6.4
Total	**2,592**	**584**	**22.5**
*Surveys were given to out-of-state ramp patrons, not mailed.			

1.3. GIS Database Development

Spatial Database Design: Trip Origins, Travel Routes, and Destinations

Questionnaire recipients were asked to (1) mark the starting point of their last two pleasure boating trips on a map, (2) draw their entire travel routes, (3) identify destinations along those routes, and (4) annotate the map with abbreviations for their primary activities en route and/or at destinations. They were also asked to indicate by the letter "C" any places on the map they considered congested. Not all the returned surveys included spatial information or were of a quality to be digitized. Data collected from 1,787 surveys (86.3% of total returns, or 892 summer returns, 391 fall/winter returns, and 504 spring returns) were digitized into the ESRI ArcGIS geographic information system (GIS). This yielded a sample of 3,510 trip departure sites and travel routes (some respondents reported only one trip), 5,630 boating destinations, and 1,645 points of congestion (Table 4).

Table 4. Trip Features Digitized from Returned Surveys

Trip Features	Summer Returns	Fall/Winter Returns	Spring Returns	Totals
Origins	1,771	756	983	3,510
Destinations	2,705	1,254	1,671	5,630
Travel Routes	1,771	756	983	3,510
Congestion Spots	1,296	115	234	1,645

Spatial information was digitized 'on-screen' using a 1:24,000 scale shoreline, natural color Digital Orthophotograph Quarter Quadrangle (DOQQ) imagery, and the positions of marinas, ramps, navigation aids, and artificial reefs as background themes to enhance the accuracy of digitized data. Trip departure sites and congested spots were digitized as point features, with each record coded with the survey control number and the trip number (i.e., first or second trip). A marina or ramp origin was also coded as such, and identified with the map legend number for a given facility name. Destination/activity sites were digitized as point features and were coded with the survey control number, the trip number, and the type of activity. Travel routes were digitized as line features with the following attribute information coded: survey control number, trip number, and trip features such as one-way vs. round trip, and whether or not the trip was confined to the study region. Off-map trip attributes included ultimate destinations and associated activities.

The database structure allows information from survey questions to be linked to digitized spatial information via the survey control number (ID), which uniquely identifies spatial and attribute information provided by each survey respondent. The selection and display of destination point data within the GIS is illustrated in Figure 5. A close-up of the Shell Island boating area is displayed in the GIS view. Red dots represent all destination sites in the area identified by survey respondents for summer mailings. Blue dots represent a subset of destination sites with a beach picnic (BP) activity attribute. The Select by Attributes window—upper right corner of Figure 5—illustrates a GIS database query that selects and highlights in blue on the GIS view those destination points with a "beach picnic" attribute. The Selected Attributes of

Destinations window—lower left corner of Figure 5—displays a portion of the 151 linked database records in blue. These records share the query criterion of beach picnic (BP field highlighted in yellow).

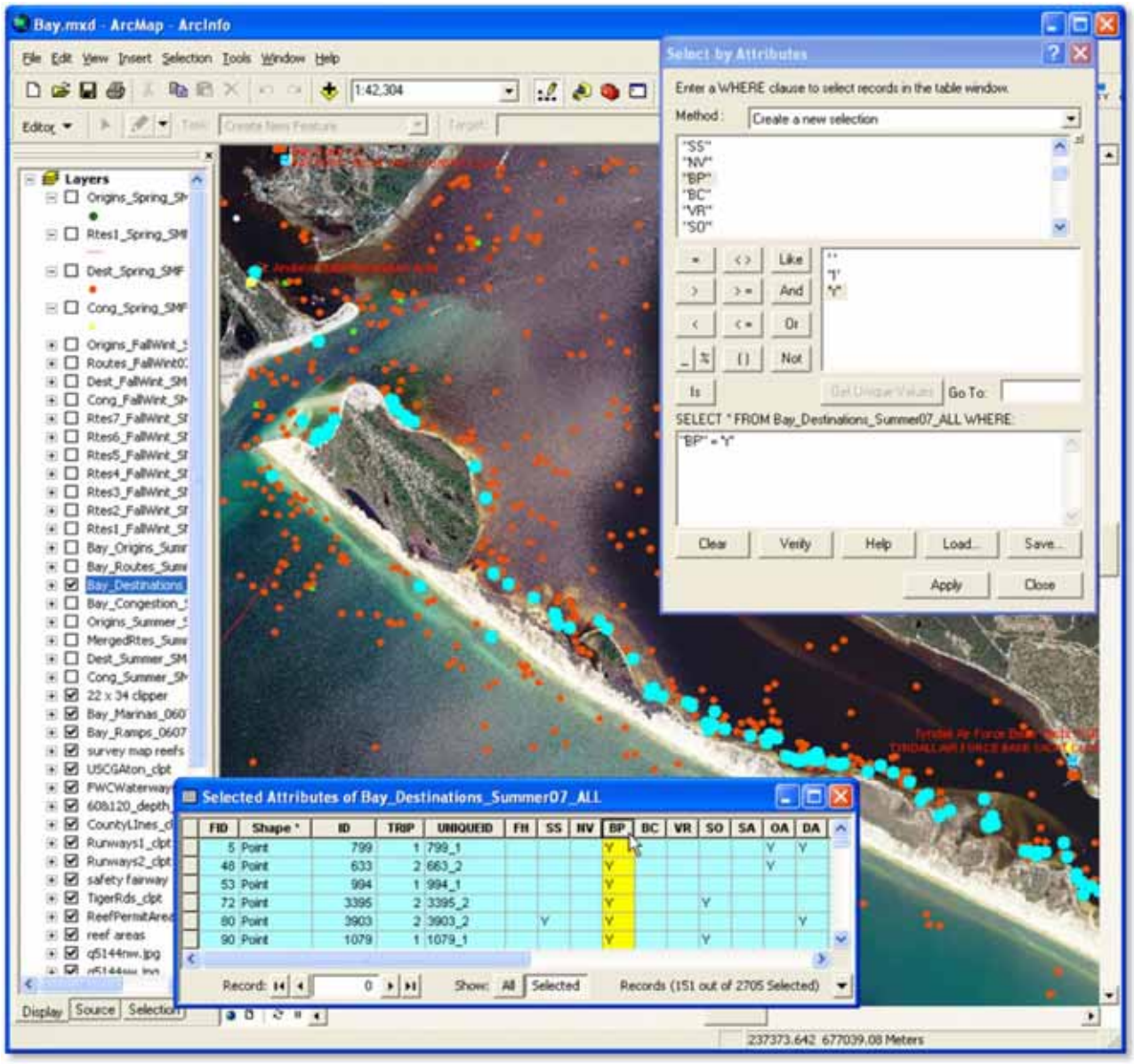

Figure 5. Example of GIS Attribute Query and Display: User Linked Destination Activity (Beach Picnic)

Reported summer travel routes within the Bay boating region are displayed in Figure 6. Pink lines represent travel routes digitized from returned surveys; green dots represent digitized departure sites. The blue lines depicted in the GIS view represent two travel routes that were selected for display. The corresponding database records that are linked to the two travel routes via the survey control number ID are shown in blue in the "Attributes of Routes" database window—lower center of Figure 6.

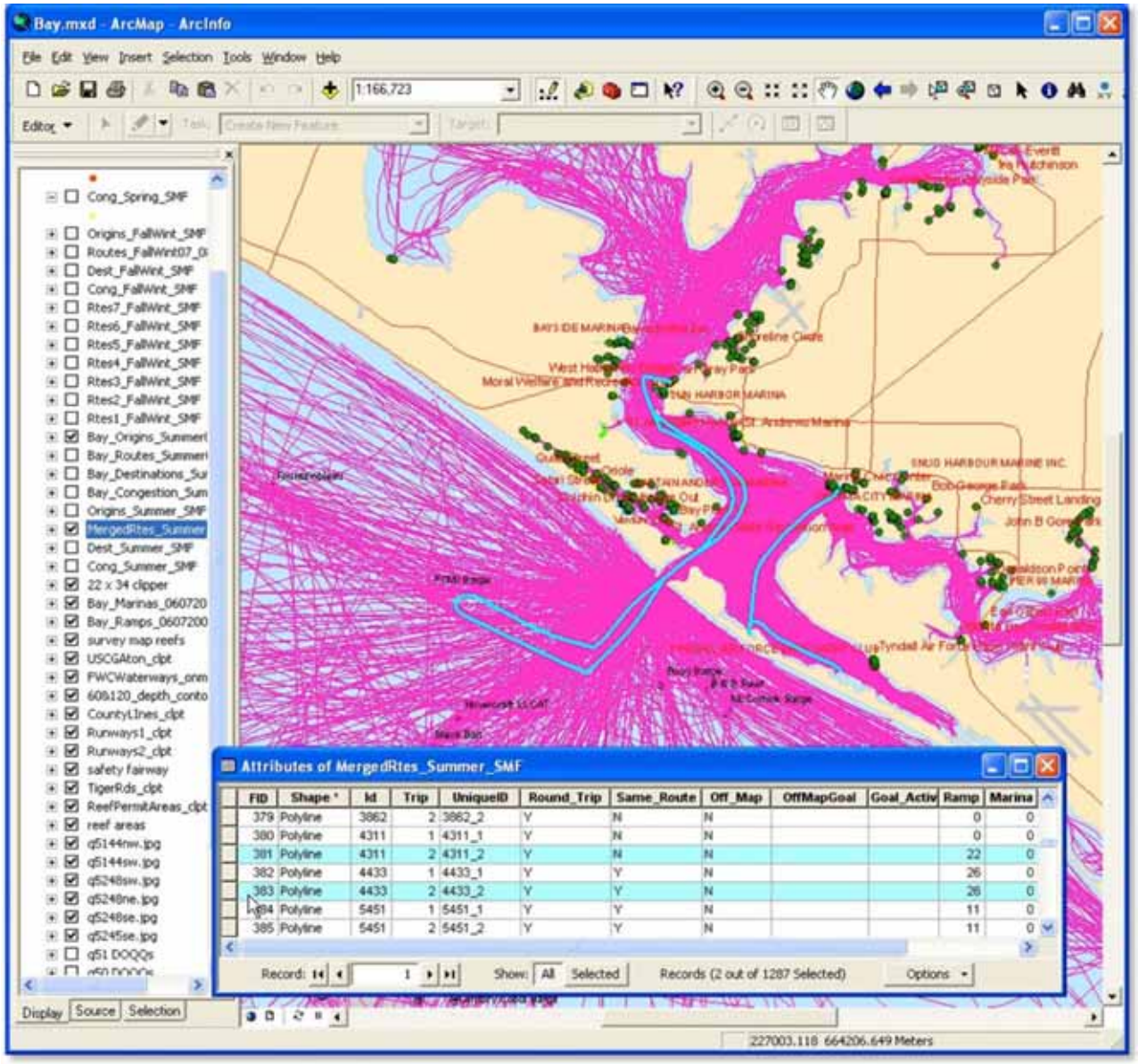

Figure 6. Example of GIS Attribute Query and Display: Reported Travel Routes

Part 2-Study Analysis

2.1. Boater-Group Characteristics

Overview

This chapter presents an evaluation and summary of responses from boaters in the Bay County study region to specific survey questions. The sections of this chapter are divided according to themes that describe (1) vessel and boater profiles; (2) choice rationale for selecting departure sites and travel routes; (3) drive time to departure sites; (4) boating activities; (5) reasons for avoiding specific departures sites; and (6) drive time to specific ramps by user group and residency. It should be noted that while questions were arranged to follow a logical progression on the survey instrument, the following results and corresponding discussion sections are arranged thematically and, therefore, questions do not necessarily follow the order in which they appeared on the survey instrument. The descriptive analysis presented in this chapter is based on information obtained from N=2,060 surveys returned by July 28th, 2008. Each survey typically describes two boating trips, and, therefore, several questions (Questions 1-8, 11) embody two responses, one for each trip. The number of survey responses to specific survey questions or combinations of questions varies from question to question, as does the sample size associated with the various user groups responding to those questions. For convenience, the sample sizes are listed within each summary table. A copy of the survey instrument is provided in Appendix A.

Vessel and Boater Profile: Access Type, Vessel Type, and Experience

Frequency counts and a percentage breakdown of survey responses by waterway access categories (WAC) are shown in Table 5. Of the n=3,587 survey responses to Question 7 – departure site type for reported trips – approximately 50% indicated a Boat Ramp. Those indicating Docks accounted for roughly 27% of survey responses. Together, these two groups accounted for well over 75% of the survey responses to Question 7. Trips originating from Marina Wet Slips accounted for about 15% of the survey responses, while those from Marina Dry Storage facilities accounted for slightly more than 7%. Survey responses associated with Shoreline/Causeway departures accounted for less than 2% of the sample. (Table 5; Q7)

Table 5. Survey Response by Waterway Access Category (WAC)

Access Category	Frequency Count	Percentage of total	Rank
Boat Ramp	**1,771**	**49.37%**	**1**
Dock	**964**	**26.87%**	**2**
Shore/Causeway/Other	55	1.53%	5
Marina Wet Slip	536	14.94%	3
Marina Dry Storage	261	7.28%	4

n = 3,587 responses to Question 7

A summary of the vessels used by Bay County survey respondents in reported trips is given in Table 6. Of the n=3,564 survey responses to Questions 5 and 6, 45% fell into the Open Fisherman category (which was the most common vessel category found amongst survey participants), followed by Offshore Sport Fisherman at 15% and Power Cruisers at 11%. These three vessel types accounted for roughly 71% of all vessels used by Bay County survey respondents who reported trips in Question 5 of the survey. The Speedboat (Runabout) and Sailboat (with Cabin) categories each accounted for around 7% of the vessels used by survey respondents, placing a distant fourth and fifth place, respectively. Note that Cabin-less Sailboats, Speedboats of the Cigarette variety, and the Kayak/Row/Canoe category were all associated with less than 1% of the trips reported by survey respondents. (Table 6; Question 5 and 6).

Table 6. Vessels Used by Survey Respondents for Reported Trips

Vessel type	Frequency count	Percentage of total
Jet Ski	125	3.51%
Kayak/Row/Canoe	30	0.84
Sailboat (no Cabin)	34	0.95
Sailboat (with Cabin)	**233**	**6.54**
Speed Boat (Runabout)	**268**	**7.52**
Speed Boat (Cigarette)	30	0.84
Open Fisherman/Flat/Skiff/John boat	**1,605**	**45.03**
Off-Shore Sport Fisherman	**533**	**14.96**
Power Cruiser (with Cabin)	**396**	**11.11**
Deck Boat	122	3.42
Pontoon Boat	135	3.79
Other*	53	1.49

Note: Top-5 vessel types highlighted in bold.

* Includes: bass boat, WA cuddy, catamaran, Admiral's gig, airboat, trawler, pilot house, head boat, lobster boat, inshore fisherman, modified Tremblay mullet boat, shrimp boat, wakeboard cruiser types

Average length and draft statistics for vessels used in reported trips by survey respondents (Question 6) are shown in Table 7. The survey results reveal that the average vessel length was 33.6 feet for Marina Wet Slip users, followed by Marina Dry Storage and Dock users at 24.8 and 23.8 feet, respectively. Not surprisingly, the shortest vessel lengths were associated with trip origins from Boat Ramps (19 feet) and Shoreline/Causeway (19.5 feet). In all cases, the median vessel length was very similar to the average vessel length, indicating a fairly symmetrical distribution of values.

Similarly, the average and median vessel drafts were highest for trips departing from Marina Wet Slips (with a mean and median draft of 3.5 feet), followed by Marina Dry Storage facilities (with a mean and median draft of 2 feet) and Docks (with a mean and median draft of just under 2 feet). As expected, the shallowest draft vessels were associated with trips departing from Boat Ramps and Shoreline/Causeway, with a mean vessel draft of approximately 1.3 and 1.5 feet, respectively. The median draft for Ramp boats was 1.1 foot, and the median draft for Shoreline/Causeway vessels was 1 foot.

Based on the n=3,528 responses to survey Question 6 (vessel length) and Question 7 (Water Access Category—WAC), it was shown that the mean vessel length was approximately 23 feet, with a median vessel length of 21 feet. Of the 3,305 responses to Question 6 (draft) and Question 7 (WAC), the mean vessel draft was shown to be 1.8 feet, and the median vessel draft was 1.5 feet. Note that the deepest vessel drafts were associated with trips originating from Marina Wet Slips, with a mean and median draft of 3.5 feet. (Table 7; Question 6)

Table 7. Length and Draft Statistics, by Water Access Category for Reported Trips

	Length (ft.)			Draft (ft.)		
Access Category	**Count**	**Mean**	**Median**	**Count**	**Mean**	**Median**
Boat Ramp	1,735	19.0	19	1600	1.32	1.1
Dock	949	23.8	23	896	1.93	1.8
Shore/Causeway/Other	55	19.5	18	49	1.58	**1.0**
Marina Wet Slip	528	33.6	34	512	3.52	3.5
Marina Dry Storage	261	24.8	24	248	1.97	2.0
Overall	n=3,528	22.9	21	n=3,305	1.88	1.5

Table 8 shows summary statistics on the number and percentage of survey trips, by access type, made by Bay County residents versus nonresidents, as based on the responses to Questions 7 and 8. Roughly 79% of trips overall were associated with Bay County residents.

Well over 90% of Dock and Shoreline/Causeway trips were made by Bay County residents, and about 80% of trips departing from Boat Ramps were by residents. Survey trips departing from Marina Wet Slips and Marina Dry Storage facilities represented the lowest percentages of residents within the various waterway access categories, with 62% and 55% made by Bay County residents, respectively. (Table 8; Question 8)

Table 8. Breakdown of Residents vs. Nonresidents, by Water Access Category for Reported Trips

	Frequency Counts		
Access Category	**Non-resident**	**Resident**	**% Resident**
Boat Ramp	350	1411	80.1%
Dock	67	893	93.0%*
Shoreline/Causeway/Other	2	53	96.3%
Marina Wet Slip	203	331	61.9%**
Marina Dry Storage	116	145	55.5%**
Overall	738	2833	79.3%

n=3,571 responses to Questions 7 and 8

* Significantly greater than overall average of 79.3% at 95% confidence level.
** Significantly less than overall average of 79.3% at 95% confidence level.

Summary statistics for years of boating experience of Bay County survey participants are shown in Table 9. A graph of the distribution of values is shown in Figure 7. Survey respondents had, on average, approximately 18.8 years of recreational boating experience, with a median of 16 years of boating experience. The most common answer to Question 18 among the n=1,200 survey responses was 20 years boating experience (the mode).

It was estimated that the mean number of years of boating experience among survey respondents was somewhere between 18.2 and 19.4 years overall, based on the estimated 95% confidence interval for the mean. The maximum reported number of years of boating experience was 75 years, and the minimum number was 0.1year (roughly 5 weeks). (Table 9; Question 18)

Table 9. Years Boating Experience in Florida (All Survey Respondents)

Statistic	Boating experience (years)
Average (overall)	**18.8**
Standard Deviation	14.3
Minimum	0.1 (or approx. 5 weeks)
Maximum	75
Median (overall)	16
Mode	20
95% Confidence Interval	18.2–19.4

Statistics based on n = 1,200 survey responses to Question 18

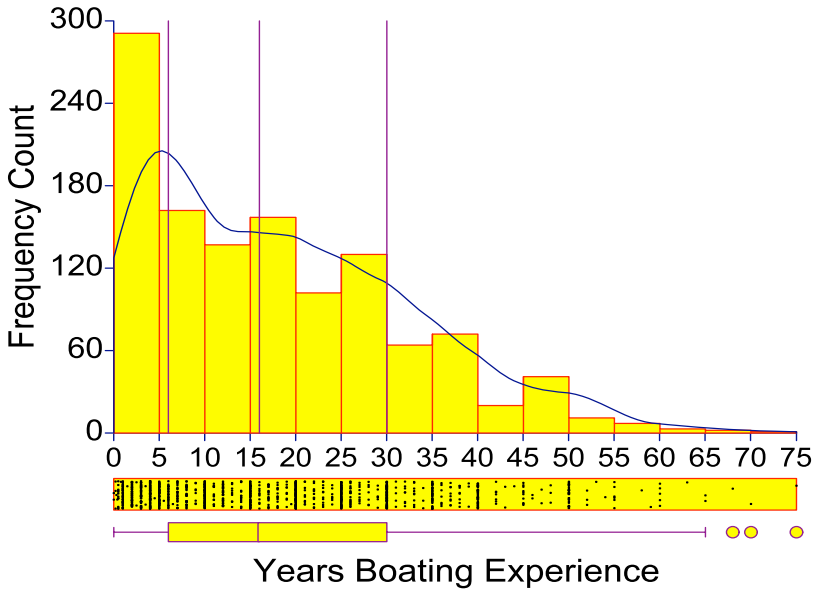

Figure 7. Histogram and Box Plot of Years Boating Experience

Survey respondents who accessed the water from home and condominium Docks tended to have the greatest amount of boating experience, with 21.7 years operating experience, on average. All other respondents from the remaining waterway access groups had an average number of years boating experience that was either not significantly different from the overall average or an average that fell below the overall average for all survey respondents [when compared to the overall mean operating experience equaled 18.8 years and a median of 16 years, as shown in Table 9].

Boaters departing from Marina Dry Storage facilities tended to have the least amount of boating experience – an average of 15 years, and a median of 12 years of boating experience. Moreover, Marina Dry Storage facility users who participated in the survey tended to have significantly less boating experience than boaters departing from all other waterway access groups. (Table 10; for Questions 7 and 18)

Table 10. Years of Boating Experience by Waterway Access Category

		(in years)				
Reported Trip Access Category	**n**	**mean**	**sdev.**	**Median**	**min**	**max**
Boat Ramp	***1,240***	***18.1***	***14.1***	***15***	***0.1***	***90***
Dock	**507**	**21.7****	**14.2**	**20****	**0.5**	**65**
Shoreline/Causeway	36	18.8	12.5	18	2.0	68
Marina Wet Slip	349	17.5	14.5	15	0.5	70
Marina Dry Storage	**186**	**15.0***	**12.2**	**12***	**0.2**	**59**

Results are based on n = 2,318 survey responses to Questions 7 and 18 for the Waterway Access Categories listed above.

***** Denotes less-than-average experience—values that are significantly less than the overall mean of 18.8 years at the 95% confidence level, with median values < 16 years. Also, significantly less boating experience than all other waterway access groups.

****** Denotes greater-than-average experience—values that are significantly greater than the overall average of 18.8 years at the 95% confidence level, with median > 16 years.

Statistics, by reported trips, on the percentage of survey respondents who have completed a boater safety or seamanship course (based on responses to Questions 7 and 19) are given in Table 11. For roughly 58% or 1,405 of the n=2,430 reported trips, respondents indicated that they had had a boating safety or seamanship course.

Boaters launching from Boat Ramps tended to be less likely to have had a boating safety or seamanship course. The percentage of boaters from this group having completed a seamanship course is significantly less than the overall average of 57.8%.

Survey respondents accessing the water from Marina Wet Slips were the most likely to have had a boating safety or seamanship course (75.5%); followed by boaters departing from Marina Dry Storage facilities (67.2%), Docks (65.3%), and Shoreline/Causeway (63.8%). The percentage of boaters that had completed a seamanship course from each of these four categories is found to be significantly greater than average. (Table 11; Question 19)

Table 11. Boaters Having Completed a Boat Safety/Seamanship Course, by Waterway Access Category

Reported Trip Access Category	n	Yes	percentage	Above Average*
Boat Ramp	1,259	660	52.4	%** No
Dock	**508**	**332**	**65.3%**	**Yes**
Shoreline/Causeway	**36**	**23**	**63.8%**	**Yes**
Marina Wet Slip	**351**	**265**	**75.5%**	**Yes**
Marina Dry-Storage	**186**	**125**	**67.2%**	**Yes**
Overall	n=2,430	1,405	57.8%	

Results are based on n = 2,430 survey responses to Questions 7 and 19 for the Waterway Access Categories listed above.

* Yes indicates a significantly above average percentage at the 95% confidence level.
** Indicates significantly less than the average percentage at the 95% confidence level.

A breakdown of the age of survey participants by trip access type is given in Table 12. The distribution of age for the n=2,334 responses to Questions 7 and 20 is illustrated in Figure 8. Survey respondents were 55 years of age on average, with a standard deviation of approximately 12½ years. Note that 55 years of age was also the median age of survey respondents.

Respondents who accessed the water from Marina Wet Slips and Marina Dry Storage facilities tended to be of an average or median age not significantly different from the overall average or median age of approximately 55 years.

Respondents launching from Docks or the Shoreline/Causeway were found to be roughly 4-5 years older than the average respondent. The average or median age of respondents in these two categories was significantly higher than the overall average or median value of 55 years (at the 95% confidence level).

Survey respondents launching from public Boat Ramps tended to be about 4 years younger than the average respondent, and about 7-8 years younger than respondents departing from Docks or the Shoreline/Causeway. The average (median) age of survey respondents departing from Boat Ramps was 51.7 (51) years. Both the average and median ages for respondents in this category were found to be significantly less than the average and median ages of all survey respondents. (Table 12; Question 20)

Table 12. Age of Boaters by Waterway Access Category

Reported Trip Access Category	n	(in years) Average	Std. Dev.	Median	Min	Max
Boat Ramp	1,259	51.7**	12.1	51**	17	95
Dock	**504**	**60.1***	**12.1**	**61***	**18**	**88**
Shoreline/Causeway	**36**	**59.0***	**12.9**	**58.5***	**35**	**87**
Marina Wet-Slip	349	57.1	10.7	58	24	84
Marina Dry Storage	186	55.4	10.5	57	23	79
Overall	n=2,334	55.2	12.5	55	17	95

Results are based on n = 2,334 survey responses to Questions 7 and 20 for Waterway Access Categories listed above.

* Denotes above-average or significantly larger median value (95% confidence)

** Denotes below-average or significantly smaller median value (95% confidence)

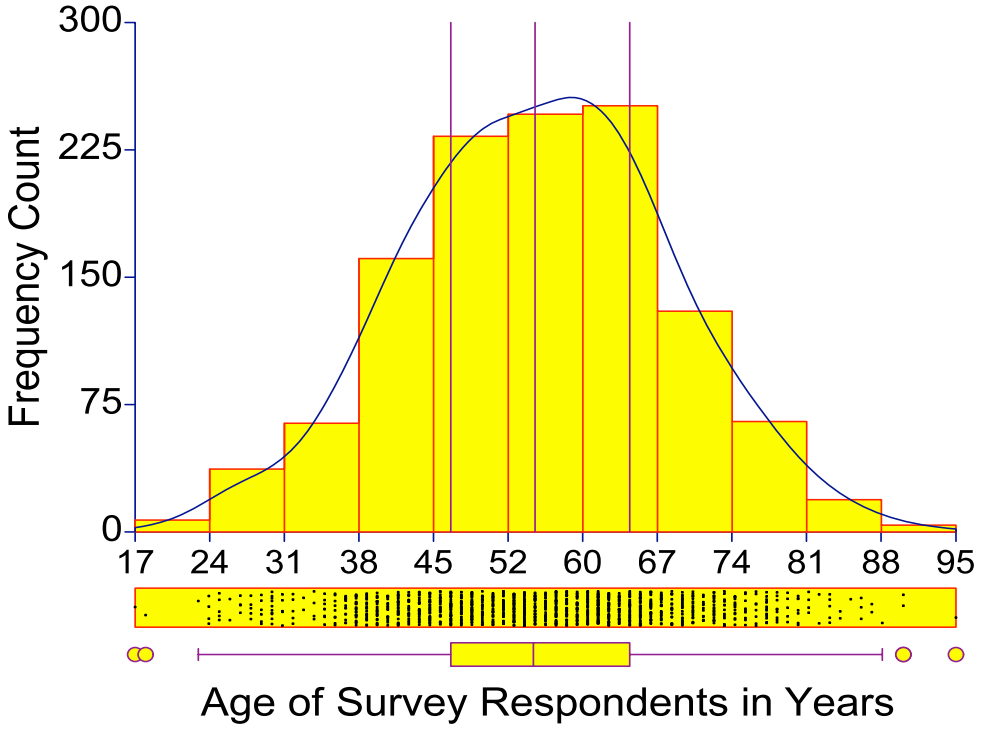

Figure 8. Histogram and Box Plot showing the Age of Survey Participants

Summary statistics on Drive Time from home to departure sites are shown in Tables 13 and 14 for survey respondents that completed Questions 7 and 11, and those that departed from a public Boat Ramp, Marina Wet Slip, or Marina Dry Storage Facility. Two tables are provided to differentiate between all reported drive times – including those with large outlying values (shown in Table 13) and drive times that are less than or equal to 3 hours in length (see Table 14). The distribution of drive-time values associated with Table 14 (i.e., for drive times of three hours or less) is illustrated in Figure 9.

The large standard deviations associated with the drive time statistics and the large differences between mean and median drive times in Table 13 suggest the presence of large outliers (long drive times). The overall mean drive time to a departure site is approximately 53 minutes including the outliers (Table 13), whereas the mean drive time to departures site of less than three hours is roughly 29 minutes (Table 14).

On average, survey respondents departing from Marina Wet Slips or Marina Dry Storage facilities were shown to have drive times 25-50 minutes greater than the overall average drive time to a departure site for all respondents (see Table 13). The distribution of drive-time values shown in Figure 9 (for respondents traveling three hours or less) and the summary statistics shown in Tables 13 and 14 highlight the fact that the vast majority of respondents have a median drive time of 20 minutes or less to their departure sites. Nevertheless, there is a fairly sizeable contingent of respondents – about 7% – that travel fairly great distances—in excess of 300 minutes (or 5 hours) to gain access to their departure locations (see summary statistics in bottom half of Table 13). Note that this sub-sample tends to distort the average drive time statistics.

- Boaters/respondents departing from Marina Dry Storage facilities tend to have the longest drive times to their point of departure (with drive times that exceed 100 minutes, on average).

- Survey respondents departing from Boat Ramps tended to travel an average of approximately 39 minutes from home to their launch site, a value that is significantly less than the typical respondent's drive time for the three user categories examined. Note that the maximum reported drive-time distance for a Boat Ramp user was 1,200 minutes or 20 hours.

- Survey respondents departing from Marina Wet Slips were shown to travel approximately 78 minutes, on average, from their home to the Marinas from which they departed, with a median drive time of roughly 20 minutes. The difference in the mean and median drive time values for this water access category is attributable to the fact that the distribution of drive-time values is highly (positively) skewed (due to the presence of extreme or outlying values). The presence of large outlying values also accounts for the relatively large standard deviation associated with this category of respondents (approximately 144 minutes).

- Note that the reported maximum drive time from home to a Marina Wet Slip was 1,020 minutes or 17 hours. Moreover, Marina Wet Slip users tend to have drive times that are somewhere between 10 and 40 minutes greater than the drive time of the average respondent based on the 95% confidence interval for mean drive time.

- Respondents departing from Marina Dry Storage facilities tended to travel, on average, 102 minutes from their homes to the facilities from which they launched their boats. Note that the average drive time from home to Marina Dry Storage facilities is significantly greater than the overall average for the three water access categories examined in this section. The reported maximum drive-time distance from home to Marina Dry storage facilities was 1800 minutes (or 30 hours). On average, respondents launching from Marina Dry Storage facilities tend to travel between 70 and 133 minutes from home to their departure sites based on the estimated 95% confidence interval. (Tables 13 and 14; Questions 7 and 11)

Table 13. Drive Time from Home to Departure Site for Reported Trips (in minutes)

		(in minutes)				
Reported Trip Access Category	**n (trips)**	**Mean**	**Std. Dev.**	**Median**	**Max**	**95% Confidence Interval**
Boat Ramp	1,241	39.5**	79.0	20	1200	35.1–43.9
Marina Wet-Slip	332	78.7*	144.1	20	102	63.2–94.2
Marina Dry Storage	184	102.1*	215.8	20	1800	70.7–133.5
Overall	n=1,757	52.9	116.0	20	1800	47.5–58.3

Summary statistics for survey responses with drive times to departure sites > 3 hours:
Sub-sample size n = 118 (6.7% of responses to Question 7 and 11 indicated drive times > 3 hours)
Mean = 389.4 minutes (6.5 hours); standard deviation = 259.9 minutes
Median=325 minutes (5.4 hours)
95% confidence interval for mean drive time: {342.0 to 436.83 minutes}

Mean (median) by Waterway Access Category, shown in minutes:
Boat Ramp = 360.7 (310)
Marina Wet Slip = 388.5 (315)
Marina Dry Storage = 434.6 (330)
* mean is significantly greater than overall average at 95% confidence level;
** mean is significantly less than overall average at 95% confidence level

Table 14. Drive Time from Home to Departure Site for Reported Trips (in minutes) for Drive Times ≤ 3 hours

Reported Trip Access Category	n (trips)	(in minutes) Mean	Std. Dev.	Median	Max	95% Confidence Interval
Boat Ramp	1,195	27.2	29.8	15	180	25.5–28.9
Marina	290	33.8	39.9	15	180	29.2–38.4
Wet-Slip Marina Dry Storage	154	32.5	45.9	15	180	30.1–44.7
Overall	n=1,639	29.1	33.6	15	180	27.5–30.8

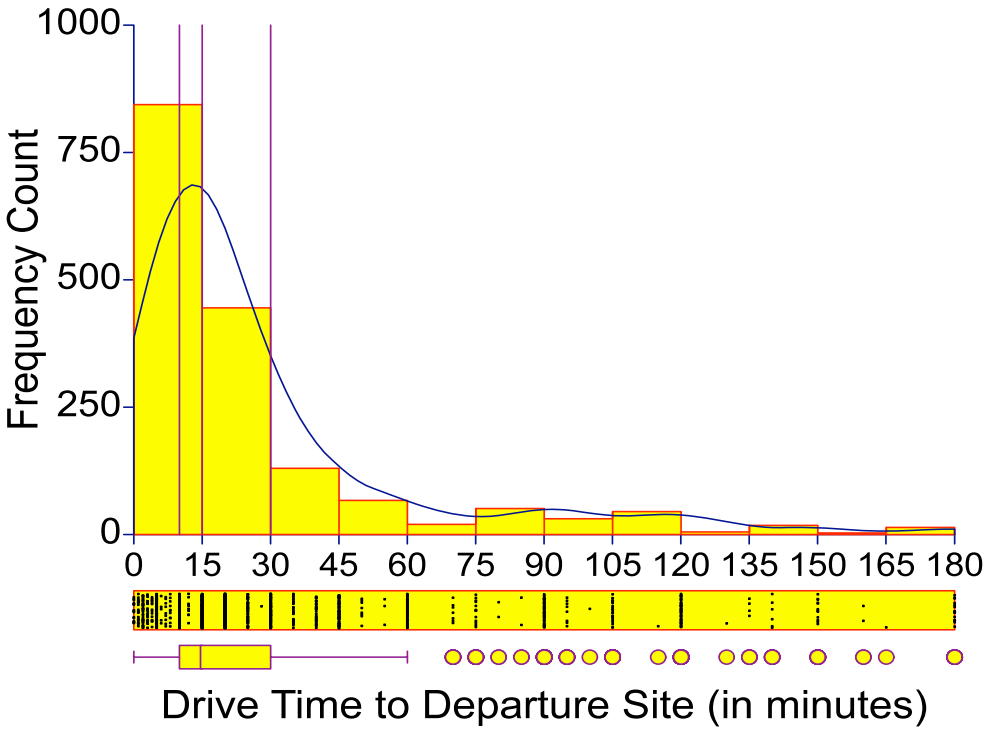

Figure 9. Histogram and Box Plot of Drive Times for Boaters Traveling *Three Hours or Less* to Departure Sites

Statistics on departure times are shown in Table 15. Note that the average AM and PM start times for reported trips by survey respondents (in response to Question 1) were highly variable amongst the various waterway access categories.

Survey respondents departing from public Boat Ramps were shown to launch earlier than their counterparts during the morning hours (with an average start time of 7:53AM); and tended to depart later during the afternoon hours (around 2:38PM). In general, Boat Ramp users who participated in the Bay County survey had AM starting times that were significantly earlier than the average starting time of 8:12AM; and an average PM starting time of 2:38PM, a value that was not significantly different from that of the overall average of 2:26PM.

On average, survey respondents departing from Docks, Marina Wet Slips, and the Shoreline/Causeway tended to begin their AM trips later than the average respondent, with departure times that were significantly later than the overall average start time of 8:12AM. Respondents departing from Marina Wet Slips, Docks, and the Shoreline/Causeway tended to have average PM departure times ranging from 2:11PM to 2:41PM, values that were not significantly different form the overall average afternoon departure time of 2:26PM.

Survey respondents departing from Marina Dry Storage facilities, on average, started their morning trips at 8:18AM (a start time that was not significantly different from the overall average of 8:12AM). Note, however, that the average PM launch time for Marina Dry Storage users was 1:32PM—indicating a start time that is significantly earlier than the overall afternoon average of 2:26PM. (Table 15; Question 1-AM, 1-PM and Question 7)

Table 15. Average Trip Departure Time by Waterway Access Category

Reported Trip Access Category	n (trips)	Average AM hour	Average AM time	n	Average PM hour	Average PM time
Boat Ramp	***1,510***	***7.89***	***7:53****	***177***	***2.64***	***2:38***
Dock	654	8.71	8:42**	246	2.49	2:29
Shoreline/Causeway	49	9.01	9:01**	5	2.69	2:41
Marina Wet Slips	402	8.41	8:25**	116	2.18	2:11
Marina Dry Storage	230	8.30	8:18	30	1.53	1:32*
All Groups	n=2,845	8.20	8:12 AM	574	2.43	2:26 PM

* Denotes a trip departure time that is significantly earlier than the average start time for all waterway access groups (at the 95% confidence level).

** Denotes a trip departure time that is significantly later than the average start time for all waterway access groups (at the 95% confidence level).

On-water trip duration statistics by WAC are shown in Table 16 for trips that are equal to or less than 24 hours (i.e., for trips characterized as "day trips"). The summary statistics in this section are based on the n=3,197 responses to Questions 2 and 7 of the survey instrument. Note that the average overall day-trip duration for survey participants was 5.85 hours (or 5 hours and 51 minutes).

Survey respondents departing from Marina Wet Slips and Boat Ramps tend to spend more time on the water than those accessing the water from other types of access (for reported trips of 24 hours or less in duration). Boaters/respondents from these two groups tend to spend anywhere from about 30 to 45 minutes more on the water than the typical survey respondent. Respondents departing from Marina Wet Slips were shown to have a mean day-trip duration of roughly 6½ hours, and those departing from public Boat Ramps had a mean trip duration of 6.17 hours (or 6 hours and 10 minutes).

Boaters departing from private Docks were shown to have an average day-trip duration of just under 5 hours—a value that was markedly below the average day-trip duration of survey respondents in all waterway access categories. Survey trips which departed from the Shoreline/Causeway had day-trip durations of approximately 5 hours; values that were also well below the overall average. (Table 16; Question 2)

Table 16. Trip Duration: On-Water Travel Time by Waterway Access Category (All Reported *Day Trips*; Trip duration ≤ 24 hours)

Reported Trip Access Category	n (trips)	(in hours) mean	95% C.I.	median
Boat Ramp	1,627	6.17*	6.05-6.29	6
Dock	879	4.90**	4.70-5.10	4**
Shoreline/Causeway	52	5.06**	4.48-5.64	5**
Marina Wet Slip	395	6.58*	6.22-6.94	6
Marina Dry Storage	244	5.98	5.63-6.33	6
Overall	n = 3,197	5.85	5.75-5.95	6

*Denotes above-average on-water travel time/trip duration (a value that is significantly greater than the average of 5.85 hours at the 95% confidence level).

**Denotes a below-average on-water travel time/trip duration (a value that is significantly less than the average of 5.85 hours at the 95% confidence level) or median value significantly less than the overall median of 6.

On-water trip duration statistics by waterway access category are shown in Table 17 for trips that are greater than 24 hours in duration; i.e., trips characterized as "overnighters". Note that only reported trips that exceeded 24 hours in duration, but were less than or equal to 168 hours (or 7 days in length) were considered. The 168-hour cut-off point was employed to lessen the impact of extreme or outlying values. The results are based on the responses to Questions 2 and 7 of the survey instrument.

The average reported overnight trip for all waterway access categories was approximately 50.3 hours in duration (or approximately 2.1 days), with a median overnight trip duration of 48 hours (or 2 days). Boaters/respondents departing from Marina Wet Slips tend to spend slightly more time on the water than the average respondent for trips that exceeded 24 hours in duration and were less than or equal to 168 hours. Survey respondents departing from Marina Wet Slips reported overnight trip durations that averaged 56 hours (or roughly 2.3 days). Survey respondents launching from private Docks or from Shoreline/Causeways reported overnight trips of 57.6 hours in duration.

Overnight trips reported by boaters launching from Boat Ramps were 38.5 hours in duration (or about 1.6 days in length). The average reported overnight trip duration for respondents departing from Boat Ramps was found to be significantly less than the overall average trip duration of 50.3 hours or 2.1 days. The median overnight trip duration for respondents from this user group was found to be 32 hours or roughly 1.3 days in length. (Table 17; Question 2)

Table 17. Trip Duration: On-Water Travel Time by Waterway Access Category (All Reported *Overnight Trips*; Trip duration > 24 hours and ≤ 168 hours)

Reported Trip Access Category	n (trips)	(in hours) mean	95% C.I.	median	max
Boat Ramp	105	38.5*	34.3 – 42.6	32*	144
Dock	60	57.6	50.1 – 65.1	48	168
Shoreline/Causeway	3†	57.6	NA	72	72
Marina Wet Slip	125	56.0**	51.9 – 60.1	48	168
Marina Dry Storage	14	54.3	42.6 – 66.0	48	96
Overall	n = 307	50.3	47.5 – 53.1	48	168

* Denotes an on-water overnight travel time/trip duration that is significantly less than the average of 50.3 hours at the 95% confidence interval (or median < 48 hours).

** Denotes an on-water overnight travel time/trip duration that is significantly greater than the average of 50.3 hours at the 95% confidence interval.

† Small sample (not able to statistically evaluate)

Statistics for weekday versus weekend trips (from responses to Questions 3 and 7 of the survey instrument) are shown in Table 18. Of the n=3,515 reported trips, approximately 40.5% were weekday trips (taking place between Monday through Friday) and 59.4% were weekend trips (taking place on Saturday or Sunday).

Survey respondents launching from Docks or the Shoreline/Causeway tend to have a higher percentage of weekday trips and a lower percentage of weekend trips in comparison to the overall average or the typical respondent from other water access categories. Almost two-thirds of reported trips by Boat Ramp users took place on the weekend days (Saturday and Sunday). In general, respondents departing from Boat Ramps tended to have a lower overall percentage of trips on weekdays, and a higher percentage of their trips during the weekend. Boaters/respondents launching from Marina Dry Storage facilities had use patterns that mirrored the overall average with about 41% of their trips falling on weekdays and 59% of their trips on weekend days. A statistically similar pattern was observed for boaters/respondents departing from Marina Wet Slips.

Adjusting for the number of weekday versus weekend days (5 vs. 2 days), the typical weekend day (Saturday or Sunday) was associated with 3.6 times more reported trips per day than the typical weekday (Monday through Friday)—see Relative Impact Score calculation below. (Table 18; Question 3)

Table 18. Weekday versus Weekend Trips by Water Access Category

Reported Trip Access Category	n (trips)	Trip Counts and Percentages			
		Weekday %		Weekend %	
Boat Ramp	1,735	651	37.52*	1,084	62.47**
Dock	938	415	44.24**	523	55.75*
Shoreline/Causeway	55	25	45.45**	30	54.54*
Marina Wet Slip	526	227	43.15	299	56.84
Marina Dry Storage	261	107	40.99	154	59.00
Overall	n=3,515	1,425	40.55	2,090	59.45

Adjusted Percentages reflecting the impact of a typical weekday versus weekend day
Daily impact % weekday = weekday % divided by 5 days
Daily impact % weekend = weekend % divided by 2 days
Typical Weekday: 8.11; Typical Weekend: 29.725

Relative Impact Score: RIS = Daily Impact % (Weekend) / Daily Impact % (Weekday)

= 29.725 / 8.11 = 3.66

RSI → The typical weekend day is associated with approx. 3.6 times the number of typical weekday trips.

* Denotes a percentage value that is significantly less than the overall average % at 95% Confidence.
** Denotes a percentage value that is significantly greater than the overall average % at 95% Confidence.

Rationale for Selecting Departure Sites and Travel Routes

This section characterizes the choice rationale for selecting departure sites (e.g., marina or public ramp), based on the responses to Question 13 of the survey instrument. Based on the ranked average response by rationale category, Bay County survey respondents preferred departure sites that provided (a) adequate, safe, and secure parking; (b) ease of launching and retrieving boats and a short wait-to-launch time; (c) proximity to their favorite on-water boating spots/destinations; (d) well-marked access channels at or near the launch site; (e) deep-water access; and (f) sites that had no parking or launch fees (see results in Table 19; Question 13 criteria 1-14).

Table 19. Reasons for Selecting a Favorite Departure/Launch Site

	Response		
Reason/Description	**Count (n)**	**average**	**rank***
1 Deep-water access	**955**	**2.03**	**8**
2 Availability of restrooms	924	2.64	
3 No parking / launch fee	**936**	**2.05**	**7**
4 Well-marked access channels	**929**	**1.97**	**6**
5 Proximity to favorite boating spots	*947*	*1.91*	**4**
6 Adequate parking	*952*	*1.52*	**2**
7 Availability of fishing supplies	919	3.08	
8 Short wait to launch	**927**	**1.95**	**5**
9 Gas, pump-out, maintenance service	931	3.07	
10 Nearby amenities (e.g. restaurants)	917	3.28	
11 Proximity to home	954	2.13	
12 **Ease of launching/retrieving boat**	**939**	**1.56**	**3**
13 **Safe and secure parking**	**958**	**1.44**	**1**
14 Other reason: mixed (not ranked)	126	1.78	

Note: Average response based on Key below
** Ranking: from "most important" to "least important" (reasons 1-13 only)
Note: Top-8 ranked categories highlighted in bold (excluding category 14).
Key:
1 – strongly agree (very important)
2 – agree (important)
3 – neutral
4 – disagree (somewhat unimportant)
5 – strongly disagree (very unimportant)

The scoring and ranking of reasons for selecting a favorite travel route, based on survey responses to Question 15, are shown in Table 20. The results (based on the top 5 responses) suggest that Bay county survey respondents tend to select favorite travel routes to

(a) avoid congestion or congested areas;
(b) enjoy scenic beauty;
(c) obtain quick access to favorite on-water boating spots or destination;
(d) access locations where fishing is good; and
(e) take advantage of well-marked channels. (Table 20; Question 15 criteria 1-9)

Table 20. Reasons for Selecting a Favorite Travel Route

		Response*	
Reason/Description	**Count (n)**	**average**	**rank****
1 Avoid congested areas	1150	1.69	1
2 Avoid shallow water	**1139**	**2.15**	
3 Fishing is good	**1137**	**2.12**	**5**
4 Prefer well-marked channels	1140	2.00	3
5 Prefer calm protected waters	**1142**	**2.28**	
6 None are important – just cruise around	1048	3.66	
7 Easy access to supplies or fuel	1104	2.79	
8 Quick access to favorite boating spots	**1118**	**2.08**	**4**
9 Enjoy scenic beauty	**1195**	**1.71**	**2**

* Average response based on Key below;
** Ranking: from "most important" to "least important" (reasons 1-9 only)
Note: Top-5 ranked categories highlighted in bold (excluding category 10--other).

Key:
1 – strongly agree (very important)
2 – agree (important)
3 – neutral
4 – disagree (somewhat unimportant)
5 – strongly disagree (very unimportant)

Boater Activity Profile

A description and summary of the recreational boating activities reported by n=2,060 survey respondents to Question 16 of the survey instrument are presented in this section, along with a ranking of activities that take place during a recreational boating trip. Respondents were asked to choose, from an activity list provided in the survey, ***all*** of the activities in which they engage on a 'typical' boating trip. The column labeled 'Count' is the total number of times a given activity was chosen by survey respondents. Note that many respondents selected multiple activities from the list (hence, the percentages do not sum to 100). The top-eight activities (by rank) are highlighted, each of which was identified by at least 20% of survey respondents. Table 21 shows the results for all respondents, and Tables 22 through 25 highlight the results for the top-four waterway access categories or user groups (Boat Ramps, Docks, Marina Wet Slips, and Marina Dry Storage).

- Fishing ranked as the leading activity with approximately 44% of survey respondents indicating that they engaged in this activity during a typical boating trip.

- Swimming was the second-most selected activity with 28.2%, followed closely by Cruise at 27.9%, Nature Viewing at 25.5%, and Sightseeing at 23.6%.

- Socializing, Beach Picnicking, and Daytime Anchoring rounded out the top-8 list with 23.5%, 22.7%, and 21.6%, respectively. (Table 21; Question 16)

Table 21. Boaters' Activity Statistics (entire sample/all respondents)

Activity	Count	Percentage of Respondents	Rank
Beach Picnicking	**468**	**22.7%**	**7**
Cruising	**576**	**27.9%**	**3**
Diving	197	9.5%	
Fishing	**905**	**43.9%**	**1**
Water Skiing/Water Sports	170	8.2%	
Nature Viewing	**526**	**25.5%**	**4**
Daytime Anchoring	**446**	**21.6%**	**8**
Overnight Anchoring	191	9.2%	
Sailing	113	5.4%	
Beach Camping	54	2.6%	
Sightseeing	**487**	**23.6%**	**5**
Socializing	**485**	**23.5%**	**6**
Visiting Restaurant	331	16.0%	
Swimming	**582**	**28.2%**	**2**
Jet Skiing	97	4.7%	
Other	136	6.6%	

Note that % values are based on n = 2,060 respondents.

Results for Respondents departing from Boat Ramps

- Fishing ranked as the leading activity for the n=1,771 trips beginning at a Boat Ramp in Question 7. Note that 62% of survey respondents who depart from a Boat Ramp acknowledge that they engaged in fishing during a typical trip.

- Swimming and Nature Viewing occurred during 33% and 30% (respectively) of the reported trips originating from Boat Ramps.

- Respondent reports of Cruising, Sightseeing, and Beach Picnicking were all just under 28%. Note that 26% of the respondents indicated that they engage in Socializing and 22% in Daytime Anchoring during a typical trip.

- Fishing is the predominant activity among this user group, and was chosen approximately 2-to-1 over the next two highest-ranked activities, Swimming and Nature Viewing. It should also be noted that at least 1-out-of-4 survey respondents reported engaging in each of the activities ranked 4th through 7th. (Table 22; Question 16)

Table 22. Boaters' Activity Statistics: *Boat Ramp User Group*

Activity	Count	Percentage of Respondents	Rank
Beach Picnicking	**486**	**27.4%**	**6**
Cruising	**492**	**27.7%**	**4**
Diving	201	11.3%	
Fishing	**1099**	**62.0%**	**1**
Water Skiing/Water Sports	208	11.7%	
Nature Viewing	**533**	**30.1%**	**3**
Daytime Anchoring	**397**	**22.4%**	**8**
Overnight Anchoring	93	5.2%	
Sailing	50	2.8%	
Beach Camping	72	4.0%	
Sightseeing	**489**	**27.6%**	**5**
Socializing	**459**	**25.9%**	**7**
Visiting Restaurant	235	13.2%	
Swimming	**596**	**33.6%**	**2**
Jet Skiing	99	5.6%	
Other	70	3.9%	

Note that % values are based on n = 1,771 reported trips that began at a boat ramp.

Results for Respondents departing from Docks

- Fishing ranked as the top activity for respondents reporting n=964 trips from Docks, with 32.4% (about 1-in-3) reporting that they engage in this activity during a typical trip; followed closely by Cruising at 32.0%, Nature Viewing at 29.7%, and Swimming at 29.0%.

- Roughly 1-out-of-4 (about 25% of) survey respondents departing from a private Dock reported Socializing, Sightseeing, Beach Picnicking, and Visiting Restaurants as activities that take place during a typical boating trip. As an honorable mention, 24% reported that they engage in Daytime Anchoring. Note that survey respondents departing from a Dock are almost twice as likely to engage in Visiting Restaurants as their counterparts departing from Boat Ramps (compare percentage values in Tables 22 and 23).

- The least-likely activities for respondents departing from private Docks include Sailing, Diving, Water Sports, and Beach Camping, each accounting for less than 10% of the activities identified as occurring during a typical trip. (Table 23; Question 16)

Table 23. Boaters' Activity Statistics: *Dock Group*

Activity	Count	Percentage of Respondents	Rank
Beach Picnicking	**241**	**25.0%**	**7**
Cruising	**309**	**32.0%**	**2**
Diving	72	7.4%	
Fishing	**313**	**32.4%**	**1**
Water Skiing/Water Sports	88	9.1%	
Nature Viewing	**287**	**29.7%**	**3**
Daytime Anchoring	*228*	*23.6%*	
Overnight Anchoring	102	10.5%	
Sailing	47	4.8%	
Beach Camping	12	1.2%	
Sightseeing	**245**	**25.4%**	**6**
Socializing	**256**	**26.5%**	**5**
Visiting Restaurant	**236**	**24.4%**	**8**
Swimming	**280**	**29.0%**	**4**
Jet Skiing	64	6.6%	
Other	37	3.8%	

Note that % values are based on n = 964 reported trips from private residential dock.

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Results for Respondents departing from Marina Wet Slips

- Cruising was the number-one activity for those boaters reporting the n=536 trips departing from Marina Wet Slips, with slightly more than 40% indicating that they engage in this activity during a typical trip.

- Fishing was a close second with approximately 39% of survey respondents reporting that they engage in this activity during a typical outing. Rounding out the top-5 responses Daytime Anchoring at 33%, Swimming at 31%, and Socializing at just under 28%.

- Note that less than 10% of respondents departing from Marina Wet Slips indicated that they engage in Jet Skiing, Water skiing/Water-sports, and Beach Camping.

- Restaurant Visits and Sailing deserve honorable mention as about 1-in-5 respondents who depart from Marina Wet Slips indicate that they partake in these activities on a typical boating trip. (Table 24; Question 16)

Table 24. Boaters' Activity Statistics: *Marina Wet Slip Group*

Activity	**Count**	**Percentage of Respondents**	**Rank**
Beach Picnicking	103	19.2%	
Cruising	**218**	**40.6%**	**1**
Diving	66	12.3%	
Fishing	**209**	**38.9%**	**2**
Water Skiing/Water Sports	21	3.9%	
Nature Viewing	**134**	**25.0%**	**7**
Daytime Anchoring	**177**	**33.0%**	**3**
Overnight Anchoring	**144**	**26.8%**	**6**
Sailing	*110*	*20.5%*	
Beach Camping	13	2.4%	
Sightseeing	**133**	**24.8%**	**8**
Socializing	**148**	**27.6%**	**5**
Visiting Restaurant	*114*	*21.2%*	
Swimming	**170**	**31.7%**	**4**
Jet Skiing	18	3.3%	
Other	26	4.8%	
Note that % values are based on n = 536 reported trips from a marina wet slip.			

Results for Respondents departing from Marina Dry Storage facilities

- Fishing was the top-ranked activity for respondents who accessed waterways from Marina Dry Storage facilities in 261 reported trips, with slightly over 57% indicating that they engage in this activity during a typical trip.

- Cruising was the second-most common response for Marina Dry Storage facility users--an activity that occurs on approximately 41% of typical trips taken by this group of survey respondents. Swimming, Beach Picnicking, and Socializing were also found to be among the top-five activities for this group (each accounting for over 32%).

- Sightseeing, Daytime Anchoring, and Nature Viewing were also found to be activities in which a large percentage of respondents from this category engage during a typical boating trip. Once again, Visiting Restaurants deserves honorable mention as 1-in-4 respondents identified this as an activity that occurs during a typical trip.

- Note that less than 10% of survey respondents departing from Marina Dry Storage facilities identified sailing, skiing/water-sports, beach camping, and jet skiing as activities that occur on a typical trip. (Table 25; Question 16)

Table 25. Boaters' Activity Statistics: *Marina Dry Storage Group*

Activity	Count	Percentage of Respondents	Rank
Beach Picnicking	**85**	**32.5%**	**4**
Cruising	**107**	**40.9%**	**2**
Diving	40	15.3%	
Fishing	**150**	**57.4%**	**1**
Water Skiing/Water Sports	19	7.2%	
Nature Viewing	**70**	**26.8%**	**8**
Daytime Anchoring	**74**	**28.3%**	**7**
Overnight Anchoring	28	10.7%	
Sailing	3	1.1%	
Beach Camping	7	2.6%	
Sightseeing	**80**	**30.6%**	**6**
Socializing	**84**	**32.1%**	**5**
Visiting Restaurant	*65*	*24.9%*	
Swimming	**91**	**34.8%**	**3**
Jet Skiing	11	4.2%	
Other	2	0.7%	

Note that % values are based on n=261 trips that departed from a marina dry storage facility.

Avoidance of Departure Sites

This section offers a summary and overview of responses to Question 12 of the survey instrument, as it pertains to the identification of departure sites that were avoided by survey respondents and the reason for avoiding those sites. Survey participants were asked to name a boat ramp they would like to use but avoid, and select the reason(s) for avoiding that ramp from a list of avoidance factors which include congestion-, infrastructure-, and parking-related concerns.

The list of ramps identified as "avoided" by survey respondents is shown in Table 26, along with the number of times the ramps were mentioned. Frequency counts of avoidance factors for the avoided ramps are summarized in Table 27. All in all, 44 ramps were identified as avoidance ramps, with 19 ramps identified by 10 or more survey respondents. Table 28 highlights the selected avoidance factors for those ramps (i.e., those identified by at least 10 survey respondents), with a percentage breakdown of the avoidance factors for each of those ramps.

Note that out of n=935 responses to Question 12 of the survey, 411 (or 43.9%) indicated that they desired to use a given ramp but avoided that ramp for one reason or another (see list of ramps in Table 17). The top-10 avoidance ramps/locations (shown below in descending order) were each identified by at least 15 survey respondents as ramps/launch locations they would like to use but avoid for one reason or another. They are listed below for convenience.

(1) Marina Civic Center
(2) Carl Gray Park
(3) St. Andrews Marina
(4) Dolphin Drive
(5) St. Andrews State Recreation Area
(6) Leslie Porter Wayside Park
(7) B.V. Buchanan
(8) 37th Street
(9) Earl Gilbert Pass
(10) West Hathaway Bridge

A summary of the selected reasons for avoiding a ramp/launch location is given in Table 27. Congestion ("Too Crowded") and Inadequate Parking are the top-2 reasons for avoiding a ramp or departure site with 22.5 % and 19.2% of survey respondents selecting these two factors, respectively. Crowding and Inadequate Parking accounted for approximately 42% of all selected avoidance factors. Rounding up the top-five avoidance responses are Inadequate Docks, Shallow Water, and the absence of Restrooms.

In short, slightly over 1-out-of-5 (about 22%) of the survey participants who responded to Question 12 selected "crowding" as a reason they avoid a boat ramp or launch location. A more detailed summary of avoidance factors for each ramp/location highlighted in bold in Table 26 is presented in Tables 27 and 28. Table 27 highlights the predominant avoidance factors and displays the frequency counts for factors identified by survey respondents. Table 28, as its companion, gives a brief synopsis and description of the chief reasons for ramp/location avoidance.

Table 26. List of the 44 Ramps/Launch Sites Avoided by Survey Respondents

Ramp name/Location	Frequency count	Rank
Carl Gray Park	**57**	**2**
Dolphin Drive	**37**	**4**
37th Street	**10**	**8**
Howard Ramp at Quail St.	5†	**tie 17-19 (rank=8)**
Leslie Porter Wayside Park	**19**	**6**
St. Andrews SRA	**27**	**5**
Marina Civic Center	**87**	**1**
Hideaway	1†	
St. Andrew's Marina	**52**	**3**
Southside of West Bay Canal at Hwy 79	1†	
Econfina River	1†	
Deep Massalina Bayou	1†	
Shoreline Circle	7†	**11**
McKenzie	6†	**tie 12-16 (rank=14)**
Maude Holmes	2†	
Bayhead South	3†	
Bayhead North	3†	
Ramp at end of Frankford Avenue	1†	
McCall-Everitt	6†	**tie 12-16 (rank=14)**
Cook Bayou Marina	1†	
Earl Gilbert Pass	**9†**	**9**
John B Gore Park	1†	
Donaldson Point	6†	**tie 12-16 (rank=14)**
B.V. Buchanan	**11**	**7**
Safari Street	1†	
Venture Out	1†	
Deer Point Draw Down	2†	
Miramar	4†	
West Hathaway Bridge	**8†**	**10**
Bob George Park	6†	**tie 12-16 (rank=14)**
Cherry Street Landing	3†	
Ira Hutchinson	2†	
Davis Beach	5†	**tie 17-19 (rank=18)**
Burnt Mill Creek	6†	**tie 12-16 (rank=14)**
Bonita Bay Tyndall AFB	3†	
Pine Log	1†	
Lake Powell Recreation Area	5†	**tie 17-19 (rank=18)**
388 Crooked Creek	1†	
Tyndall Air Force Base YC	2†	
Crooked Island Research Center	1†	
Blue Water	1†	
Cherokee Landing	1†	
High Point Landing	2†	
Choctawhatchee R at SR 20	2†	

† indicates a very small sample size (n < 10). Note that tied ranks are assigned an average (group) rank.

Table 27. Frequency counts and rankings of selected avoidance factors (all ramps)

Avoidance Factor	Count	% overall	> 5%	Rank
a. ***Water Too Shallow***	***106***	***12.4%***	***Yes***	***4***
b. Slope Too Steep	60	7.0%	Yes	
c. **No Restrooms**	**82**	**9.6%**	**Yes**	**5**
d. Lane(s) Too Narrow	33	3.8%	No	
e. Slope is Not Steep Enough	28	3.2%	No	
f. ***Too Crowded (Congestion)***	***193***	***22.5%***	***Yes***	***1***
g. Bad or No Pavement	71	8.3%	Yes	
h. ***Inadequate Parking***	***164***	***19.2%***	***Yes***	***2***
i. ***Inadequate Dock(s)***	***117***	***13.7%***	***Yes***	***3***
	total=854responses			

Note that total exceeds sample size of n=411 as numerous respondents indicated more than one reason, given that they were asked to select all avoidance factors that applied to the given ramp. Those factors with proportions not significantly different from 0.10 (10%) or proportions significantly greater than 0.10 (10%) are highlighted in bold and italics.

Table 28. Top reasons for boat ramp/launch site avoidance for ramps identified in Q12

	Frequency Counts -- Avoidance Factors† (see key below)								
Ramp name/Location	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**
Carl Gray Park	47					13	17		25
Dolphin Drive				8		18		30	
37th Street						8		9	6
Howard Ramp at Quail St.	4			2		2		4	
Leslie Porter Wayside Park	6	13				8	6	10	6
St. Andrews SRA						21		9	
Marina Civic Center	10	13	20			71		13	22
St. Andrew's Marina		14				34		42	14
Shoreline Circle							4	5	4
McKenzie			2				3		
McCall-Everitt	2			2		2			
Earl Gilbert Pass	4		3						4
Donaldson Point									4
B.V. Buchanan	6		4					8	
West Hathaway Bridge	3		3						6
Bob George Park	3	3							
Davis Beach	3						4		
Burnt Mill Creek							5		
Lake Powell Recreation Area									2

Key-- Avoidance Factors:

a – shallow water
b – slope to steep
c – no restrooms
d – lane(s) too narrow
e – slope is not steep enough
f – too crowded (congestion)
g – bad or no pavement
h – inadequate parking
i – inadequate dock(s)

† Only Frequency counts >1 are shown-- indicates the predominant avoidance factors per ramp

Table 29. Primary reasons for boat ramp/launch site avoidance (Companion to Table 28)

Ramp name/Location	General description of avoidance factors
Carl Gray Park	Shallow water, bad pavement, crowding, inadequate docks
Dolphin Drive	Crowding and inadequate parking
37th Street	Crowding and inadequate parking
Howard Ramp at Quail St.	Shallow water and inadequate parking
Leslie Porter Wayside Park	Slope too steep, crowding and inadequate parking
St. Andrews SRA	Crowding and inadequate parking
Marina Civic Center	Congestion, slope too steep, no restrooms
St. Andrew's Marina	Crowding and inadequate parking, inadequate docks
Shoreline Circle	Inadequate parking, bad pavement, inadequate docks
McKenzie	Bad pavement, slope too steep
McCall-Everitt	Shallow water, narrow lane, congestion
Earl Gilbert Pass	Shallow water, no restrooms
Donaldson Point	Inadequate docks
B.V. Buchanan	Inadequate parking, shallow water, no restrooms
West Hathaway Bridge	Inadequate docks, shallow water, no restrooms
Bob George Park	Shallow water, slope too steep
Davis Beach	Crowding and shallow water
Burnt Mill Creek	Bad pavement
Lake Powell Recreation Area	Inadequate docks

It should be noted that the ramps/departure locations listed above differ in terms of the avoidance factors identified by survey respondents. Some ramps have infrastructure issues, some have crowding/congestion issues, and others have both. In short, selected avoidance factors are not similar across all ramps or launch locations.

In light of these differences, a more detailed and in-depth survey instrument should be employed to gather information on the severity of the perceived avoidance factors *and the ramps boaters use as substitutes to the avoided ramps* (and the reasons why). This information would serve a three-fold purpose, as it would (a) yield a more in-depth account of the shortcomings and problems associated with each of the avoided ramps/launch locations, (b) allow for the development of a prioritization scheme for maintenance and management of those ramps/launch locations (to alleviate some of the concerns of boaters who frequent those sites), and (c) provide useful information and a geographic narrative of the locations of problem ramps/launch sites that would aid in both the *design* and *location* of future public waterway access sites.

Drive Time from Residences to Departure Sites for Reported Trips

Drive-time information to specific trip departure sites was also collected from Bay County survey respondents in Question 11. (Note: Respondents from home or condominium docks were instructed not to answer this question.) Thirty-four departure sites had a sample of at least 10 respondents who provided information on the drive times to those sites. The summary results and drive-time statistics to specific ramps or marinas are presented in Table 30.

The results were then used to group ramps/other departure sites based on similarities. Three distinct groups of ramps/departure sites were identified: (a) those with a local draw (see Tables 30 and 31, Figure 10); (b) those with a regional draw (see Table 31, Figure 10); and those with a "long draw" (see Table 31, Figure 10). The results are based on a standard analysis of summary statistics, an analysis of means test, and a k-mean clusters analysis (k=3). A listing of the sites associated with each group is provided in Table 31.

Note that two departure sites, Pirate Cove Marina and Miramar ramp, were found to be "long-draw" – having a mean drive time > 2 hours and a median drive time > 1 hour. Note that 22 local draw departure sites were identified, along with 11 regional draws (see Table 31 for a detailed listing).

In addition, drive-time statistics were compiled for Bay County residents versus non-residents for each of the three applicable user groups; namely, users departing from Boat Ramp, Marina Wet Slips, and Marina Dry Storage facilities (based on responses to Questions 7, 8, and 11). The results are shown in Table 32 and Figure 11.

The findings indicate that roughly 73% of survey respondents, departing from Boat Ramps, Marina Wet Slips, and Marina Dry Storage facilities are Bay County residents, and approximately 27% are non-residents. Marina Dry Storage users tend to have the highest percentage of non-residents (at 46.7%), followed by Marina Wet Slip users (at 36.6%); both of which are significantly greater than the mean of percentage of non-residents 26.8%. Roughly 1-out-of-5 survey respondents that depart from a boat ramp are non-residents, a proportion that falls slightly below the overall average for all three user groups.

Drive times to ramps/departure sites are the greatest for non-residents, as would be expected. The survey results reveal that the mean drive time to a ramp or departure site for a Bay County residents/respondent is approximately 17 minutes on average, with a median drive time of 15 minutes. Non-resident respondents departing from a Boat Ramp tend to have an average drive time of almost 2 hours, and a median drive time of 90 minutes. Those departing from Marina Wet Slips tend to have a mean drive time of just over 3 hours, with a median drive time of 120 minutes. The longest average drive time is associated with respondents departing from Marina Dry Storage facilities. This group has a mean drive time of 3 hours and 18 minutes, and a median drive time to departure site of 120 minutes. Note that the overall median drive time for non-residents is 90 minutes, with an average drive time that ranges from approximately 130 to 165 minutes (based on a 95% confidence interval for the mean).

Table 30. Statistics for drive times to reported trip departure sites

Ramp / Location	n	(drive-time statistics in minutes) mean	median	max	95% confidence interval
Pirate Cove Marina	95	153.9	45	1,800	96.5–211.3
Bay Point Yacht & CC	65	77.9	20	300	53.0–102.8
Lighthouse Marina ‡	38	29.8	15	195	15.4–44.3
Sun Harbor Marina	27	120.5	15	660	41.5–199.5
Carl Gray Park† ‡	94	28.4	20	240	21.4–35.4
Marquardt's Marina ‡	5	47.0	10	105	na*
Mexico Beach Municipal ‡	10	48.2	15	195	na*
Treasure Island Marina	20	98.6	20	530	30.0–167.2
St. Andrew's Marina ‡	169	47.7	15	570	33.0–62.4
Laid Back Boat Club ‡	21	48.7	20	360	13.0–84.4
B.V. Buchanan	19	46.2	30	105	29.7–62.7
Bayside Marina	18	68.9	30	300	23.2–114.6
Marina Civic Center ‡	201	42.0	20	1,200	24.3–59.7
Dolphin Drive ‡	34	47.7	20	300	22.3–73.0
Tyndall Air Force Base YC	31	62.1	25	480	20.2–104.0
37th Street ‡	25	46.2	10	270	19.7–72.6
Miramar	35	119.2	90	420	70.4–168.0
Howard Ramp at Quail St. ‡	10	11.5	10	28	na*
Davis Beach	41	57.8	40	390	32.6–82.9
Panama City Marina	139	76.1	20	1,020	49.9–102.2
Leslie Porter Wayside Park† ‡	81	18.8	15	120	14.8–22.8
St. Andrews SRA	147	77.3	30	480	60.6–93.9
Donald Penny† ‡	18	8.8	5	30	4.8–12.7
Navy Base Rec. Area ‡	10	18.0	17.5	25	na*
Cherokee Landing† ‡	11	11.2	10	30	5.9–16.5
Earl Gilbert Park ‡	17	31.1	30	90	17.4–44.9
High Point Landing ‡	20	19.4	17.5	60	12.3–26.5
John B. Gore Park ‡	53	22.5	20	90	17.2–27.8
McCall-Everitt† ‡	33	13.2	10	45	10.2–16.1
Bonita Bay Tyndall AFB† ‡	17	21.4	20	45	15.2–27.6
Shoreline Circle† ‡	39	14.5	10	45	10.4–18.5
Deer Point Draw Down ‡	12	10.8	10	15	na*
Bob George Park† ‡	32	21.0	13.5	165	10.8–31.1
Burnt Mill Creek	25	48.4	40	105	37.6–59.3
Maude Holmes	10	40.0	40	70	na*

* Not applicable due to small sample size (estimated only if n > 10).

† Indicates "local draw" ramp—a ramp/departure site where average drive time is significantly less than or equal to 40 minutes (at the 95% confidence level) using a standard analysis of means t-test.

‡ Ramp/departure site with "local draw" as determined by a k-means cluster analysis (k=3).

Table 31. Cluster analysis summary statistics based on drive-time statistics

k-means cluster analysis results (k=3):

Variables	**Cluster 1**	**Cluster 2**	**Cluster 3**
Mean Drive Time (minutes)	136.55	27.63	70.35
Median Drive Time (minutes)	67.5	15.1	28.1
Standard deviation Mean DT	24.53	14.65	23.80
Standard deviation Median DT	31.81	5.62	9.02
% of Variation Accounted for	28.74	28.54	28.74
Frequency Count	2	22	11

Variation Accounted for overall: 86.0%

Cluster 1 – ***Long-Draw*** (2): Pirate Cove Marina, Miramar

- **Mean Drive Time > 2 hours**
- **Median Drive Time > 1 hour**

Cluster 2 – ***Local-Draw*** (22): Lighthouse Marina, Carl Gray Park, Marquardt's Marina, Mexico Beach Municipal, St. Andrew's Marina, Laid Back Boat Club, Marina Civic Center, Dolphin Drive, 37th Street, Howard Ramp at Quail Street, Leslie Porter Wayside Park, Donald Penny, Navy Base Recreational Area, Cherokee Landing, Earl Gilbert Park, High Point Landing, John B. Gore Park, McCall-Everitt, Bonita Bay Tyndall AFB, Shoreline Circle, Deer Point Draw Down, Bob George Park

- **Mean Drive Time < 30 minutes**
- **Median Drive Time approx. 15 minutes**

Cluster 3 – ***Regional-Draw*** (11): Bay Point Yacht & CC, Sun Harbor Marina, Treasure Island Marina, B.V. Buchanan, Bayside Marina, Tyndall Air Force Base YC, Davis Beach, Panama City Marina, St. Andrews SRA, Burnt Mill Creek, Maude Holmes

- **Mean Drive Time slightly more than 1 hour**
- **Median Drive Time < 30 minutes**

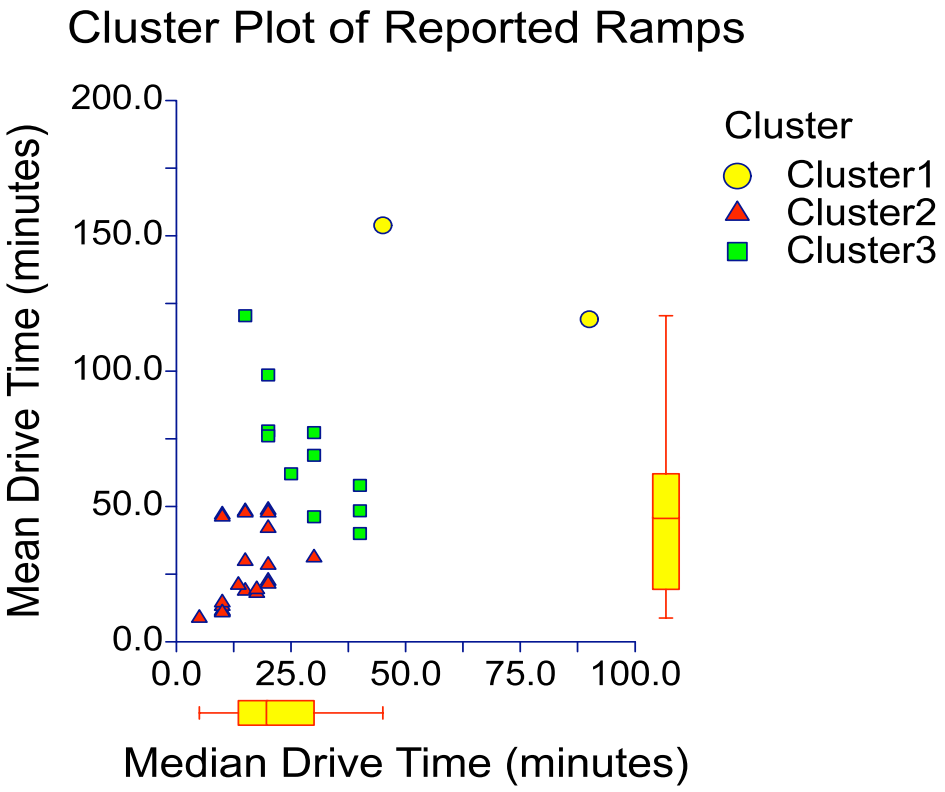

Figure 10. Scatter-plot and groupings of k-means cluster analysis (k=3)

Table 32. Drive-time statistics by resident status and user group

User Group	Bay County Resident	n (trips)	Drive-time statistics (in minutes) mean	median	95% confidence interval
Boat Ramp	yes	976	18.7	15	17.6 – 19.6
Boat Ramp	no	263	113.5	90	96.4 – 130.6
(% non-resident = 21.2%)					
Marina Wet Slip	yes	209	15.2	15	13.6 – 16.8
Marina Wet Slip	no	121	188.0	120	152.9 – 223.1
(% non-resident = 36.6%)					
Marina Dry Storage	yes	98	17.2	15	14.3 – 20.1
Marina Dry Storage	no	86	198.9	120	137.4 – 260.4
(% non-resident = 46.7%)					
All 3 user groups	yes	1283	17.4	15	17.1 – 19.0
All 3 user groups	no	470	148.3	90	130.8 – 165.8
(% non-resident = 26.8%)					

Note: Equality of means tests reveal that the median drive times for Bay county residents are not significantly different across waterway access/user groups at 95% confidence level, whereas the median drive times for non-residents are not equal--with the median drive times of non-resident Marina Wet Slip and Marina Dry Storage facility users being greater than the median drive time of those departing from Boat Ramps at the 95% confidence level.

Equality of Proportions tests indicate that the % non-residents of both Marina Wet Slip users and Marina Dry Storage facility users are greater than the % of non-resident Boat Ramp users and exceed % non-resident for all three users groups (26.8%) at the 95% confidence level.

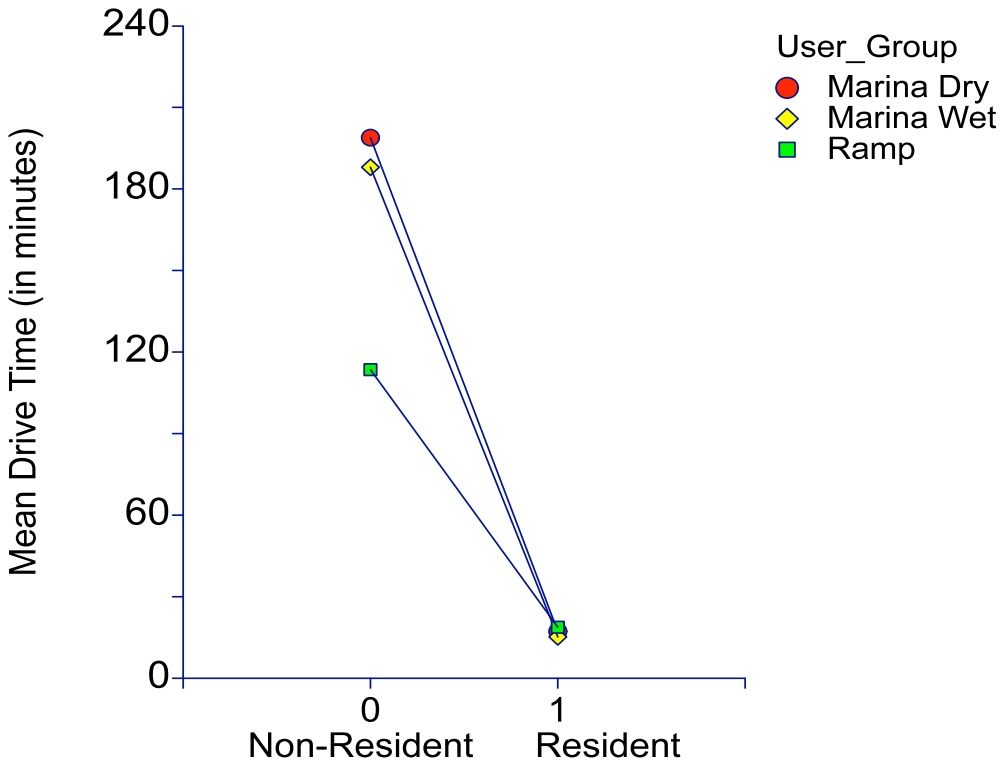

Figure 11. Drive times of Bay County residents versus non-residents (by user group)

2.2. Seasonal Boating Characteristics

Defining the Boating Seasons in Bay County – A Temporal Analysis

Monthly trip data were examined to identify the number and duration of boating seasons based upon the average number of trips taken by boaters during each month and related statistics. Trip frequency counts – *the number of reported boating days* – were obtained from responses to Question 14 of the mail survey instrument.

For the purposes of this analysis, a *boating season* is defined as a grouping of "like" consecutive or non-consecutive months based on temporal trends in waterway use and monthly trip frequency counts. The averages of the number of reported trips (per month) are shown in Table 33 and highlighted in Figure 12. Summary statistics are presented for all survey respondents and for each of four large sub-sample waterway access groups, comprised of boaters/respondents accessing the waterways from Boat Ramps, Marina Wet Slips, Marina Dry Storage facilities, and private Docks.

Visual inspection of the average number of trips for all waterway access groups (Figure 12) exposes a pattern that is consistent with defining two distinct *boating seasons* in the Bay County study area. Identifiable clusters of 'like months', based on similarities in trip frequencies, suggest the presence of a primary "peak" season and an "off-peak" season.

The "peak season" is centered about the month of July, and runs from April through September, with an average reported trip count per respondent/boater ranging between 4.07 and 5.41 trips per month—values that are shown to be significantly greater than the overall average of 3.47 trips per month at the 95% confidence level.

A low use-intensity "off-peak" season spans from October through March, with average reported trip counts that range from a low of 1.56 to a high of 3.26 trips per month. Note that all six monthly mean trip values for these off-peak months are shown to be significantly less than the overall average of 3.5 trips per month at the 95% confidence level. While the month of October may appear to be a borderline case, it should be noted that the upper-level of its 95% confidence interval for the mean (3.44) falls just below the average trip value of 3.5, and the median number of trips for that month is equal to 2, falling below the overall median of 2.58 trips per month.

Several distinct trends emerge in the mean reported trips per month by respondents from the various user groups (see Table 33). First, respondents departing from Marina Wet Slips tend to be more active during the off-peak season than boaters from the other user groups. Second, respondents who launch from Marina Wet Slips tend to remain the most active during the peak boating season (with as high as 7 trips during the peak month of July). Third, Marina Wet Slip users tend to have an average number of trips per month that exceeds the average of each of the other user groups during each month of the year; with an overall average of 4.4 trips per month (a value that is significantly greater than the overall mean of 3.5 at the 95% confidence level).

Table 33. Average Number of Reported Trips by Month and User Category

	Average Number of Reported Trips					
Month	All	Ramp	Dock	Marina Wet Slip	Marina Dry Storage	95% confidence interval (mean) All Users†
January	1.57	1.55	1.38	***2.06***	1.06	(1.45 – 1.69)
February	1.56	1.51	1.41	***2.19***	1.06	(1.44 – 1.68)
March	2.80	2.69	2.51	***3.80***	2.35	(2.65 – 2.95)
April*	**4.09**	**3.95**	3.65	**5.39**	3.75	**(3.91 – 4.27)**
May*	**4.97**	**4.64**	**4.64**	**6.57**	**5.12**	**(4.78 – 5.16)**
June*	**5.35**	**5.08**	**5.12**	**6.60**	**5.52**	**(5.14 – 5.55)**
July* (peak month)	**5.41**	**4.99**	**5.27**	**6.91**	**6.00**	**(5.19 – 5.62)**
August*	**4.88**	**4.64**	**4.80**	**5.93**	**5.00**	**(4.68 – 5.09)**
September*	**4.07**	**3.90**	**3.81**	**4.98**	**4.08**	**(3.89 – 4.24)**
October	3.26	3.05	3.09	***4.26***	3.05	(3.09 – 3.44)
November	2.16	2.07	2.04	***2.59***	2.72	(2.02 – 2.30)
December	1.57	1.56	1.43	***2.00***	1.04	(1.45 – 1.70)
Monthly Avg. (Overall)	3.50	3.30	3.26	**4.43**	3.39	(3.21 – 3.73)

* Indicates peak-season month

Note: Values in **bold** indicate that the average number of trips for user group exceeds mean for all users at 95% confidence (> 3.50); Values in ***bold italics*** indicate the most-active group during the off-season months.

† 95% Confidence Intervals are shown in parentheses, shown in **bold** if the lower limit of the confidence interval is greater than 3.50 trips.

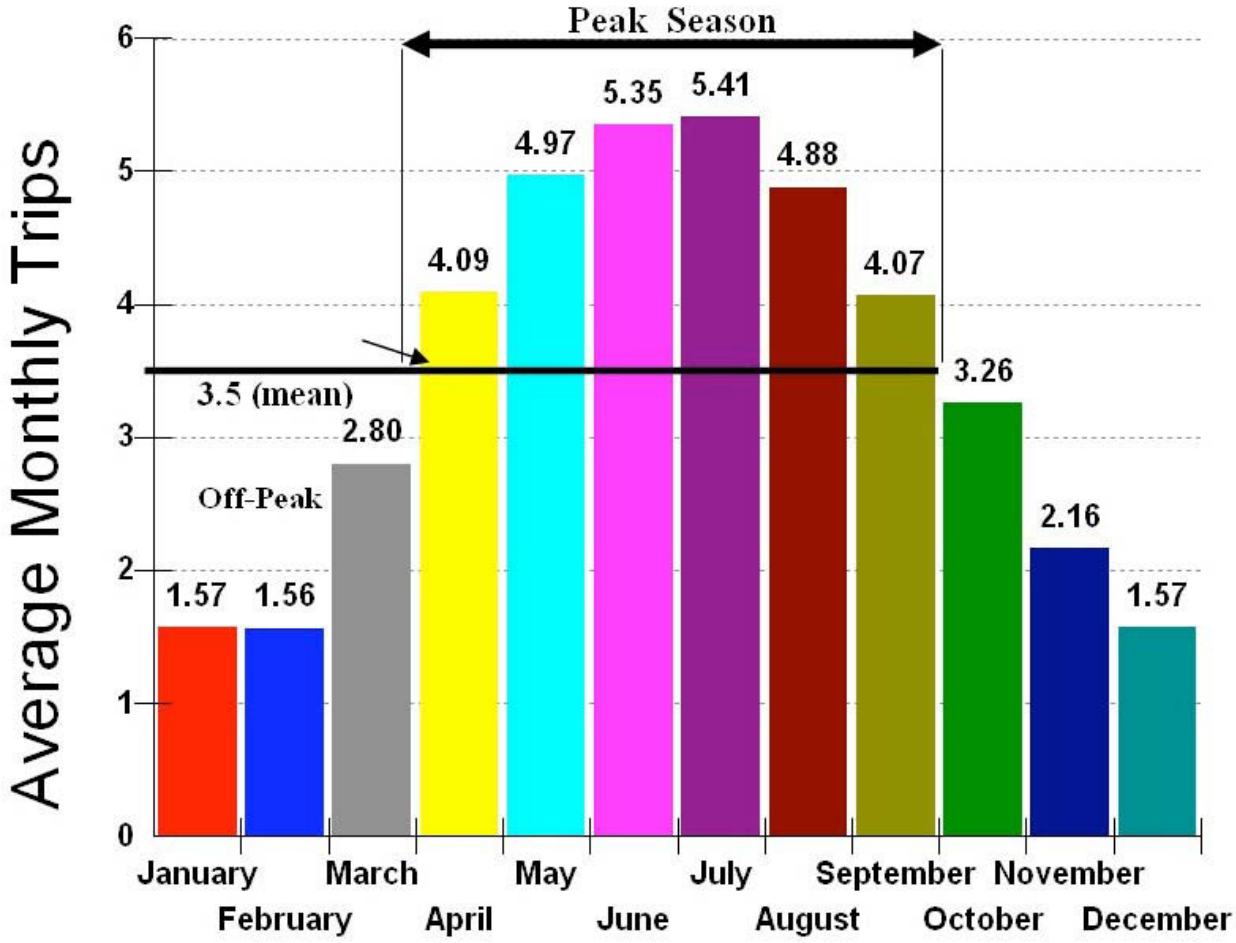

Figure 12. Mean Monthly Trip Counts (All Bay County Survey Respondents)

A Note on Sample Size Considerations

Average monthly trip counts are based on user information obtained from Question 14 of the survey questionnaire, in which survey respondents were asked to report the number of boating trips taken during each month of the year. The observed maximum estimated standard deviation s_{max} for monthly trip counts of all respondents was approximately 4.95 trips per month. This value implies a minimal required sample size (n*) of approximately 377 respondents to be within an acceptable margin of error – plus or minus .5 trips per month – when estimating the mean monthly trip count at the 95% confidence level. As such, the sample size easily exceeds the number required to meet the specified margin of error for generating estimates of the average number of monthly trips for all respondents.

In the validation of individual sample sizes associated with the various waterway access or user groups, questions do arise over the adequacy of the size of sub-samples. There is statistical evidence, however, to suggest that an adequate sample size for each user group was obtained based on the estimated standard deviations associated with reported monthly trip counts. For example, consider that for a j-th user category (j=1,…,4 waterway access/user groups) for any given k-th month (k = 1,…12), the average estimated standard deviation of

reported monthly trip counts for a j-th user category and k-th month (s^*_{jk}) is approximately 3.3. This value implies that a minimum sample size of approximately 167 is required for each individual user group to be within the prescribed margin of error (plus or minus .5 trips). This sub-sample target is somewhat overstated, however, as it does not take into account the "finite" nature of the various boater populations associated with each of the four major waterway access groups.

The required sample size of 167 trip observations is exceeded in 6 out of the 8 cases examined, the exceptions being trips departing from Marina Wet Slips or Marina Dry Storage facilities during the off-peak season. Adjusting for the finite nature of the boating population within these two categories (where $n < N$, and N is finite and relatively small, based on a rough estimate of Marina Wet Slip and Marina Dry Storage availability within the region and the standard deviation in monthly trip counts), the estimated minimum required sample size is in the 100 to 120 range (for these two waterway access categories), to fall within an acceptable maximum margin of error – plus or minus 0.5 trip per month at a minimum of 95% confidence, respectively. Hence, the sample size of each waterway access category obtained from the survey questionnaire may be deemed as appropriate for the purposes and objectives of this study and the desired level of precision, with the sole exception of the sub-sample of trips departing from Marina Dry Storage facilities (having only a sub-sample size n=44). Note, however, that this sub-sample is still "relatively large" in a statistical sense (and is, therefore, not viewed as limiting for the purposes of this study).

In short, adequate sample sizes were obtained from the various statistical populations to allow for the estimation of confidence intervals that are deemed "acceptable" based on various statistical criteria.

Validation of Designated Boating Seasons

The two designated boating seasons in Bay County (as described above) were validated by the results of a cluster analysis. Several hierarchical clustering routines were run using monthly data for the variables listed in Table 34, each yielding consistent results. The clustering routines were constrained to search for an optimal number of clusters c*, based upon an assessment of the natural breaks and the trends found within the monthly trip data as reported by survey participants (in response to Question 14). The cluster analysis was run under the imposed minimum of two clusters and a maximum of five clusters in the identification of 'like months'. Hierarchical clustering routines were chosen given that the variables used to describe the trends in Figure 12 were measured at a variety of different scales (i.e., the analysis involved the use of nominal, ordinal, and interval- scale data).

Hierarchical clustering methods were used to identify clusters of months that exhibited 'similar' characteristics in terms of the average reported trips, the relative position of months with respect to the peak-trip months, the monthly moving average in comparison to the overall average, and monthly trip rankings. Similarity, and hence the clustering of 'like months,' is determined by the shortest statistical "distance" (i.e., the least dissimilarity between clusters) in which months or clusters of months are linked together in relational or statistical space (as measured in Euclidean terms).

In short, individual months and clusters of months were linked in a manner that is efficient in terms of accounting for variation, similarities/dissimilarities, and/or differences in the values of monthly observations for the variables listed in Table 34.

Table 34. A Listing and Description of Variables Used in the Hierarchical Cluster Analysis

Cluster/Label Variable: ***MONTH*** (month of the year): January–December

Variables used to cluster ***MONTH****	
Variable	***Description***
ANRT	Average Number of Reported Trips (per month)
DISTP	Distance from Peak center-- absolute number of months
Rank	Rank of ANRT (in descending order → 1=high; 12=low)
MA3_Rank	Moving Average of Rank (3rd, centered)
INC_ANRT	Increase in ANRT (over previous month)
AATM	Above-Average Trip Month (1=yes; 0=no)

*Note that the variables listed above are measured at a variety of scales, including the nominal, ordinal, and interval scale; requiring clustering methods that allow for "mixed" data types.

A cluster routine is typically accompanied by a *dendrogram* – a graphical device that displays the distance (or dissimilarity) between clusters, and the distance at which individual objects or clusters are joined. This device offers a way to map the distances at which various clusters join. It also allows for the identification of logical break points that separate clusters, and gives an historical account of the clustering process as individual elements/clusters are linked together. Dissimilarity distances and break points, appearing as large gaps between clusters, are the basis by which an optimal number of clusters can be determined. In short, a dendrogram is a graph that includes information on the dissimilarity distances at which clusters form and link together.

Summary statistics for the cluster analysis on reported monthly trips and the designation of boating seasons are provided in Table 35 for a selected number of hierarchical clustering methods. In all the hierarchical routines employed, the clustering algorithms produced identical groupings or clusters of months.

Note also that the selected cluster routines each produced *cophenetic* correlation coefficients that ranged between 0.72 and 0.81 – indicating that the identified cluster groupings are strong and efficient in terms of representing the similarities/dissimilarities that exist in the values of the variables associated with the different months of the year.

The results suggest that the months of October, November, December, January, February, and March form a distinct cluster whose members are similar in terms of reported trip statistics, yet dissimilar and differentiable from months not contained within this cluster. In other words, these six months are statistically dissimilar to the other months of the year. The months of October through March form an "off-peak" season that is markedly different from the cluster of months that comprise the "peak" season (i.e., the months of April through September).

In conclusion, each of the four hierarchical clustering routines suggests the existence of a six- month *peak season* (which runs from April through September) and an *off-peak season* (which runs from October through March).

A more detailed account of the step-by-step clustering process for each of the hierarchical clustering routines is provided by the dendrograms shown in Figures 13 and 14. The vertical axis of the dendrogram represents the months or clusters of months as they link together, using each of the four respective clustering algorithms. The horizontal axis yields a measure of dissimilarity and the distance at which months or clusters of months 'fuse together'. The observed gaps between clusters reveals distinct break points based on observed dissimilarity distances. The horizontal axis provides a platform for viewing the positioning of each month as it clusters with other months, and shows how months and clusters of months are linked and arranged in relational space at any given dissimilarity value.

Table 35. Results of Cluster Analysis in the Designation of Boating Seasons

	Distance Values for Clusters and Cluster Links†			
Routine →	Simple Avg. Weighted	Group Average Un-Weighted	Median Weighted	Centroid Un-Weighted
Distance type →	(Euclidean)	(Euclidean)	(Euclidean)	(Euclidean)
Cluster(s) identified: 1 and 2				
Off-Peak	{January, February, October, November, December, March}			
1	1.076	1.065	0.945	0.939
Peak	{April, May, June, July, August, September}			
2	0.976	0.905	0.709	0.689
Cluster links:				
1-2	1.302	1.482	1.124	1.717
Cophenetic Correlation	0.8006	0.8137	0.7277	0.7595
Identified # of clusters	2	2	2	2

Note: Cluster routines were run using ***NCSS 2000***

† Similar cluster designations were also produced using the Manhattan metric distance type.

The dendrogram is useful in helping to visualize the distance at which any two months and/or clusters are fused together and the degree to which there is dissimilarity between months or clusters. The less the dissimilarity, the faster months or clusters link together as one moves from right to left on the dendrogram. For example, the dendrogram in Figure13 suggests that the months of June and July are very similar (note that they cluster very rapidly). Yet these two months are dissimilar to the months of December and January (a pair of months that are also similar to one another, and are first to cluster). Note, however, that the June-July pairing does not cluster with the December-January pairing until the very end of the clustering sequence (at a distance of 1.71). The month of January is more similar to the month of December (joined at a distance of approximately 0.116) than it is to the month of February (which is joined with January and December at a distance of 0.218).

Note that the months of June and July link with May at a distance of 0.297, but the months in this cluster do not link with the off-peak months of December, January, and February until 1.71. Also, there is a fairly large natural break or gap between the cluster of "off-peak" months and the cluster of "peak" months (a gap of 1.71-0.93 = 0.78). In general, dissimilarity between any two months or clusters increases as the distance between those months or clusters increases, as one moves left down the horizontal axis. In the case of monthly trip statistics, there is strong empirical evidence that the months associated with each of the two distinct boating seasons clusters are very dissimilar.

The dendrograms in Figures 13 through 16 are very similar in structure. This consistency suggests that the two designated boating seasons represent an efficient way in which to group months based on the trip data. The results of the hierarchical cluster analysis also suggest that the optimal number of clusters is 2, with groupings of months that match those identified by visual inspection of Figure 12 and the summary statistics highlighted in Table 33. The cluster analysis, however, provides tangible statistical evidence for the designated groupings of months that define the two distinct boating seasons – defined as peak and off-peak for the purposes of this study.

It is interesting to point out that the resulting clusters do not conform to conventional seasonal classifications of winter, spring, summer, and fall. This statistical finding suggests that trip propensity in any given month may be affected by numerous factors including physical conditions (e.g., weather patterns), boater characteristics, and behavioral factors – boaters' perceptions and expectations regarding conditions associated with individual months or time periods and the on-water recreational boating experience in a given season, as well as general use or activity patterns by waterway access category and season. Perceptions on congestion/crowding and accessibility to favorite on-water destinations also affect trip propensity.

It should be noted that the results presented in this section form the foundation for the subsequent seasonal analyses in which trip patterns and activities by boating seasons and user groups will be analyzed.

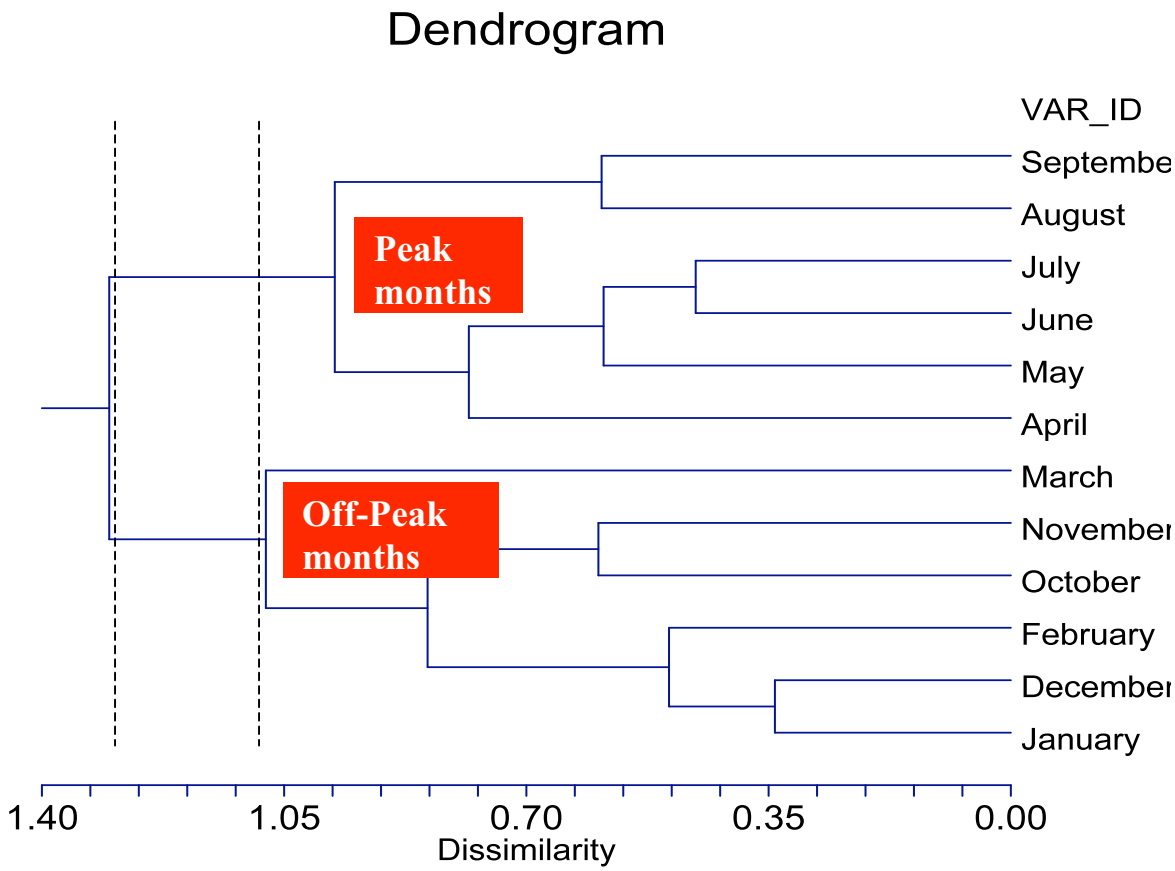

Figure 13. Dendrogram showing clusters of months based on the mean number of reported monthly trips and related variables, using a Multivariate Hierarchical Cluster Analysis (*Method: Simple Average, Weighted Pair-Group w/Euclidean Distance*)

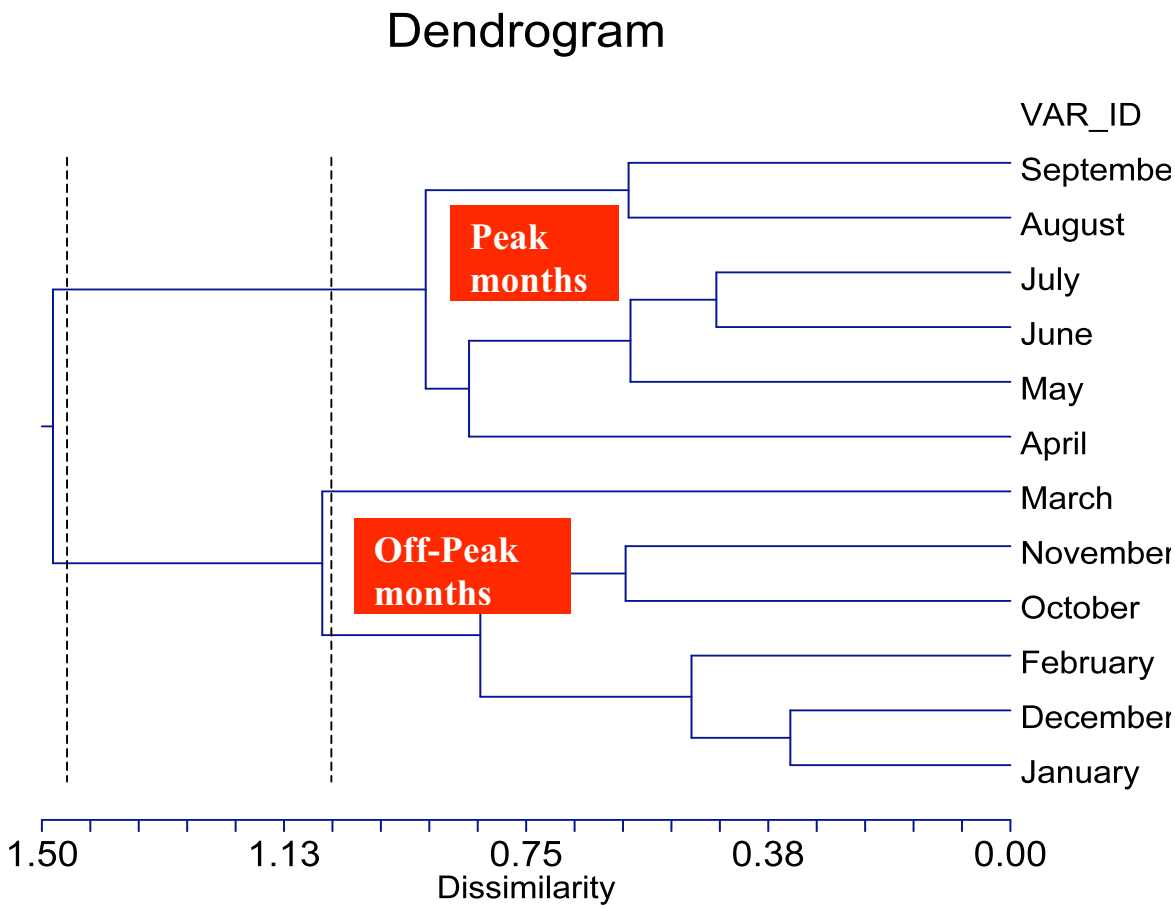

Figure 14. Dendrogram showing clusters of months based on the mean number of reported monthly trips and related variables, using a multivariate Hierarchical Cluster Analysis (*Method: Group Average, Un-Weighted Pair-Group w/Euclidean Distance*)

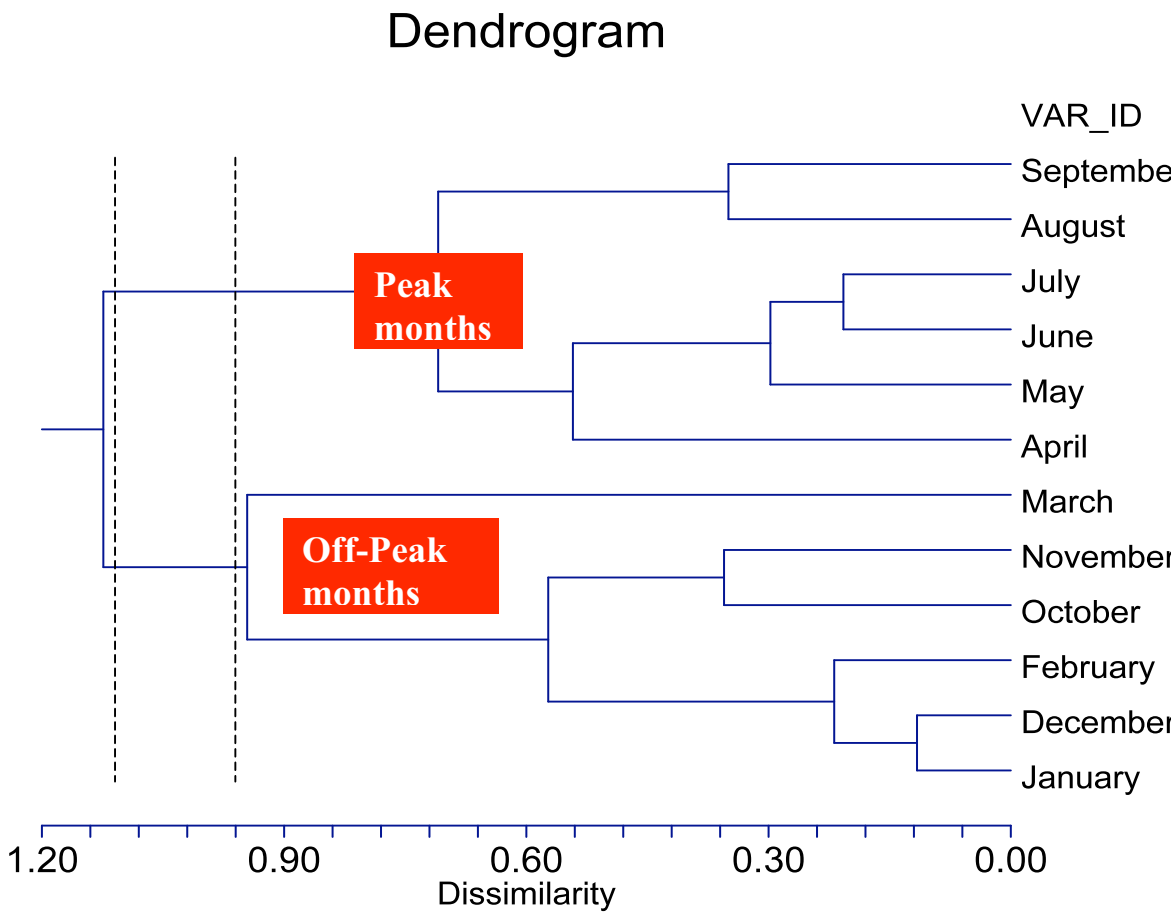

Figure 15. Dendrogram showing clusters of months based on the mean number of reported monthly trips and related variables, using a multivariate Hierarchical Cluster Analysis. (*Method: Median, Weighted Pair-Group Centroid w/Euclidean Distance*)

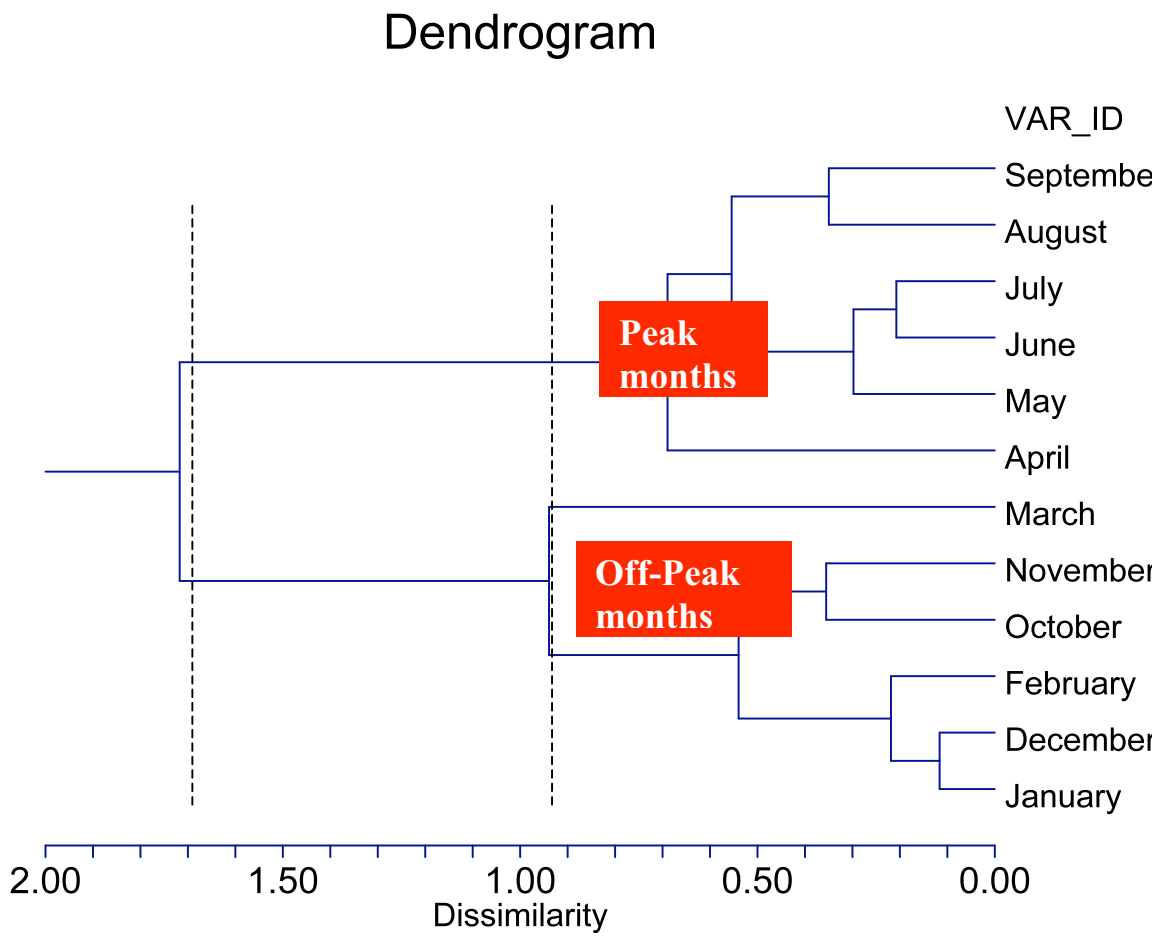

Figure 16. Dendrogram showing clusters of months based on the mean number of reported monthly trips and related variables, using a Multivariate Hierarchical Cluster Analysis (*Method: Centroid, Un-Weighted Pair-Group Centroid w/Euclidean Distance*)

Seasonal Trip Statistics by Waterway Access Group

This section examines the frequency of seasonal boating trips using the information from the reported trips taken by Bay County survey respondents. The analysis focuses on seasonal variations in the following trip-related attributes: AM and PM departure time, trip duration (daytrips versus overnight trips), weekend versus weekday trip proportions, and reported trip activities.

Questionnaire information on various trip characteristics was evaluated seasonally and by user group. The number of reported trips during the peak and off-peak boating seasons is shown in Table 36. A total of n=3,552 boating trips were reported by respondents to the survey questionnaire. As expected, the largest percentage of reported trips was associated with the peak season, roughly 78% of all trips. Despite the orientation of the sample toward peak season trips, adequate sample sizes were obtained for the off-peak season, as well as the majority of the various season/user-group combinations.

Bay County residents accounted for approximately 73% (78%) of all reported trips during the peak (off-peak) season. Note that these percentages are not significantly different from 75% at the 95% confidence level, suggesting that roughly three-quarters of the reported trips are associated with Bay County residents. This is a finding that is relatively consistent across user groups and seasons.

The summary statistics in Table 36 suggest that the greatest proportion of trips are associated with respondents departing from boat ramps, a user group that accounts for roughly half (49%) of all reported trips by survey respondents during both the peak and off-peak season. Respondents departing from Docks were the next-largest user group with approximately 27% of all reported trips.

The percentage breakdown of reported trips by respondents departing from Ramps, Docks, or Marina Wet Slips is fairly consistent across the two boating season, with approximately 77% (23%) of reported trips occurring during the peak (off-peak) season. Although Marina Dry Storage users accounted for a relatively low percentage of reported trips (with 261 overall), roughly 83% of those trips occurred during the peak season (a percentage that was significantly higher than the 77% for all users at the 90% confidence level).

Table 36. Frequency Counts of Reported Trips by Season and User Group

Season	All Users	Ramp	Dock	Marina Wet Slip	Marina Dry Storage	Other*
Off-Peak	800 (22.5%)	392 (22.3%) **(49.0%)**	221 (23.2%) **(27.6%)**	121 (22.7%) **(15.1%)**	44 (16.8%) **(5.5)**	22 (38.5%) **(2.7%)**
Peak	2,752 (77.5%)	1,360 (77.6%) **(49.4%)**	729 (76.7%) **(26.4%)**	411 (77.3%) **(14.9%)**	217 (83.2%) **(7.8%)**	35 (61.5%) **(1.2%)**
All	3,552	1,752	950	532	261	57
	% of All Users	*49.3%*	*26.7%*	*15.0%*	*7.3%*	*1.6%*

*Survey respondents classified as "Other" – boaters launching from Beach, Shoreline or Causeway. Percentages shown in parentheses are defined as follows: % of user group in non-bold type; % of season total shown in bold type.

Mean and Median Trip Numbers by Season and User Group

For the seasonal analysis of mean and median trips, only the four major waterway access groups were analyzed; specifically boaters/respondents departing from Ramps, Docks, Marina Wet Slips, and Marina Dry Storage facilities. Table 37 highlights the mean and median number of reported trips taken during each of the two designated boating seasons (as based on responses to Question 14 of the survey questionnaire). Figures 17 through 19 highlight the mean or median monthly trips by season and/or user group.

Note that trip data was 'standardized' to reflect the mean and median number of reported trips that occurred during a 'typical' month within each of the three boating seasons. In other words, the summary statistics on seasonal trips in forthcoming sections will be shown on a season-specific "per month" basis.

Seasonal distributions of reported trips were positively skewed and found to be significantly different from a "normal distribution" at the 95% confidence level. The implication here is that mean monthly trip counts by season may be somewhat overstated due to the presence of "outliers," i.e., large observations that tend to inflate the averages.

The summary statistics in Table 37 reveal that the mean and median numbers of trips per month vary across user groups and seasons, with the most dramatic differences observed between seasons. The least variation in average monthly trips occurs across user groups.

Respondents from most user groups reported a median number of monthly trips in the peak and off-peak seasons that was not statistically dissimilar from the overall median for the season in question, with the exception of respondents departing from Marina Dry Storage facilities. This waterway access group reported median monthly trips that exceeded the monthly seasonal average by anywhere from 0.67 to 1.0 trip per month, with season-specific median monthly trips that exceeded the median for all respondents in both the peak and off- peak season.

Table 37. Seasonal Breakdown of the Mean and Median Number of Trips/Month by Waterway Access Group

Season	All Respondents	Ramp	Dock	Marina Wet Slip	Marina Dry Storage
Off-Peak	**2.18** 1.16	**2.10** 1	**1.99** 1	**2.84** 1.83*	**1.76** 1.16
Peak	**4.82** 3.83	**4.57** 3.6	**4.58** 3.5	**6.05** 4.83*	**4.92** 3.6
Overall mean median	**3.50** 2.58	**3.34** 2.5	**3.31** 2.41	**4.43** 3.33*	**3.34** 2.5

Note: Mean number of trips per month shown in **bold** and median in normal type.

*Median value is significantly greater than Seasonal median for all respondents.

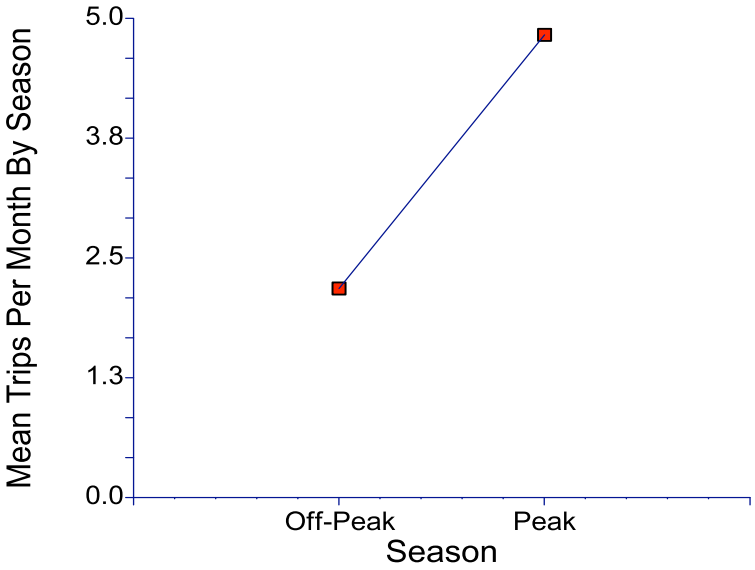

Figure 17. Mean reported monthly trips per season (all respondents)

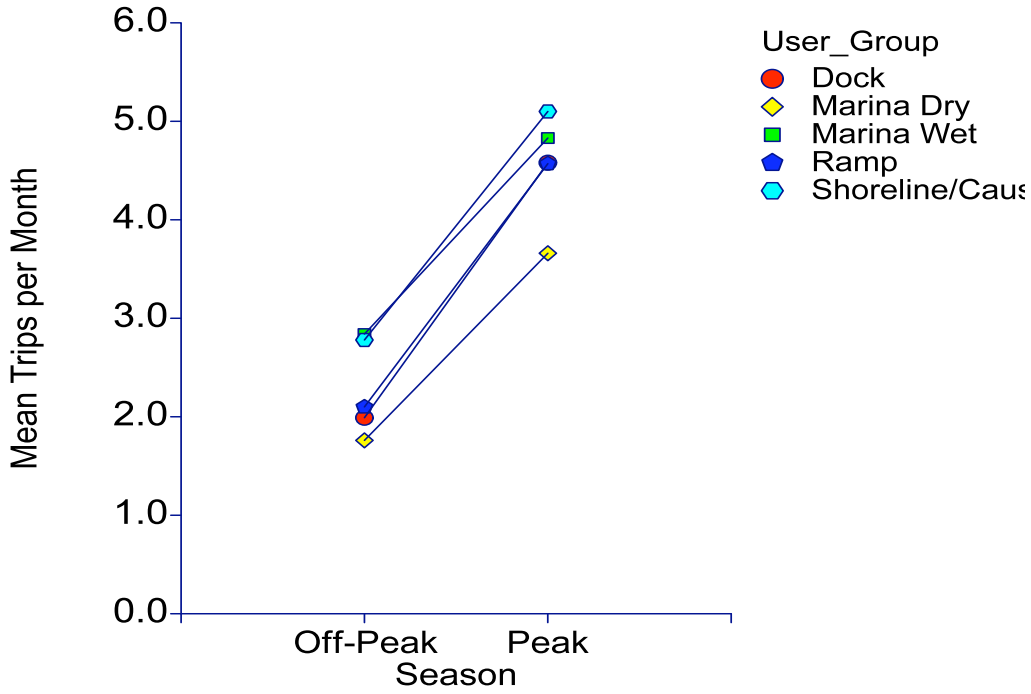

Figure 18. Median (reported) Trips per Month by Season and User Group

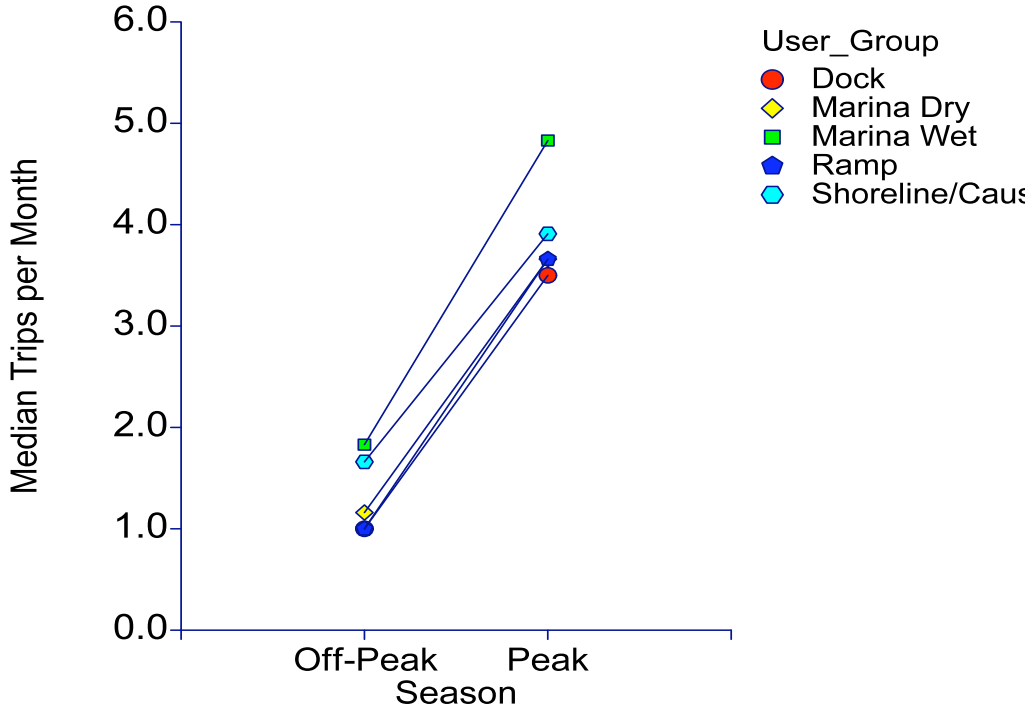

Figure 19. Median (reported) Trips per Month by Season and User Group

Seasonal and Temporal Analysis of Trip Departure Times by User Group

AM Departure Time

Summary statistics for reported AM departure times by season and user group are presented in Table 38[6]. The results are based on information obtained from the n=2,847 total survey respondents to Question 1 of the survey questionnaire. The mean overall AM departure time of trips reported by all survey respondents was approximately 8:12AM. The average peak-season departure time of approximately 8:07AM is substantially earlier than the average AM departure time during off-peak season (8:30AM).

Relative frequency histograms highlighting the distributions of reported AM departure times by season are shown in Figures 20 and 21. Class intervals are broken down by the half-hour to help differentiate the nuances that occur in the AM launch times by season. The histograms (Figures 20 and 21) and summary statistics (Table 38) reveal several interesting features that are worthy of enumeration and discussion.

- The peak AM departure time tends to occur earlier in the day during the peak season in comparison to the off-peak season. In short, there is a tendency for boaters to begin their on-water trips earlier during the peak boating season.

- A "staggering" of departure times is evident in both histograms, with spikes followed by voids. Note that there are 5 sequential peaks that occur at various times, with a departure pattern that is fairly consistent across the two seasons. Note also that there is a more prominent first spike (around 6:00AM) during the peak season, implying that boaters tend to get an early start when there is more competition for waterway access.

- Boaters launching from Ramps begin their trips earlier than boaters from other user groups during the peak boating season (departing at approximately 7:46AM, on average).

- Boaters accessing the waterways from Docks and Marina Wet Slips reported AM departure times that were significantly later than other user groups during both the peak and off-peak boating seasons on average. Those departing from Docks (Marina Wet Slips) tend to have an average departure time of around 8:42AM (8:30AM). Boaters in these two user groups tend to depart anywhere from about 40 minutes to almost an hour later than boaters departing from Ramps during the peak boating season.

- Marina Dry Storage facility users tend to have AM departure times that are not significantly different from the overall average for all boaters.

[6] Note that departure time difference between the peak boating season and the non-peak season may be somewhat understated due to complications that arise with the conversion to Daylight Savings Time.

Table 38. Mean AM Departure Time by Season and User Group

Season	All Users‡	Ramp	Dock	Marina Wet Slip	Marina Dry Storage
Off-Peak	***8:30AM**** (606)	**8:19**** (336)	**8:45††** (126)	**8:43††** (91)	**8:23** (34)
Peak	***8:07AM*** (2,230)	**7:46*†** (1,355)	**8:42††** (522)	**8:22††** (309)	**8:17** (196)
All Seasons	***8:12AM*** (n = 2,847)	***7:53AM†*** (1,510)	***8:42AM††*** (654)	***8:30AM††*** (402)	***8:20AM*** (230)

Mean departure time shown in boldface type; Sample sizes are shown in parentheses.

‡ Note that "All Users" represents all Waterway Access categories including Shoreline/Causeway/Other.

Note that the results above are for survey respondents that answered Questions 1 (AM), 4, and 7.

These factors account for discrepancies in row/column totals.

* Significantly less (earlier) than values observed from the same user group or the overall mean during other seasons at the 95% confidence

** Significantly greater (later) than values observed for the same user group or the overall mean value during the other season at the 95% confidence level

† Significantly less (earlier) than values observed for other user groups or the overall mean value during the same season at 95% confidence

†† Significantly greater (later) than values observed for other user groups or the overall mean value during the same season at 95% confidence

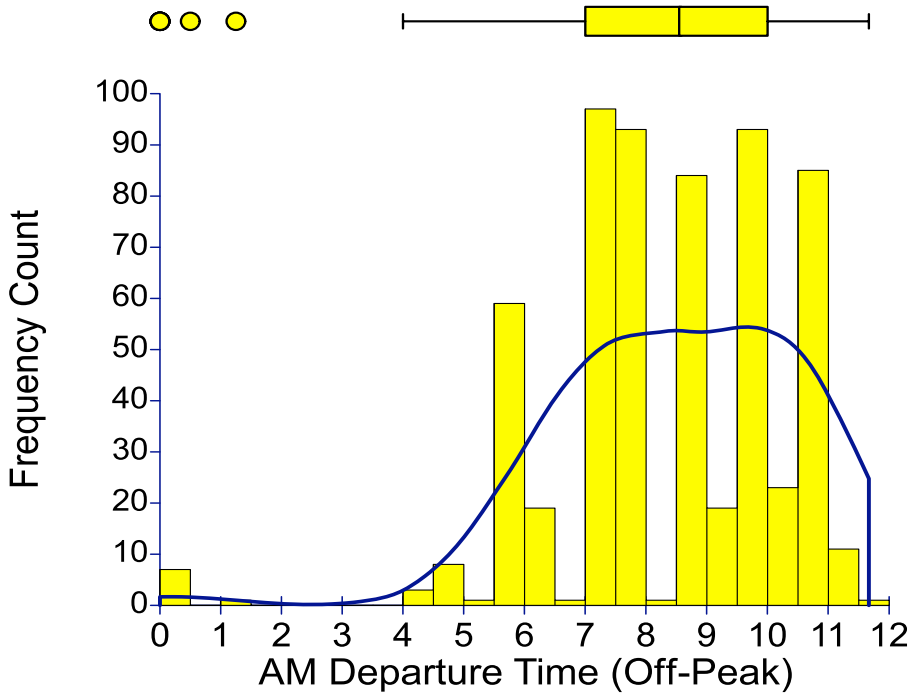

Figure 20. Histogram of AM Departure Time—Off–Peak Season

AM Departure Time (n = 606 respondents)

Note: X-Axis (0.0 = midnight; 12.0 = noon)

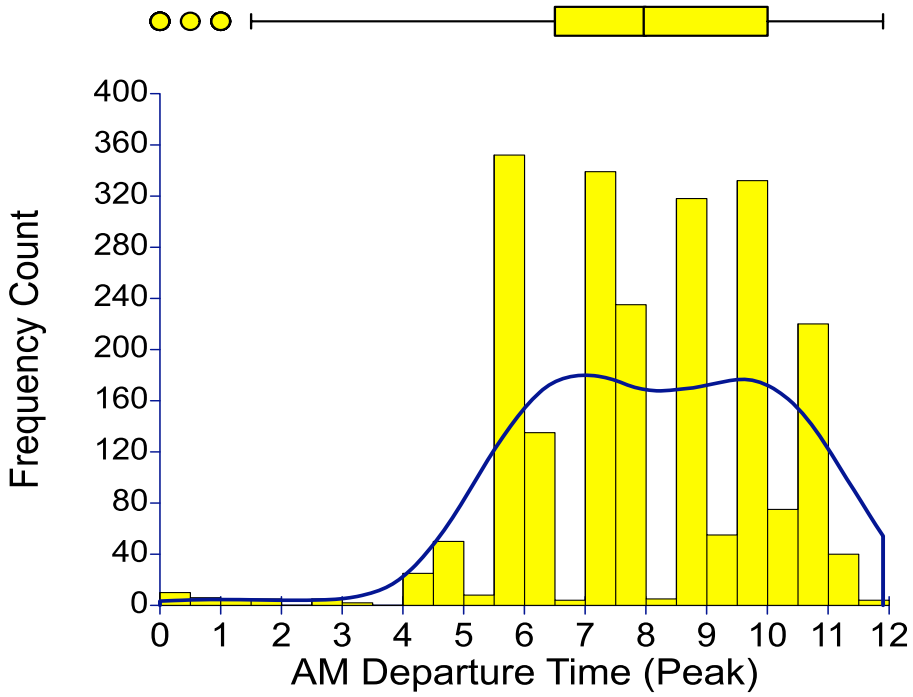

Figure 21. Histogram of AM Departure Time—Peak Season

AM Departure Time (n = 2,230 respondents)

Note: X-Axis (0.0 = midnight; 12.0 = noon)

AM departure times by season and user group are also highlighted in Figure 22. Substantial differences can be observed between the average AM departure times of Ramp users versus those of other waterway access groups. Notwithstanding, the seasonal trends in departure times are quite similar; with the earliest AM departure times occurring during the peak boating season and the latest AM departure times occurring during the off-peak season.

In general, boaters departing from Ramps tend to launch anywhere from an hour to 75 minutes earlier than boaters launching from other user categories. As indicated earlier, Dock and Marina Wet Slip users tend to have AM departure times that are significantly later than Ramp users during both the peak and off-peak seasons.

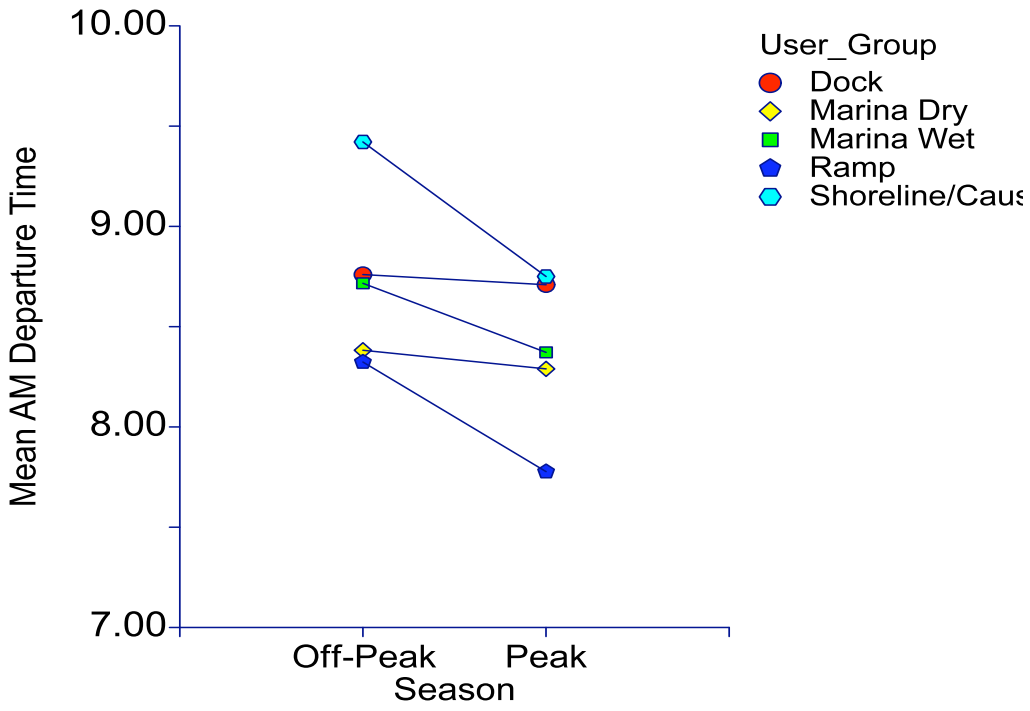

Figure 22. AM Departure Times by User Group and Season

PM Departure Time

A total of n=574 survey respondents reported trips with PM departure times. This sub-sample represents roughly one-quarter of the total reported trips. The distribution of PM departure times is shown in Figure 23. The distribution is positively skewed and unimodal, with trip frequency counts that decline in a fairly consistent manner over the evening hours.

The peak PM departure time occurs between 1:00 and 2:00PM, followed by a much smaller wave of departures between 3PM and 5PM. The median PM departure time is 2:00PM, and the mean PM departure time is 2:25 PM for the sub-sample of survey respondents who answered question 1. The fact that the mean and median values are fairly similar suggests that the distribution of PM departure times is not severely skewed.

A summary of PM departure times by user groups and season is given in Table 39[7]. The reported PM launch time for reported trips that occurred during the peak boating season (2:35PM) is not significantly different from the overall average PM launch time of 2:25PM. Note, however, that off-peak PM departure times tend to be slightly less than the overall average.

Several distinctions in departure times are observed when broken down by user group. First, the reported afternoon departure time of respondents using Ramps was significantly later than other user groups during each of the three designated boating seasons; with an overall average PM departure time of 3:30PM. Second, Marina Wet Slip users and those departing from Marina Dry Storage facilities reported PM departure times that were significantly earlier than the other groups in virtually all seasons (with the exception of Marina Dry Storage users during the peak season). Lastly, respondents departing from Docks had PM departure times that were statistically similar to the overall average and seasonal average PM departure times for all groups.

[7] Some caution should be exercised in analyzing the trends in PM launch times as described in this section, due to the fact that relatively small sample sizes were obtained for Marina Dry Storage facility users, making statistical comparisons slightly more difficult.

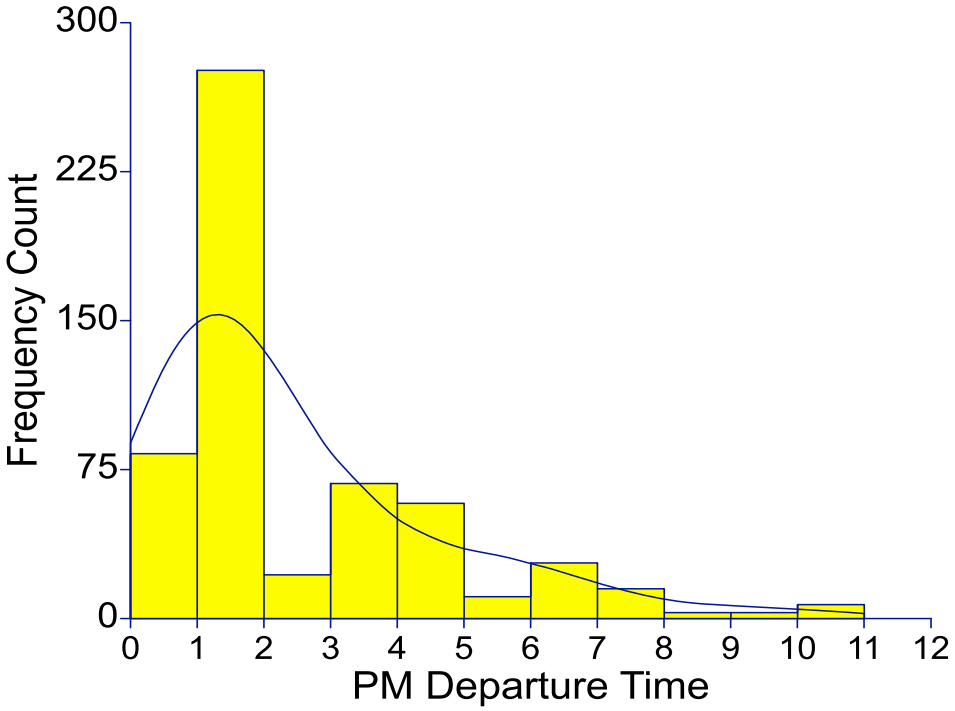

Figure 23. Frequency Distribution of PM Launch Times for Reported Trips

Departure Time (n = 574)

Note: X-Axis (0.0 = noon; 11.0 = 11PM maximum)

Table 39. PM Departure Time by Season and User Group

Season	All Users‡	Ramp	Dock	Marina Wet Slip	Marina Dry Storage
Off-Peak	***2:00PM**** (135)	**2:01*** (41)	**2:14†*** (77)	**1:45†*** (25)	**12:48†*** (10)
Peak	***2:35PM*** (416)	**2:49††**** (135)	**2:37** (167)	**2:18†** (91)	**1:53†**** (20)
All Seasons	***2:25PM*** (n = 574)	**2:38PM** (177)	**2:30PM** (246)	**2:10PM†** (116)	**1:31PM†** (30)

Mean departure time shown in **boldface** type; Sample sizes are shown in parentheses.

‡ Note that "All Users" represents all Waterway Access categories including Shoreline/Causeway/Other.

Note that the results above are for survey respondents that answered Questions, 1 (PM), 4 and 7.

These factors account for discrepancies in row/column totals (as not all respondents answered 2,4, and 7).

*Significantly less (earlier) than values observed from the same user group or the overall mean during other seasons at the 95% confidence

**Significantly greater (later) than values observed for the same user group or the overall mean value during the other season at the 95% confidence level

†Significantly less (earlier) than values observed for other user groups or the overall mean value during the same season at 95% confidence

††Significantly greater (later) than values observed for other user groups or the overall mean value during the same season at 95% confidence

Seasonal Analysis of Trip Duration

Day Trips: Reported Trips of 24 Hours or Less

A seasonal comparison was made of trip durations of n = 3,199 reported trips of 24 hours or less; representing roughly 78% of the total number of trips reported by survey respondents. Summary statistics for trip duration are presented in Table 40 for "day trips" (i.e., reported trips of 24 hours or less). Supporting graphics for this section are shown in Figures 24 and 25.

The analysis of day-trip duration revealed numerous statistical differences in the mean and median number of hours spent on the water during the three boating seasons and by the four user groups. Seasonal differences in the duration of day trips were least pronounced for respondents departing from Boat Ramps with a difference of only about 35 minutes between the peak and off-peak boating season. Much larger differences in seasonal trip durations were observed for Marina Wet Slip and Marina Dry Storage Users (with peak season trip durations that were ≥ 90 minutes longer than those in the off-peak season).

Reported day trips for all users averaged about 5.85 hours, with a median trip duration of 6 hours. Median trip durations ranged from 4 to 6 hours, depending on the user category and season. Note that the 95% confidence interval for the mean day trip duration is between 5.75 hours and 5.95 hours for user groups across all seasons. The limited range of this interval (approximately .20 hours or 12 minutes) indicated that reported trip durations were compactly distributed about the mean of 5.85 hours; a feature that was confirmed by the box plot of this distribution shown in Figure 25.

Boaters departing from Marina Wet Slips tended to stay out on the water approximately 1 hour and 45 minutes longer than boaters departing from Docks during the peak boating season. Day trips taken by Dock users tended to be of a significantly shorter duration than boaters in other waterway access categories during the off-peak season. Boaters departing from Dock and Marina Dry Storage facilities, during the off-peak season, reported the shortest trip durations. The longest trip durations were associated with Marina Wet Slip users during the peak season, where the average trip duration was 6.85 hours. Boaters departing from Ramps or Marina Wet Slips had average trip durations that were between 30 to 60 minutes longer than the overall trip duration average for all user groups over the entire year.

All in all, the results presented in Table 40 reinforce the notion that boaters associated with the various user groups constitute distinct statistical populations with distinct use characteristics and trip durations that vary across seasons.

Table 40. Mean and Median Trip Durations (in hours) by Season and User Group– Reported "Day Trips" (Trips ≤ 24 Hours)

Season	All Users‡	Ramp	Dock	Marina Wet Slip	Marina Dry Storage
Off-Peak	***5.33 hrs*** 5 hrs (715)	**5.90*** 6†† (359)	**4.45**†* 4† (207)	**5.48*** 5 (87)	**4.66**†* 4† (40)
Peak	***6.00 hrs*** 6 hrs (2,471)	**6.25**†† 6 (1,264)	**5.03**† 4† (665)	**6.85**††** 6 (306)	**6.24**††** 6 (204)
All Seasons	**5.85 hrs** 6 hrs (3,199)	**6.17**†† 6 (1,627)	**4.90***† 4† (879)	**6.58**†† **6** (395)	**5.98** **6** (244)

Mean departure time shown in boldface type; Sample sizes are shown in parentheses.

‡ Note that "All Users" represents all Waterway Access categories including Shoreline/Causeway/Other.

Note that the results above are for survey respondents answered Questions 2 (Duration ≤ 24hrs), 4, and 7.

These factors account for discrepancies in row/column totals (as not all respondents answered 2, 4 and 7).

*Significantly less (earlier) than values observed from the same user group or the overall mean during other seasons at the 95% confidence

**Significantly greater (later) than values observed for the same user group or the overall mean value during the other season at the 95% confidence level

†Significantly less (earlier) than values observed for other user groups or the overall mean value during the same season at 95% confidence

††Significantly greater (later) than values observed for other user groups or the overall mean value during the same season at 95% confidence

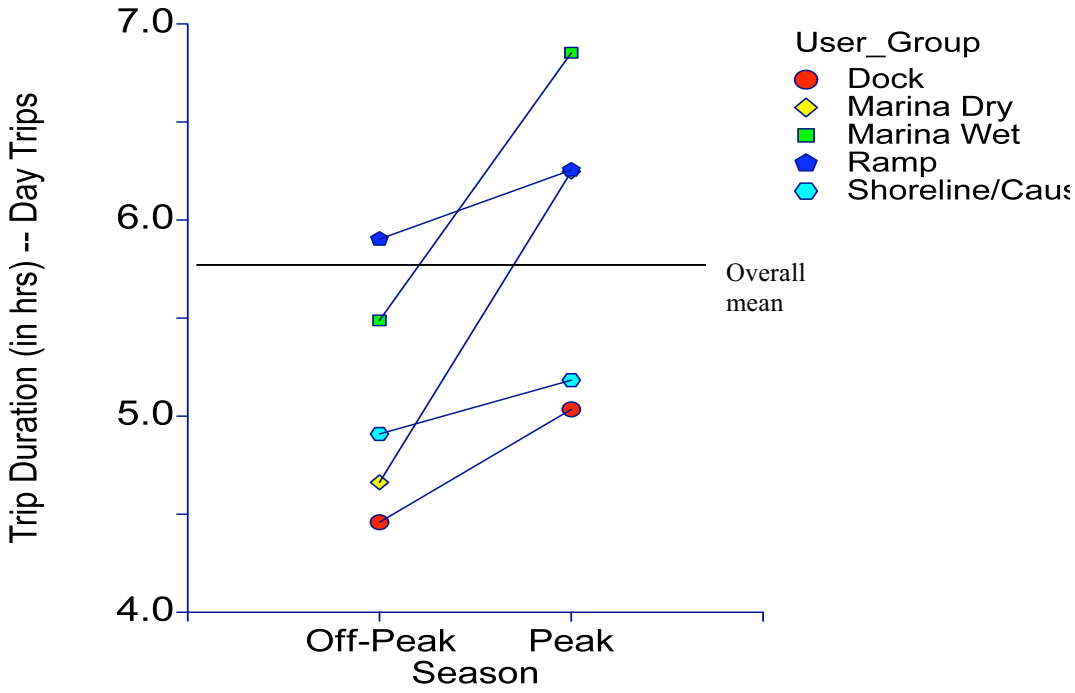

Figure 24. Average Reported Duration of Day Trips (in hours) by Season/User Group

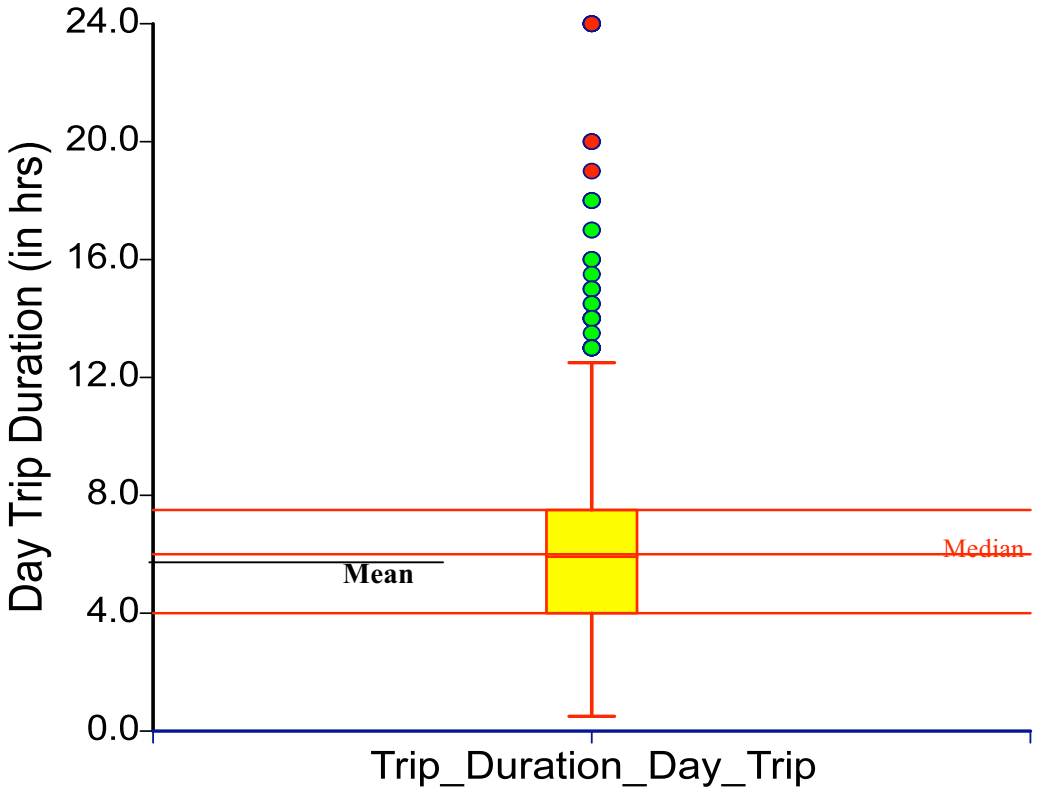

Figure 25. Box-Plot of the Duration of "Day Trips" as Reported by Respondents from All User Groups

Overnighters: Reported Trips Greater than 24 Hours in Duration

A total of n=319 reported trips (representing approximately 13.6% of the total trips reported by survey respondents) were categorized as "overnighters". Note that overnight trips were greater than 24 hours in duration but less than or equal to 168 hours (7 days). A limit of 168 hours was employed to sidestep the influence of potential outliers, which would tend to positively skew the distribution of trip duration values and inflate the mean (as indicated by a pre-test of the trip duration data relevant to this section).

Summary statistics are provided in Table 41, with the seasonal results by user group illustrated in Figure 26. Note that the mean overnight trip duration was 65.0 hours, with a median overnight trip duration of 48 hours. The gap between the mean and the median trip values imply that the distribution of overnight trip durations is indeed highly skewed; a fact that is confirmed by the box plot diagram shown in Figure 27.

The results revealed that Marina Wet Slip users had the longest average overnight trip durations during the off-peak season, approximately 100 hours (4.1 days). By contrast, the average overnight trip duration of Marina Wet Slips users was not significantly different from the overall average of all user groups during the peak boating season. Marina Wet Slip users, like most of the user groups examined, tended to have median trip durations of 48 hours.

Overnight trips associated with boaters departing from Docks tended to be long during both the peak and off-peak seasons when compared to boaters from other waterway access groups. Boaters departing from Docks tended to have overnighters that averaged about 64 hours (2.6 days) in the off-peak season and 89 hours (3.78 days) during the peak season. However, the median trip duration of boaters launching from Docks was 48 hours during both seasons. Once again, this draws attention to the fact that the distribution of overnight trip duration values, even with the imposed limit of 168 hours, is still fairly skewed (a feature that tends to inflate the mean). Further, the sample size of Dock users who reported overnight trips during the off-peak season was very small (a factor that could also account for the discrepancy between the mean and median value in that season).

Respondents departing from Ramps tended to have overnight trip durations that were significantly shorter than those of the other user groups, with average (median) trip durations of about 39 hours (exactly 32 hours) during the off-peak and peak boating seasons. The similarity in the mean and median values across seasons suggests that the distribution of overnight trip duration values for this group is less severely skewed than the distributions of overnight trip durations for the other user groups. All in all, Ramps users tended to have a median overnight trip duration of 32 hours (1.33 days), a value that is significantly less than the median values for all other waterway access groups (~2 days).

Boaters departing from Marina Dry Storage facilities showed some of the greatest variation in overnight trip duration across boating seasons, with an average of about 45 hours (1.875 days) during the off-peak season and 86 hours (3.5 days) during the peak boating season. Marina Dry Storage facility users tended to have a median overnight trip duration of 66 hours (2.75 days); a duration value that is significantly longer than the overall median of 48 hours during the peak boating season. Note that the results for this group were based on a relatively small sample size ($n < 20$).

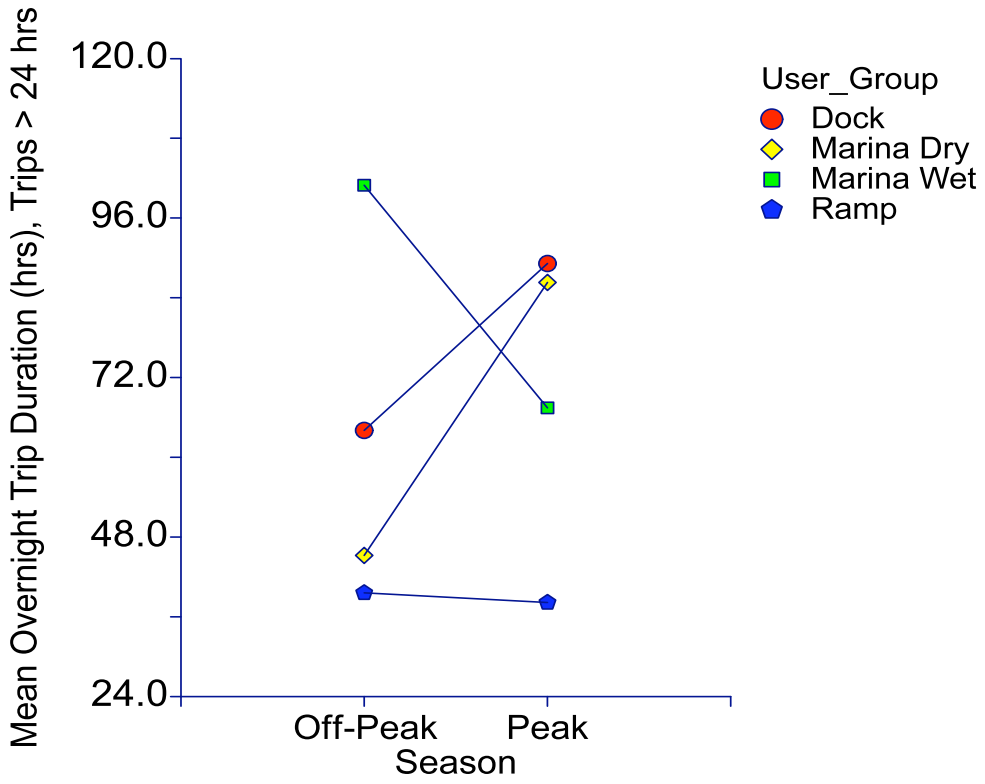

Figure 26. Average Reported Duration of Overnight Trips by Season and User Group

Table 41. Mean and Median Overnight Trip Durations (in hours) by Season and Use Group. "Overnighters" = Trips > 24 Hours and ≤ 168 Hours

Season	All Users‡	Ramp	Dock	Marina Wet	Marina Dry
Off-Peak	***70.2 hrs*** 42 hrs (72)	**39.6**† 32† (27)	**64.0**†* 48 (9)	**100.9**††** 48 (32)	**45.2**†* 39.5 (4)
Peak	***63.5 hrs*** 48 hrs (246)	**38.1**† 32† (78)	**89.1**†† 48 (52)	**67.4*** 48 (101)	**86.3**†** 66†† (12)
All	**65.0 hrs** 48 hrs (319)	**38.5**† 32† (105)	**85.2**†† 48 (62)	**75.5**† 48 (133)	**76.0**†† 54†† (16)

Mean departure time shown in boldface type; Sample sizes are shown in parentheses.

‡ Note that "All Users" represents all Waterway Access categories including Shoreline/Causeway/Other.

Note that the results above are for survey respondents answered Questions 2 (Duration >24hrs), 4, and 7.

These factors account for discrepancies in row/column totals (as not all respondents answered 2, 4, and 7).

*Significantly less (earlier) than values observed from the same user group or the overall mean during other seasons at the 95% confidence

**Significantly greater (later) than values observed for the same user group or the overall mean value during the other season at the 95% confidence level

† Significantly less (earlier) than values observed for other user groups or the overall mean value during the same season at 95% confidence

†† Significantly greater (later) than values observed for other user groups or the overall mean value during the same season at 95% confidence

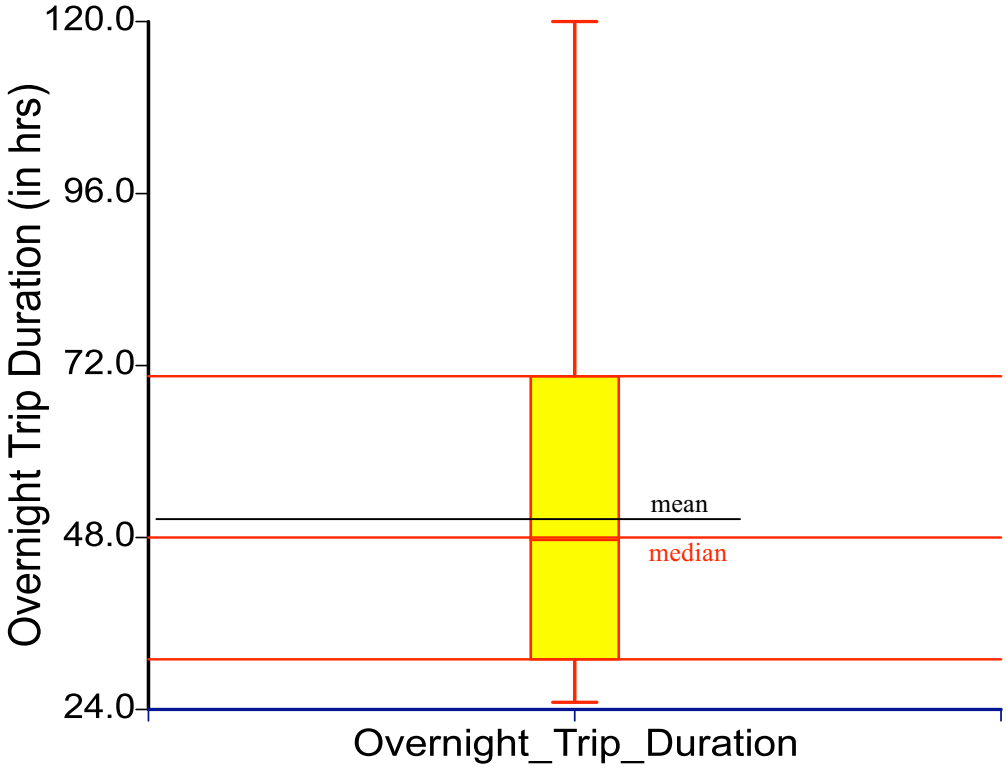

Figure 27. Box Plot Showing Duration of Reported Overnight Trips by Survey Respondents from All User Groups (Duration > 24 hours and ≤ 168 hours)

Seasonal Analysis of Weekend vs. Weekday Trips

Summary statistics highlighting the proportion of trips associated with weekend days (Saturday or Sunday) versus weekdays (Monday through Friday) are based on the responses to Question 3 of the survey. Of the n=3,449 reported trips, 1,400 fell on weekend days, yielding an overall proportion of 0.406. In other words, 40.6% of the reported trips were classified as weekend trips and 59.4% were classified as weekday trips.

A breakdown of the proportion of weekend trips by waterway access group and season is presented in Table 42. Dock users had the highest proportion of reported trips falling on weekend days during the off-peak season .47 (or 47%), a value that is significantly greater than the average for all user groups during the off-peak season. Survey respondents departing from Ramps had a relatively lower proportion of weekend trips in both the off-peak and peak boating seasons, with an overall average of approximately 37% of their reported trips occurring during the weekend. Survey respondents departing from Marina Wet Slips had the second-highest overall percentage of trips occurring on weekends (approximately 43%). Boaters departing from Marina Dry Storage facilities reported the lowest percentage of weekend trips during the off-peak season, with slightly less than 32% of their trips falling on weekend days.

It should be noted that if all days of the week were equally likely in terms of observing a trip (that is, trips were equally spread out over the course of the week), the "expected" proportion of weekend trips would be 2/7 = .285 (or 28.5%). This represents a hypothetical benchmark by which to compare the proportion of reported trips by user group and/or season. In all cases, user groups posted proportions that significantly exceeded this benchmark in both boating seasons. The ratio of "reported" trips to "expected" trips -- (40.4%/28.5% or 1.42) – indicates that weekend trips are, on average, about 1.4 times as likely to occur than a weekday trip (across all seasons). During the peak season, this ratio increases only slightly to 1.46 (41.7%/28.5%).

All in all, the results indicate that the likelihood ratio of weekend to weekday trips is fairly stable throughout the two boating seasons, with weekend trips being approximately 1.5 times more likely than a weekday trip. These indices highlight the weekend orientation of recreational boating trips in the Bay County study region, based on survey responses to Questions 3 of the survey instrument. No user-group/season combination had a proportion of weekend trips that fell below the 28.5% benchmark (or a proportion of 0.285). Of the four major waterway access groups examined, the highest ratio was observed for boaters departing from Docks, where the likelihood ratio of a weekend versus a weekday trip was 1.66 (0.474/0.285), indicating that a weekend trip was 1.6 times more likely for this group during the off-peak season.

Table 42. Proportion of "Weekend Trips" by User Group and Season

Season	All Users	Ramp	Dock	Marina Wet Slip	Marina Dry Storage
Off-Peak	***0.392*** (770)	**0.363**†† (388)	**0.474***† (219)	**0.411**†† (119)	**0.318****†† (44)
Peak	***0.417*** (2,679)	**0.378*** (1,344)	**0.430**** (711)	**0.437** (407)	**0.428**** (217)
Overall	**0.406** n=3,449	**0.375**** (1,732)	**0.442*** (930)	**0.431*** (526)	**0.410** (261)

Note: Sample and sub-sample sizes shown in parentheses.

Note: Proportions shown above are the number of "weekend trips" divided by the number of trips.

Note "All Users" are for the 4 major user groups only.

*Significantly greater than mean for the same season at the 95% confidence level

**Significantly less than mean for the same season at the 95% confidence level

†Significantly greater than mean for same user group at the 95% confidence level

†† Significantly less than mean for same user group at the 95% confidence level

Seasonal Analysis of Boating Activities

Typical Trip Activities

Information on recreational boating activities that occur on a typical trip was gathered from survey respondents, along with the number of typical trips taken per month. The objective was to identify the predominant boating activities by user group and season in the Bay County study region. A list of 15 boating activities was provided in Question 16 of the survey questionnaire.

Survey respondents were asked to identify those boating activities that they engaged in during a "typical trip" (Question 16), and to "check all that apply". Participants were also asked to report the number of typical trips taken in each month of the year (Question 14). Data on boating activities and trips per month were combined to estimate the number and the percentage of specific trip activities that occur during the two designated boating seasons during a typical boating trip.

Table 43 provides a breakdown of the estimated percentage of recreational boating activities for each of the 15 activity categories listed in Question 16. The percentage breakdown of activities tended to be fairly inconsistent from season to season, and marked differences were observed in the reported activities that a respondent engaged in during a typical boating trip in the peak versus the off-peak season.

Fishing was the predominant activity of boaters who participated in the survey, regardless of season. As a seasonal recreational boating activity, 29% (56%) of respondents indicated that they engaged in Fishing during the off-peak (peak) season. Of all boating activities, only Fishing was listed as an activity that occurred during the off-peak season by at least 20% of survey respondents.

The top-5 recreational boating activities during the off-peak season (in descending order) were Fishing (29.1%), Nature Viewing (16.7%), Swimming (15.8%), Cruising (15.3%), and Sightseeing (14.6%).

The top-5 recreational boating activities during the peak season (in descending order) were Fishing (56.2%), Swimming (37.2%), Cruising (36.7%), Nature Viewing (32.8%), and Socializing (31.3%).

Note the significant increase in the percentage of respondents who indicated that they engaged in certain activities in the peak season in comparison to the year-round percentages. Specifically, there were marked increases in the percentages of respondents engaging in Fishing, Sightseeing, Nature Viewing, Beach Picnicking, Visiting Restaurants, Socializing, Daytime Anchoring, Cruising, and Swimming. All of these activities were more than 2 times as likely during the peak season in comparison to the off-peak season. Certainly, weather and coastal waterway conditions, as well as the amount of daylight, play prominent roles in influencing the likelihood of the various boating activities, with more favorable conditions occurring during the peak boating season.

Table 43. Percentage of Respondents Engaging in a Particular Activity by Season (during a Typical Trip)

Recreational Boating Activity	Year Round	Off-Peak Season	Peak Season
Fishing	43.9*‡	29.1*‡†	56.2*‡††
Sight Seeing	23.6*	14.6†	30.4*††
Nature Viewing	25.5*	16.7*†	32.8*††
Beach Picnicking	22.7*	12.1†	29.9*††
Beach Camping	2.6	1.7	3.2
Visiting Restaurants	16.0*	8.7	21.8*††
Socializing	23.4*	11.8†	31.3*††
Sailing	5.4	4.2	6.8
Overnight Anchoring	9.2	6.8	11.5
Daytime Anchoring	21.6*	11.6†	28.6*††
Diving	3.7	4.5	12.7
Jet Skiing	4.7	2.0	6.4
Cruising	27.9*	15.3*†	36.7*††
Swimming	28.2*	15.8*†	37.2*††
Water Skiing/Water Sports	8.2	4.2	11.0

*Indicates an activity ≥ 15% for that season; ‡ indicates the top activity for season.

Note: Results based on n = 4,120 total survey respondents, and reported trips (by month/season) and activities said to occur during a "typical trip".

Note: Column totals do not sum to 100% as many respondents indicated engaging in multiple activities during a typical boating trip.

† the percentage value for an activity in a given season was statistically less than the yearly percentage value at the 95% confidence level (considering top activities only)

†† the percentage value for an activity in a given season was statistically greater than the yearly percentage value at the 95% confidence level (considering top activities only)

2.3. Bay Boating Detractions and Needs

Overview

This chapter analyzes the responses to the following survey questions:

-**Question 21**: *What detracts most from your St. Andrew Bay area boating experience?*

-**Question 22**: *What is needed most to improve your St. Andrew Bay area boating experience?*

Typologies of principal detractions and needs were developed through content analyses of 2,781 responses contained in n=1,254 returned surveys[8] (i.e., the long version that contained Questions 21 and 22). Responses with a shared theme were grouped within a *primary category,* such as "altered environment" or "more water access." In most cases, a primary category encompassed one or more *subcategories,* identifying and grouping more specifically expressed concerns, such as "beach litter" or "more ramps." Every effort was made to capture the intended meaning of a given response and to maintain consistency in its assignment to a particular category/ subcategory. Certain singular or more tangential responses (n=29 detractions, n=34 needs) were not included in the analyses, and others were excluded as not being amenable to intervention, such as weather issues.

In addition to the total response analysis for each question, this chapter compares detraction and need perceptions among the waterway access groups (i.e., Marina (combined wet slip and dry storage), private Dock, and Ramp) by analyzing each group's return independently. Independent analyses for each of the three user groups were necessary, given the differing amount of survey input from each. For example, more than three times as many ramp users received the long survey (with Questions 21 and 22) as did marina users, and more than twice as many ramp user responses were ultimately analyzed as were marina user responses. This disparity could potentially obscure concerns unique to the marina group in a total response analysis.

Detractions

Table 44 lists the eight primary categories of perceived boating detractions in descending rank, identified through analysis of responses to Question 21. Each is followed by its composite subcategories, with the top ten overall highlighted in column 5. The top ten detraction subcategories together accounted for 972 (or 68.5%) of the n=1,420 responses to Question 21. Only the *no detractions* category comprised no subcategories; it was ranked as both a category and a subcategory. The leading primary category addressed the *lack of courtesy and/or seamanship* in other boaters. It accounted for over forty percent (n=597) of all analyzed responses (n=1,420) and included more than three times as many responses as the next highest primary category. Specific boat operator groups were singled out in subcategories, along with a significant element citing bad boating behaviors in general. Responses that focused on *congestion* made up the second highest primary category, with 196 responses or 13.8 % of the total, followed closely by *altered environment* with 13% (n=184), led by *water quality* concerns. Just over ten percent of responses dealt with *infrastructure* shortcomings (n=144), in particular the failure to maintain dredging. Concerns addressing compromised *water access*

[8] Many survey respondents provided multiple answers to one or both questions; others chose not to answer. Therefore, the total response does not equal the returned survey count.

Table 44. All Perceptions of Boating Detractions by Primary Categories/Subcategories

Categories / Sub-Categories	Totals (all user groups)	% of Total (n=1,420)	Category Rank	Subcategory Rank (top ten)
Lack of Courtesy and/or Seamanship	**597**	**42.0**	**1**	
PWC Operators	215	15.1		**1**
Bad Boater Behaviors in General	172	12.1		**2**
Tourists/Rental Boat Operators	78	5.5		**4**
Large Fast Boats/Big Wakes	61	4.3		**9**
Ramp User Behaviors	25	1.8		
Boaters Under the Influence	17	1.2		
Charter Boats/Commercial Dive Boats	14	1.0		
Mercury Marine Test Boats	8	0.6		
Power Boat Noise	7	0.5		
Congestion	**196**	**13.8**	**2**	
Waterways in General	111	7.8		**3**
Localized Areas	59	4.2		**10**
Weekends and Holidays	26	1.8		
Altered Environment	**184**	**13.0**	**3**	
Dirty Water, Pollution	72	5.1		**6**
Island/Beach Trash	31	2.2		
Grass Flats Destruction	16	1.1		
Loss of Natural Areas to Development	14	1.0		
Red Tide	14	1.0		
Paper Mill/Chemical Plant Odors	12	0.8		
Lack of Fish	10	0.7		
Abandoned Derelicts, Sunken Debris	9	0.6		
Grass Overgrowth in Deer Point Lake	6	0.4		
Infrastructure Shortcomings	**144**	**10.1**	**4**	
Lack of Dredging (Shoaling)	58	4.1		**10**
Inadequate Ramp Facilities	50	3.5		
Inadequate Marina Facilities	15	1.1		
Lack of Recreational Destination Infrastructure	11	0.8		
Lack of Channel Marks/Waterway Signs	10	0.7		
Lack of Water Access	**115**	**8.1**	**5**	
Ramp Congestion/Too Few Ramps	72	5.1		**6**
Inadequate Ramp Parking	29	2.0		
Too Few Marinas/Wet Slips	14	1.0		
Excessive Regulation/Enforcement	**102**	**7.2**	6	
Overzealous Marine Patrol	74	5.2		**5**
Fishing Regulations	14	1.0		
Dog Restrictions on Shell Island	11	0.8		
Speed Zones(1) and Boating Regulations in General (2)	3	0.2		
Lack of Enforcement	**10**	**0.8**	8	
Speed/No Wake Zones	7	0.5		
Fishing Regulations/Catch Limits	3	0.2		
No Detractions	**72**	**5.1**	7	**6**

(n=115 or 8.1% of total), chiefly ramp inadequacies, completed the top five primary categories. *Excessive boating regulation or regulation enforcement* included 102 responses or 7.2% of the total. By contrast, 8th ranking *lack of enforcement* encompassed less than one percent of all responses.

Categories (bold red) and subcategories (italic black) are ranked in Table 45 in three columns, one for each water access group, according to internal percentages. A strong conformity occurred within the user groups as to the top three leading detraction categories and associated subcategories. The *lack of courtesy and seamanship* in other boaters garnered an almost identical, overwhelming percentage (>40%) of the responses from Marina, Dock, and Ramp users. The failure in others to observe safe, considerate, and/or regulated boating practices dominated reported detractions to the boating experience. *Bad boater behaviors* in general, whether from ignorance of or noncompliance with the rules of the road, made up the second highest (n=172) subcategory in the overall analysis (Table 44) and across all user groups (Table 45). Operators of specific boat types were singled out by respondents, with personal watercraft (*PWC) operators* receiving the most responses from all three access groups. Complaints typically dealt with reckless driving, driving too close to other boaters, and speeding in congested areas such as the Pass. PWC operators who exhibited a lack of safe or courteous practices defined the leading subcategory (n=215), considering all detraction responses and within all user groups (Table 45). Other negatively cited boat operators included the "tourist" *boat renters*, especially pontoon renters and jet ski tourist groups, described as poorly trained or insufficiently knowledgeable of waterway features (5.5% of total responses, ranking 4th). Significant mention by all access types also included the *large, fast vessel heedless of boat wake* effect on smaller craft, especially in congested areas such as the Pass or the Grand Lagoon (4.3% overall, ranking 9th). Citations with lower overall percentage returns but spread across user types included arrogant *charter fishing boat captains* and *noisy power boats*. More significant numbers of Dock and Ramp users cited *boaters under the influence* and *discourteous ramp users* respectively (Table 45).

Congestion was the second leading category overall and for Marina and Ramp users, as well as third for users of Docks (Tables 44 and 45). More than half of the category responses in each user group stressed the presence of *too many boaters*, making it the 3rd highest subcategory overall (n=111) and for Marina users and 4th for Dock and Ramp users. Smaller but similar response percentages across users were focused on congestion during *weekends and holidays* or in a specific area. The latter was most often St Andrew Pass, but also the Grand Lagoon and Deep Water Point, as well as destination draws such as reefs and Shell Island beaches. (Of note, ramp congestion was analyzed independently under the access category.)

Close behind in response number were *altered environment* detractions, ranking 2nd within the Dock group and 3rd with Marina and Ramp users. This was largely driven by the subcategory of *poor water quality*, which made up 39.1% of all environmental responses (6thoverall tied with ramp congestion) (Table 44) and led within all user groups. The highest ranking of 7% was within Dock users, followed by 4.2% and 4.0% within Ramp and Marina users respectively (Table 45). Stagnant water resulting from closure of the East Pass and the resulting lack of "flushing" was the most recurrent complaint, cited in more than one-third of the water quality based responses. Also mentioned with respect to water quality were ten instances of storm water runoff or treated waste water discharge, and the presence of floating trash. Shore litter was the 2nd ranking environmental subcategory for Dock and Ramp users (2.5% and 2.6%

Table 45. Perceived Boating Detractions by Waterway Access Groups

Detraction **Category**/Subcategory	Marina Counts	% of Marina Responses (n=276)	Marina Category Rank*	Dock Counts	% of Dock Responses (n=460)	Dock Category Rank*	Ramp Counts	% of Ramp Responses (n=684)	Ramp Category Rank*
Lack of Courtesy and/or Seamanship	**120**	**43.5**	**1**	**201**	**43.7**	**1**	**276**	**40.4**	**1**
Bad Boater Behaviors in General	35	12.7	*2*	60	13.0	*2*	77	11.3	*2*
Tourists and Rental Boat Operators	21	7.6	*4*	21	4.6	*8*	36	5.3	*7*
PWC Operators	45	16.3	*1*	70	15.2	*1*	100	14.6	*1*
Speeding Large Boats/Big Wakes	12	4.3	*7*	25	5.4	*6*	24	3.5	
Charter Fishing and Dive Boats	2	0.7		3	0.7		9	1.3	
Mercury Marine Test Boats	2	0.7		5	1.1		1	0.1	
Noisy Power Boats	3	1.1		2	0.4		2	0.3	
Ramp Users	0			6	1.3		19	2.8	
Boaters Under the Influence	0			9	2.0		8	1.2	
Congestion	**54**	**19.6**	**2**	**56**	**12.2**	**3**	**86**	**12.6**	**2**
Waterways in General	33	12.0	*3*	32	7.0	*4*	46	6.7	*4*
Specific Locations	14	5.1	*6*	19	4.1	*9*	26	3.8	*10*
Weekends and Holidays	7	2.5		5	1.1		14	2.0	
Altered Environment	**26**	**9.4**	**3**	**75**	**16.3**	**2**	**83**	**12.1**	**3**
Poor Water Quality	11	4.0	*9*	32	7.0	*4*	29	4.2	*8*
Shore, Beach Trash	2	0.7		12	2.6		17	2.5	
Grass Flats Destruction	1	0.4		7	1.5		8	1.2	
Lack of Fish	3	1.1		2	0.4		5	0.7	
Loss of Natural Areas to Development	2	0.7		5	1.1		7	1.0	
Paper Mill/Chemical Plant Odors	3	1.1		7	1.5		2	0.3	
Abandoned Derelicts, Sunken Debris	2	0.7		5	1.1		2	0.3	
Red Tide	2	0.7		2	0.4		10	1.5	
Grass Overgrowth in Deer Point Lake	0			3	0.7		3	0.4	
Infrastructure Shortcomings	**26**	**9.4**	**3**	**43**	**9.3**	**5**	**75**	**11.0**	**5**
Shoaling, Lack of Dredging	12	4.3	*7*	23	5.0	*7*	23	3.4	
Inadequate Channel Marks, Signs	2	0.7		5	1.1		3	0.4	
Poor Ramp Facilities	2	0.7		6	1.3		42	6.1	*5*
Inadequate Marina Facilities	8	2.9		5	1.1		2	0.3	
Lack of Recreational Destinations	2	0.7		4	0.9		5	0.7	
Lack of Water Access	**14**	**5.1**	**7**	**22**	**4.8**	**6**	**79**	**11.5**	**4**
Ramp Congestion/Lack of Pub. Ramps	5	1.8		15	3.3		52	7.6	*3*
Insufficient Ramp Parking	1	0.4		4	0.9		24	3.5	
Too Few Public Marinas, Wet Slips	8	2.9		3	0.7		3	0.4	
Excessive Regulation / Enforcement	**16**	**5.8**	**5**	**45**	**9.8**	**4**	**41**	**6.0**	**6**
Patrol Harassment	9	3.3	*10*	36	7.8	*3*	29	4.2	*8*
Boating Regulations in General	1	0.4		1	0.2		0		
Speed/No Wakes Zones	0			0			1	0.1	
Fishing Regulations	4	1.4		4	0.9		6	0.9	
Dog Restrictions on Shell Island	2	0.7		4	0.9		5	0.7	
Lack of Regulation / Enforcement	**4**	**1.4**	**8**	**2**	**0.4**	**8**	**4**	**0.6**	**8**
Speed/No Wake Zones	3	1.1		2	0.4		2	0.3	
Fish Regulations	1	0.4		0			2	0.3	
No Detractions	**16**	**5.8**	**5/*5***	**16**	**3.5**	**7**/10	**40**	**5.8**	**7**/6

* Highlighted red entries indicate category ranking. Black italicized entries indicate subcategory ranking.

respectively) but encompassed less than 1% of the category total responses for the Marina access group. Significantly smaller numbers addressed grass flats destruction (n=16, or 3rd within category total), the loss of natural areas to development (n=14), and red tide (n=14). More local concerns included paper mill/chemical plant odors (n=12) and vegetation overgrowth in Deer Point Lake (n=6). The former primarily reflected Marina and Dock input, and the latter was mostly from Dock and Ramp users (Table 45).

The final category to capture more than ten percent of all answers to Question 21 (Table 44) was that of *infrastructure shortcomings*. Two standout subcategories were largely responsible. Leading, with 40.2% of category responses, was the *lack of dredging* (n=58). It ranked 7th overall for Marina and Dock users (Table 45). Almost half of the responses within this subcategory (n=26) pertained to the failure to dredge (reopen) the "Old East Pass." Another 19% focused on the need to dredge the Grand Lagoon, with respect to its main channel and to its various feeding channels from shoreline ramps or marinas. *Suboptimal ramp facilities*, the second most dominant subcategory (n=50 responses), was the chief infrastructure detraction for significant numbers of Ramp users (n=42) and their 5th highest ranked overall. Reported ramp deficiencies included too little dock space (n=14), lack of safety measures such as lights (n=8), lack of maintenance (n=8), and shallow water (n=7). Likewise, though with a much smaller number (n=8), Marina users cited a *shortage of full-service marina facilities* as their 2nd highest infrastructure subcategory, though it did not rank in their top ten subcategories overall. Detracting aspects included a lack of haul-out or boatyard provisions, pump-out services, and hurricane shelter, among other things. Ten responses cited *inadequate channel markers or signs* marking shoals, most coming from Dock users (1.1% of group total, Table 45)..

The *lack of water access* as chief detraction was considered independently of infrastructure, for example addressing the quantity rather than the quality of ramps and marinas. Ranking 5th overall, the category was most strongly represented by Ramp users for whom it ranked 4th. *Too few ramps and congestion at existing ramps* were combined as a single subcategory issue and led with 62.6% of category responses, almost ¾ of which came from the Ramp access group (Table 45), making it their 3rd highest subcategory overall. A *shortage of ramp parking* was a separate subcategory, encompassing 25% of access responses, 83% of which originated with Ramp users. Too few public marinas and wet slips garnered 12.2% of total category responses, and 57% of those came from Marina users.

Excessive regulation/enforcement was the 6th highest category overall and among Ramp user responses, while higher for Dock (4th) and Marina groups (5th). Complaints of *marine patrol harassment* led (n=74 or 5.2% of all responses to Question 21, Table 44)). The subcategory ranked 3rd overall within Dock user responses and 8th and 10th respectively within Ramp and Marina groups. Cited in particular were "non-provoked" or random stops (n=11), excessive frequency of stops and boardings (n=15), and the "bad attitudes" of officers (n=7). *Fishing regulations*, particularly as to catch limits, made up the 2nd highest subcategory with 14 responses, spread fairly equally across user groups but the highest percentage coming from Marina users (1.4% of group total, Table 45). Finally, and equally representing user groups, the *restriction of dogs from Shell Island* was noted eleven times as a boater's chief detraction.

The detraction posed by *lack of enforcement* did not garner many responses, making it the 8th or lowest ranked category, with less than one percent of the total. Seven boaters were concerned as to the absence of speed zones in the Grand Lagoon or in St. Andrew Pass.

Seventy-two respondents (5.1% of total responses, Table 44) indicated that *nothing detracted* from their Bay boating experience. Included were 5.8% of both Ramp and Marina users and 3.5% of private Dock users (Table 45).

Summary conclusions for analyzed responses to Question 21:

- Bad behaviors in other boaters constituted the leading detraction for boaters in the St. Andrew Bay area among all access types. Within this category, and constituting the single largest body of specific detractions (subcategories), was bad PWC operator behaviors. This also was the leading subcategory within all user groups. Less targeted assertions of lack of seamanship in others with respect to safe, competent and considerate practices ranked 2nd overall and within each user group.
- Boater congestion, the 2nd leading primary detraction category, and its leading subcategory of waterway congestion in general, were also strongly expressed across user groups. Congestion at specific locations also made the top ten subcategories for each user group and St Andrew Pass made up 47.5% of these responses.
- Patrol harassment with overly frequent, "unwarranted" stops was a significant detraction overall, ranking highest among Dock users (3rd highest subcategory).
- Insufficient boat ramp water access ranked 6th among all subcategories, chiefly reflecting input from the large Ramp user group, for which it ranked 3rd.
- Concerns as to water quality tied for 6th place overall and was the 4th highest subcategory within Dock user responses.
- The lack of dredging finished in a near tie with localized congestion for 10th ranking overall (58 vs. 59 responses), with particular emphasis on East Pass closure. For Ramp users it did not attain a top ten ranking, but it was 7th for both Marina and Dock users.
- A substantial number of Bay boaters reported no detractions, and as a subcategory it ranked in the top ten for all user groups, highest within Marina users (5th overall in group).
- Although rankings varied somewhat, the top ten detraction subcategories identified by each user group were subsumed by the overall top ten, with the exception of the Ramp group's citing suboptimal ramp facilities as their 5th highest detraction. (This subcategory did not make the top ten overall, and there was little mention of it by the Marina or Dock access groups.)

Needs

The analysis of responses to Question 22 suggested nine primary categories, most with one or more subcategories, as listed in Table 46. Recreational destination infrastructure was separated out as a category (unlike its inclusion under infrastructure in detractions) because of the relatively greater response its subcategories subsumed under needs. Proposed solutions to problems (needs) mirrored those issues defined by analysis of the problems themselves (detractions), as did most of the subcategories. However, the areas of emphasis shifted in hierarchy, both overall and within the three access groups (see Table 47).

The need for *infrastructure improvements* led among categories, with 416 responses or 30.6% of the total (n=1,361) and 54.1% more than the next leading category (Table 46). This was most driven by expressions of need for dredging and improved ramp facilities. *Greater water access* followed (n=270 or 19.8% of total), dominated by the need for more ramps. Responses calling for *more regulation and regulation enforcement* covered a range of issues, but were directed primarily at PWC operators and speed zones. This category encompassed the third-most responses (n= 190 or 14% of total). Ranked fourth were *environmental protection* needs, (10.1% of total); *education* followed with 8.7%. Two categories received equal numbers of responses (n=79), those calling for *less regulation and/or enforcement* and those whose boating experience would be most improved with *more recreational destination* provisions. Although *congestion* ranked second in the detraction categories, the need for less congested waterways was conveyed in only 1.4% of all responses to Question 22, trailing the 3.9% (n=53) indicating *no needs* with respect to St. Andrew Bay area boating.

The *infrastructure improvement* category included 141 calls to open old East Pass. These were incorporated in the *dredging* subcategory, which ranked first among need subcategories (n=188) overall, as well as within the Marina and Dock access groups, while third in Ramp user responses (Table 47). Typically, the calls for dredging East Pass were linked to expectations of better Bay water quality, healthier aquatic life, better fishing, shorter runs to protected waters from the east, or less congestion at the St. Andrew Pass. Other expressed dredging needs included the Grand Lagoon channels, Deep Water Point (widening), and the Mexico Beach canal. *Improved ramp facilities* was the second highest infrastructure subcategory (n=127) and the 3rd highest overall (Table 46). Ramp users made it their 2nd highest subcategory of needs with 15.6% of all group responses; it ranked 5th among subcategories for Dock users (Table 47). Principal improvements cited by respondents included more dock space (n=23), better maintenance (n=12), restrooms (n=10), and secure parking (n=9). (More ramp parking is considered separately under access.) *Full service marinas*, with haul-out capability, boatyards, protected slips, and such amenities as fuel stations and bait and tackle shops, was the third (n=48) of the top ten subcategories encompassed under infrastructure. This garnered 8.4% of all Marina use responses as 2nd leading subcategory for the group. Following closely (n=45) was the need for *better channel markers and signs*. Specifics included lit markers, channel markers in the Grand Lagoon, and more signs indicating shoaling or grass flats in the Grand Lagoon and Bay. This subcategory subsumed twice as many responses from Marina and Dock access groups as from Ramp. Finally, there were eight infrastructure calls for *bridge improvements*, primarily a replacement or higher bridge at Thomas Drive, most reflecting Dock user input (Table 47).

The issue of *water access* ranked second (n=270) among primary needs categories, driven largely by expressions of need for *more ramps* (n=144, Table 46). This subcategory

Table 46. Perceptions of Bay Boating Needs by Primary Categories and Subcategories

Categories/Sub-Categories	Totals (all user groups)	% of Total (n=1,361)	Category Rank	Subcategory Rank
Infrastructure Improvements	**416**	**30.6**	**1**	
Dredging of Pass, Channels	188	13.8		**1**
Improved Ramp Facilities	127	9.3		**3**
Full Service Marinas	48	3.5		**10**
Channel/Zone Markers and Signs	45	3.3		
Bridges	8	0.6		
Water Access	**270**	**19.8**	**2**	
More Ramps	144	10.6		**2**
More Ramp Parking	61	4.5		**7**
More Marinas (43)/Dry Storage(7)	50	3.7		**9**
More Public Moorings, Anchorages	6	0.4		
More Sandy Beach Launch Sites	4	0.3		
More Access in General	5	0.4		
More Regulation / Enforcement	**190**	**14.0**	**3**	
PWC Operators	67	4.9		**5**
More Patrol Presence	20	1.5		
Speed/No Wake Zones	31	2.3		
Power Boats	11	0.8		
Operator Licensure	12	0.9		
Rental Boats	12	0.9		
Enforcement of Existing Regs in General	17	1.2		
Ramp Supervision	6	0.4		
Fishing Regulations	6	0.4		
Drinking and Boating	5	0.4		
Dogs on Shell Island	3	0.2		
Environmental Protection	**137**	**10.1**	**4**	
Water Quality Improvement	62	4.6		**6**
Grass Flats Protection	19	1.4		
Island/Shore Trash Removal	16	1.2		
More Fish	16	1.2		
Less Development/More Natural Areas	16	1.2		
Removal of Sunken Boats, Derelicts	4	0.3		
Ridding Deer Point Lake of Vegetation	4	0.3		
Education	**118**	**8.7**	**5**	
Overall Safety, Etiquette, Regulations, Skills	78	5.7		**4**
PWC Operators	10	0.7		
Boat Renters	15	1.1		
Ramp Launch/Retrieval Skills & Etiquette	8	0.6		
Environment/Conservation	7	0.5		
Less Regulation	**79**	**5.8**	6	
Less Patrol Harassment	41	3.0		
Eased Fishing Regulations	20	1.5		
Dogs on Shell Island	16	1.2		
Less Governmental Presence in General	2	0.1		
More Recreational Destination Provision	**79**	**5.8**	6	
Waterside Restaurants	27	2.0		
Artificial Reefs	27	2.0		
Public, Transient Dockage	9	0.7		
Designated Water Sport Areas	4	0.3		
Beaches and Parks	2	0.1		
Public Places to Visit	10	0.7		
Congestion Reduction	**19**	**1.4**	9	
No Needs	**53**	**3.0**	8	**8**

Table 47. Boater Needs by Waterway Access Group

BOATING NEEDS CATEGORIES/SUBCATEGORIES	MARINA ACCESS			DOCK ACCESS			RAMP ACCESS		
	Marina Counts	% of Marina Responses (n=249)	Marina Ranking*	Dock Count	% of Dock Responses (n=459)	Dock Ranking*	Ramp Counts	% of Ramp Responses (n=653)	Ramp Ranking*
Infrastructure Improvements	**75**	**30.1**	**1**	**138**	**30.1**	**1**	**203**	**31.1**	**1**
Dredging of Pass, Channels	39	15.7	*1*	72	15.7	*1*	77	11.8	*3*
Improved Ramp Facilities	2	0.8		23	5.0	*5*	102	15.6	*2*
Full Service Marinas	21	8.4	*2*	18	3.9	*10*	9	1.4	
Channel/Zone Markers and Signs	11	4.4	*6*	20	4.4	*7*	14	2.1	
Bridges	2	0.8		5	1.1		1	0.2	
Water Access	**35**	**14.1**	**3**	**59**	**12.9**	**4**	**176**	**27.0**	**2**
More Ramps	9	3.6	*8*	29	6.3	*3*	106	16.2	*1*
More Ramp Parking	1	0.4		12	2.6		48	7.4	*4*
More Marinas/Dry Storage	20	8.0	*4*	18	3.9	*9*	12	1.8	
More Public Moorings, Anchorages	4	1.6		0			2	0.3	
More Sandy Beach Launch Sites	0			0			4	0.6	
More Access in General	1	0.4		0			4	0.6	
More Regulation / Enforcement	**49**	**19.7**	**2**	**69**	**15.0**	**2**	**72**	**11.0**	**3**
PWC Regulation	21	8.4	*2*	23	5.0	*5*	23	3.5	*7*
More Patrol Presence	7	2.8		5	1.1		8	1.2	
Speed/No Wake Zones	7	2.8		11	2.4		13	2.0	
PowerBoats	2	0.8		5	1.1		4	0.6	
Operator Licensure	2	0.8		8	1.7		2	0.3	
Rental Boats	5	2.0		4	0.9		3	0.5	
Enforcement of All Existing Reg.'s	2	0.8		9	2.0		6	0.9	
Ramp Supervision	0			1	0.2		5	0.8	
Fishing Regulations	2	0.8		1	0.2		3	0.5	
Drinking and Boating	1	0.4		1	0.2		3	0.5	
Dogs on Shell Island	0			1	0.2		2	0.3	
Environmental Protection	**17**	**6.8**	**6**	**64**	**13.9**	**3**	**56**	**8.6**	**4**
Water Quality Improvement	8	3.2	*10*	31	6.8	*2*	23	3.5	*7*
Grass Flats Protection	2	0.8		10	2.2		7	1.1	
Island/Shore Trash Removal	1	0.4		6	1.3		9	1.4	
More Fish	3	1.2		1	0.2		12	1.8	
Less Development/More Natural Areas	3	1.2		9	2.0		4	0.6	
Removal of Sunken Boats, Derelicts	0			4	0.9		0		
Deer Point Lake Grass Removal	0			3	0.7		1	0.2	
Education	**25**	**10.0**	**4**	**40**	**8.7**	**5**	**53**	**8.1**	**5**
Overall Boating Safety,Etiquette,Skills	16	6.4	*5*	27	5.9	*4*	35	5.4	*5*
PWC Operators	4	1.6		3	0.7		3	0.5	
Boat Renters	3	1.2		7	1.5		5	0.8	
Ramp Launch Skills,Etiquette	0			0			8	1.2	
Environment/Conservation	2	0.8		3	0.7		2	0.3	
Less Regulation	**17**	**6.8**	**6**	**31**	**6.8**	**7**	**31**	**4.7**	**6**
Fewer Patrol Stops	5	2.0		19	4.1	*8*	17	2.6	*9*
Eased Fishing Regulations	8	3.2	*10*	2	0.4		10	1.5	
Dogs on Shell Island	4	1.6		8	1.7		4	0.6	
Less Gov't Presence in General	0			2	0.4		0		
More Recreational Destinations	**18**	**7.2**	**5**	**33**	**7.2**	**6**	**28**	**4.3**	**7**
Waterside Restaurants	9	3.6	*8*	14	3.1		4	0.6	
Artificial Reefs	5	2.0		6	1.3		16	2.5	*10*
Public, Transient Dockage	2	0.8		5	1.1		2	0.3	
Designated Water Sport Areas	1	0.4		2	0.4		1	0.2	
Public Places to Visit	1	0.4		4	0.9		5	0.8	
Beaches and Parks	0			2	0.4		0		
Congestion Reduction	**3**	**1.2**	**9**	**10**	**2.2**	**9**	**6**	**0.9**	**9**
No Needs	**10**	**4.0**	**8**/7	**15**	**3.3**	**8**	**28**	**4.3**	**7**/6

*Highlighted red entries indicate category ranking. Black italicized entries indicate subcategory ranking.

garnered the most Ramp user responses (n=106), as their leading subcategory overall (Table 47). However, the need was also expressed as the third highest among the home Dock group and 8th for Marina users. Small numbers of cited locations for additional ramps included the Marina Civic Center, the West Bay area, the Pass vicinity, and Mexico Beach. The need for *more ramp parking* was also considered an access issue, with 61 responses making it the 7th ranked subcategory overall and 4th among ramp users (n=48). Greater water access via *marina wet slip and dry storage* was the need in 50 responses, ranking 4th overall among Marina users. Included in the final fifteen access responses were *greater access in general*, *more sandy-beach launch sites* for small craft, and *more public moorings* (Table 46).

Ranking third among categories was that of *more regulation/enforcement*, with multiple targets. Chief among them was *the PWC operator*, though not with the preponderance that the issue attained under detractions. Greater regulation of PWCs ranked 5th in subcategories overall (n=67), with the most often specifically cited measure that of restricted areas of operation. User group rankings showed a spread from 2nd in Marina responses (8.4% of group total) to 5th in Dock (5% of total) and 7th in Ramp (3.4% of total) (Table 47). Greater enforcement of or introduction of *speed and no wake zones* garnered 31 responses, particularly in the Grand Lagoon, at Deep Water Point, and in St. Andrew Pass. It garnered comparable, significant percentages from each access group Table 47). Calls for *boat operator licensure* and for more *oversight of rental boats* each received 12 responses, the former a higher priority in Dock responses (1.7% of total) than in the other user groups, and the latter in Marina responses (2.0% of total). Seventeen responses called for *better enforcement of existing regulations* in general. The need for *more patrol presence* was expressed in 20 surveys, or 1.5% of the total response count (Table 46), and 2% of the Marina user response (Table 47). The remaining subcategories subsumed less than 1% of any user group total.

The need for *environmental protection* ranked 4th overall and among Ramp users, third in the Dock access group. As with environmental detraction concerns, *water quality* led in the subcategory parsing (n=62) as the 6th highest need subcategory overall (Table 46). This was stressed more by the Dock users (6.8% of group total), as their 2nd highest subcategory overall, with similar internal percentages coming from Marina and Ramp users (3.2% and 3.5% respectively) (Table 47). More than half of this subcategory linked Bay water improvement with the greater tidal flushing anticipated from opening the East Pass. Thirteen calls were split between stopping wastewater and storm water pollution. The 2nd highest environmental subcategory was that of *grass flats protection* (n=19), also with greater emphasis within the Dock user group. Three subcategories were tied with 16 responses each, including a *larger fish population*, less development (*more natural area*), and the *removal of shore (island) trash*. Half of the latter called for garbage cans, most often for Shell Island. Relative importance within groups shifted toward Marina and Ramp users as to more fish, Dock and Ramp users as to less shore trash, and Marina and Dock users as to less development (Table 47). Finally, small numbers addressed clearing the *water of derelicts and sunken boats* and, specifically in Deer Point Lake, the *removal of vegetation overgrowth.*

While bad boater behavior was deemed the foremost boating detraction, boater *education* was the 5th highest needs category, ranking 4th or 5th within user groups (Table 47). Most responses (n=78) fell into a subcategory of *improved safety, etiquette, and skills* with respect to other boaters in general, with 18 calling for a mandatory boating safety course. This was the 4th

leading subcategory overall and also ranked 4th or 5th among access user subcategory rankings. Fifteen responses addressed *greater training for boat renters*, ten for *PWC operators*, and eight for those *launching or retrieving at ramps* (Table 46). Seven responses called for education in *environmental stewardship and conservation.*

Expressions of need for *more waterside restaurants* or *more artificial reefs* each totaled 27, together making up 68.4% of the 6th ranked category, that of *more recreational destination provisions* (Table 46). Marina users considered the former a top-ten subcategory (8th), and artificial reefs were in the top ten for ramp users (10th) (Table 47). More accessible shore amenities, mostly cultural or social, incorporated ten responses, and, in keeping with this, more public dockage was the need conveyed in nine. Tied with this primary category for 6th ranking overall was the body of responses citing *less regulation or enforcement* as primary need. *Less marine patrol harassment* (n=41), primarily regarding stops without probable cause, led under enforcement subcategories, with 4.1% of Dock response, 2.6% of Ramp response, and 2.0% of Marina response. E*ased fishing regulations* as to sport fish catch limits was the leading subcategory among the Marina users (3.2% of response total), and *eased dog restrictions* on Shell Island encompassed greater that 1.5% of responses within Marina and Dock groups (Table 47).

Those answers to Question 22 indicating *no needs* comprised the 8th ranked subcategory overall, but 7th among Marina users and 6th among Ramp users.

Summary conclusions from analyzed responses to Questions 21 and 22:

- 64.5% of the total responses were subsumed under the top ten overall subcategories for needs as compared to the 68.5% under detractions. Greater variability as to need subcategory rankings among water access groups was found, compared to detraction subcategories, such that the top ten overall subcategories did not encompass three of the top ten for Marina users (more channel markers and signs, more waterside restaurants, and less fishing regulation), two of the top ten for Dock users (more channel markers and signs and fewer patrol stops) and two of the top ten for ramp users (fewer patrol stops and more artificial reefs).
- While bad PWC operator behaviors led significantly overall and within user groups among detraction subcategories, the total combined need for PWC education and regulation equaled only 5.6% of needs responses. This was less than ½ of the leading needs subcategory (dredging) percentage of 13.8%. Nonetheless, the need for greater PWC regulation was the only regulation subcategory making the top ten overall and within each user group. Also noted, the subcategory subsuming the need for greater boater education in general was a top ten within all user groups.
- The opening of East Pass was significantly more expressed as a need under infrastructure (dredging) than its closure was as a detraction (n=141 vs. n=26), such that dredging was the leading subcategory overall and was within the top three needs subcategories for all user groups.
- Certain issues more relevant to a single access group were sufficiently represented within needs responses to make the overall top ten subcategories,

which was not true of their detraction counterparts. Specifically, the large ramp group and its strong internal support for improved ramp facilities and for more ramp parking drove their respective 3rd and 7th overall rankings under needs, whereas the detraction aspect of each did not make the top ten subcategories. The same was true for the Marina group responses, which drove the needs subcategories of more marina and dry storage access and better, full service marina infrastructure to 9th and 10th place finishes respectively overall. Neither, as deficiencies, placed among the top ten detraction subcategories. This difference between detraction and parallel need rankings may reflect the disproportionately large percentage of all detraction responses encompassed by the behavior issue, potentially depleting other subcategories.

- The issue of improved water quality as a need and its poor quality as a detraction ranked 6th among subcategories comprising needs and detractions, respectively. It also retained similar internal percentages among user groups, with Dock access respondents leading in both cases.
- While the perception of excessive marine patrol stops was the 5th leading detractions subcategory, attaining a top ten ranking within all user groups, the corresponding perception of less zealous marine patrol activity as a need did not make the top ten overall. Within Dock and Ramp groups, it retained a top ten needs ranking, but with significantly smaller percentages.
- Finally, the subcategory perceptions of no detractions and no needs made the top ten for both overall analyses. They also made the top ten for all six internal user group analyses of detractions and needs, with the exception of Dock users and no needs.

Part 3–Spatial Analysis of Boating Patterns

3.1. Mapping Ramp Patronage

An important element of the Bay County recreational boating characterization was to determine the general land-side service areas for the county's boat ramps. This analysis relied, first, upon identifying ramp patrons and, second, mapping where those patrons live relative to the facilities that they used. Florida Sea Grant personnel collected automobile and vessel trailer registration numbers at 33 boat ramps on 69 weekend and weekday visits over a year (July 2007 through June 2008). Trailer and automobile tag numbers collected at the ramps were compared to registration data maintained by the Florida Department of Highway Safety and Motor Vehicles in order to obtain names and mailing addresses. Figure 1 shows locations in Florida mapped using address locating or *geocoding* software[9]. (Out of 3,939 addresses identified from Florida tags, 3,905 were successfully geocoded, including 45 that were in states other than Florida.)

Many boaters from Georgia (472 license tags logged during ramp visits) and Alabama (436 tags) use ramps in Bay County. Data that would allow determining addresses from the Georgia and Alabama tags have not been obtained from those states.

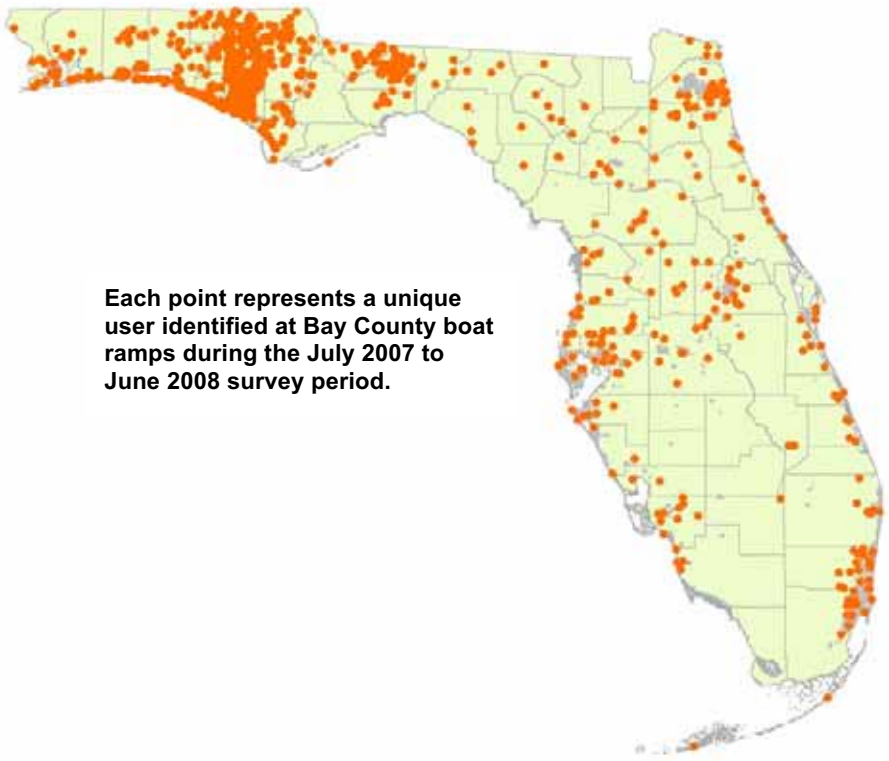

Figure 28. Florida Distribution of Bay County Ramp Patrons

[9] Geocoding is the process of associating street addresses to geographic coordinates.

Ramp Use Landside Profile

Vessel trailers and tow vehicle inventories at Bay County ramps on 69 sample days, throughout one year, yielded 8,861 log sheet entries (trailer and/or tow vehicle tag). The Florida Department of Highway Safety and Motor Vehicles linked 3,905 Florida tag numbers to unique owner mailing addresses, which were mapped by geocoding. Of these addresses, 3,860 were in Florida; the remainder were scattered over many other states. Of the Florida ramp patrons, 78.3% of the addresses were in Bay County (Figure 29). Of Florida counties, Washington (3.5%), Gulf (1.8%), Leon (1.8%), and Jackson (1.7%) contributed an additional 8.8% to Bay County ramp use. The top five counties accounted for 87.1% of Bay County in-state ramp patronage.

Geocoded ramp patron data can be used to map land-side service areas for individual ramps. Figure 30 shows such areas for three ramps: Marina Civic Center and St. Andrew Marina (both in Panama City), along with St Andrew State Recreational Area, at Panama City Beach. The GIS method incorporated criteria established by Applebaum (1966) for determining a retail market share boundary based on consumer travel distances. Applebaum suggested that the boundaries of a primary service area encompass an area that accounts for 70 to 80 percent of the users or consumers within that market. The areas shown for the Civic Center and St. Andrew Marina ramps meet the criteria. The service area for the SRA ramp captures about 55 percent of the in-state users identified in the study, with the remainder spread over other Florida counties. Note: There was also a high out of state usage for this ramp (over 1/3 of tag entries). Mapped patronage data can be used to estimate demand for particular boat ramps based on use profiles (obtained from this study) and the number of trailer boats within delineated service areas.

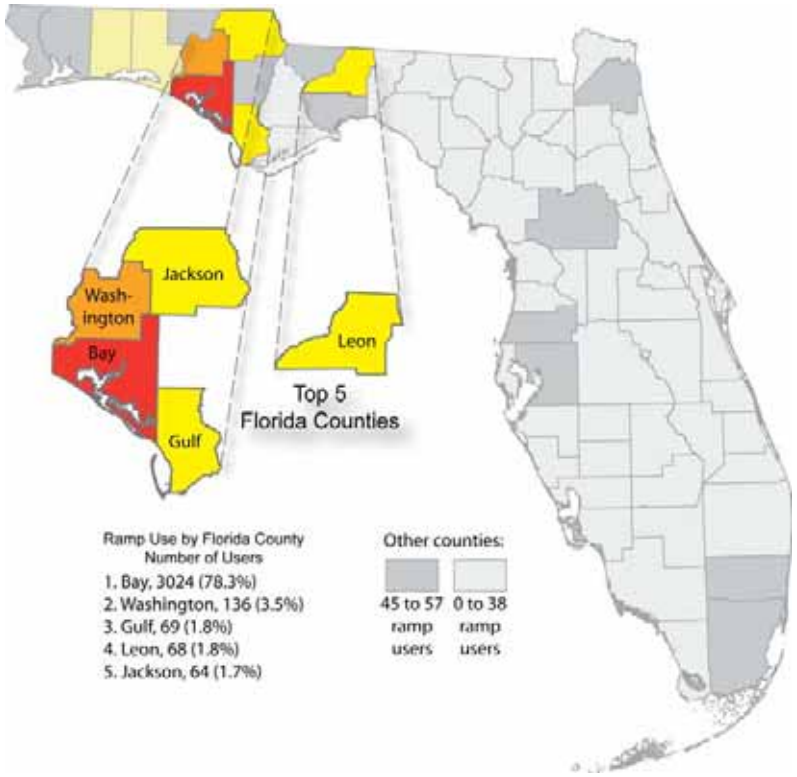

Figure 29. Florida Distribution of Bay County Ramp Patrons

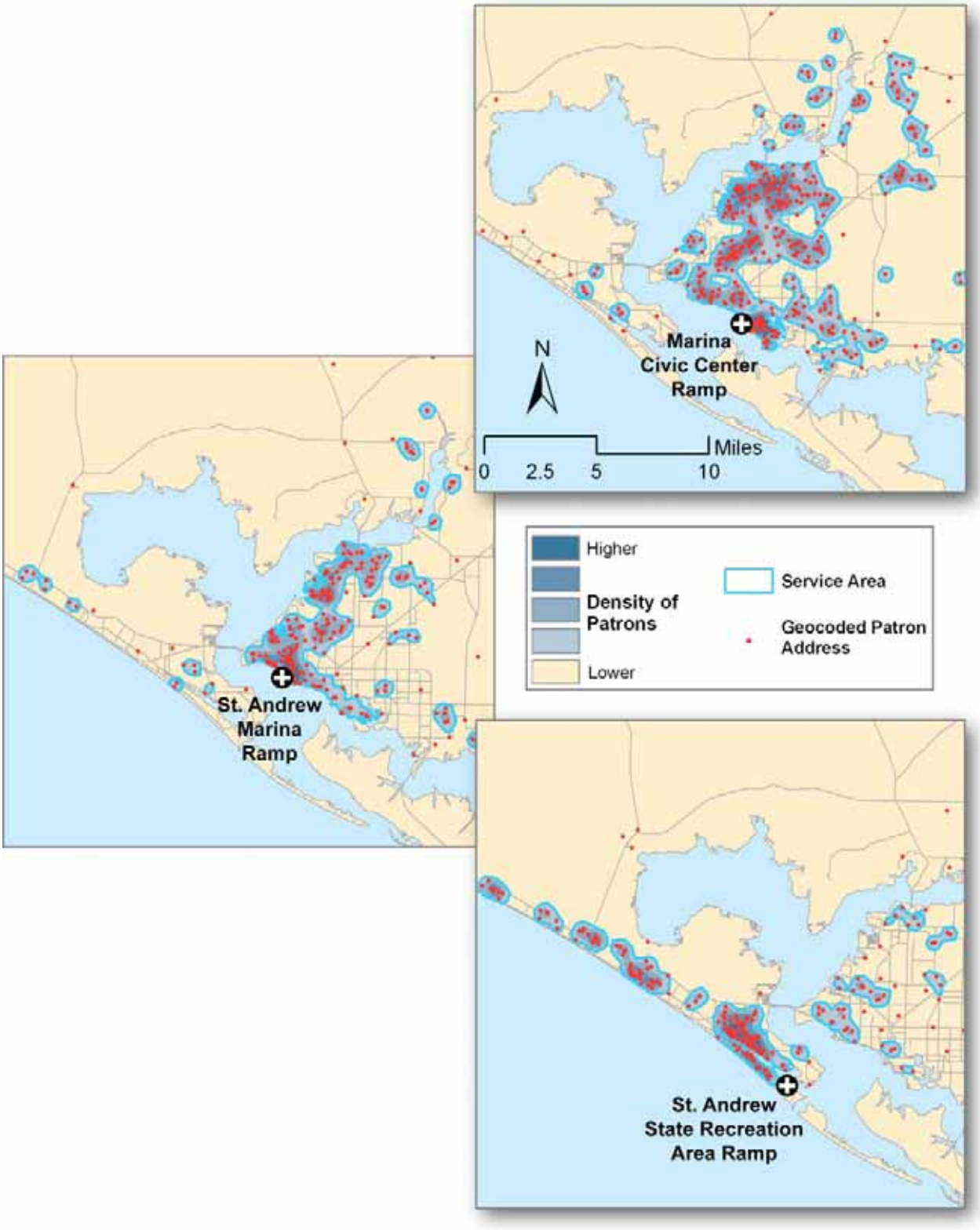

Figure 30. User Service Areas for Three Popular Bay County Ramps

Ramp Use vs. Parking Capacity

The parking capacities of boat ramps were estimated and compared with the average numbers of boat trailers observed during peak (April–September) and off-peak (October–Mar) use periods.[10] The analysis was limited to the 42 weekend days that ramp visits took place (Table 1). Some boat ramps are operating close to or above estimated parking capacity during some use periods. By contrast, some ramps may be underutilized relative to estimated parking capacities.

Table 48. Ramp Parking Capacity and Usage Estimates in the Peak Usage Period

Ramp	Parking Places*	Average No. of Trailers Observed (Peak**)	
		All Survey Days	Weekends Only
37th St	8	6.1	6.1
Bayhead North	0+	5.4	5.8
Bayhead South	0+	4.5	4.5
Bob George Park	7	11.8	13.1
Bonita Bay Tyndall AFB	7	5.7	6.2
Burnt Mill Creek	0+	6.6	7.2
BV Buchanan Park	0+	5.3	6.3
Carl Gray Park	4	16.9	26.4
Cherokee Landing	0+	15.7	17.2
Cook Bayou Marina	0+	2.0	2.0
Davis Beach	0+	14.1	14.9
Deer Point Draw Down	0+	8.7	10.3
Dolphin Drive	5+	4.6	4.8
Donaldson Point	0+	3.7	3.9
Donald Penny	0+	2.4	2.9
Earl Gilbert Park	15	7.7	8.1
High Point Landing	44	17.7	22.1
Howard Ramp at Quail St	0+	2.6	3.5
Ira Hutchinson	20+	14.0	16.3
John B Gore Park	0+	12.1	13.1
Lake Powell Rec. Area†	10	5.8	3.1
Leslie Porter Wayside Park†	9+	13.5	15.5
Marina Civic Center	30	24.4	40.7
Maude Holmes	16	3.8	3.6
McCall-Everitt	0+	5.4	5.6
McKenzie	0+	2.7	2.6
Miramar	0+	7.4	7.1
Overstreet	0+	2.9	2.9
Safari Street	0+	2.0	2.4
Shoreline Circle	0+	5.8	6.7
St Andrews Marina	27+	15.5	24.6
St Andrews State Park	19+	30.4	37.6
Tharp's Landing	0+	2.0	2.1

*Designated rig parking spaces; "+" means nearby overflow, shared, or street-side parking available.
**The Peak use period is April through September (see Chapter 5).
† Use was compromised by construction activity during a significant portion of the study period.

[10] Use periods were identified by a cluster analysis of the number of days each month that survey respondents reported taking boat trips. See Chapter 5 for a more detailed description of the seasonal analysis.

3.2. Mapping Boating Patterns

General Density Patterns

This chapter presents the results of a GIS analysis that mapped the distribution or spread of the digitized trip information as "density of occurrence." Continuous density surfaces generated by the GIS illustrate the degree of concentration or clustering of digitized trip information. General clustering patterns for travel routes, destinations, and congested areas were mapped and described using 100-meter grid cells and a search radius of 1,000 meters.

Route densities are depicted in Figure 31. The greatest density of vessel traffic occurs throughout St. Andrew Bay and West, North, and East Bays, as well as lower Grand Lagoon and St. Andrews Pass. Offshore, the flow of boat traffic is generally dispersed, with some greater density of routes leading to popular artificial reefs and reef areas in the Gulf of Mexico.

Figure 32 displays favorite destinations, the locales where respondents most like to visit on a typical recreational boating outing. The density analysis revealed several prime inshore and Bay boating destinations: Shell Island, especially the north side; the Pass; Redfish Point; the Panama City Civic Center Marina; St. Andrews Marina, and the Hathaway Bridge vicinity. Offshore, some artificial reefs are popular destinations, consistent with patterns suggested by the route density map.

Figure 6 illustrates areas where boaters experience congestion, defined in Question 18 as "more boats than you prefer." The analysis shows that respondents experience the most congestion at favorite boating destinations, especially the vicinity of St. Andrew Pass, passage through which is also required for access to and from the Gulf of Mexico. Another significant area is the north shore of Shell Island, with the greatest congestion reported near the middle of that shoreline.

Natural-color Digital Ortho Photo Quadrangle (DOQQ) imagery with one-meter resolution was the base map for digitization of trip information drawn on the 1:109,636-scale survey maps by respondents. As a result, information collected as part of the study can also be mapped at higher resolutions than shown in Figures 31 through 33. Figure 34 shows favorite destination spots mapped by survey respondents and a density analysis of those points for the St. Andrew Bay area. Figure 34 was generated using the ArcGIS density kernel function, with a search radius of 500 meters and a mapping resolution of 100 meters.

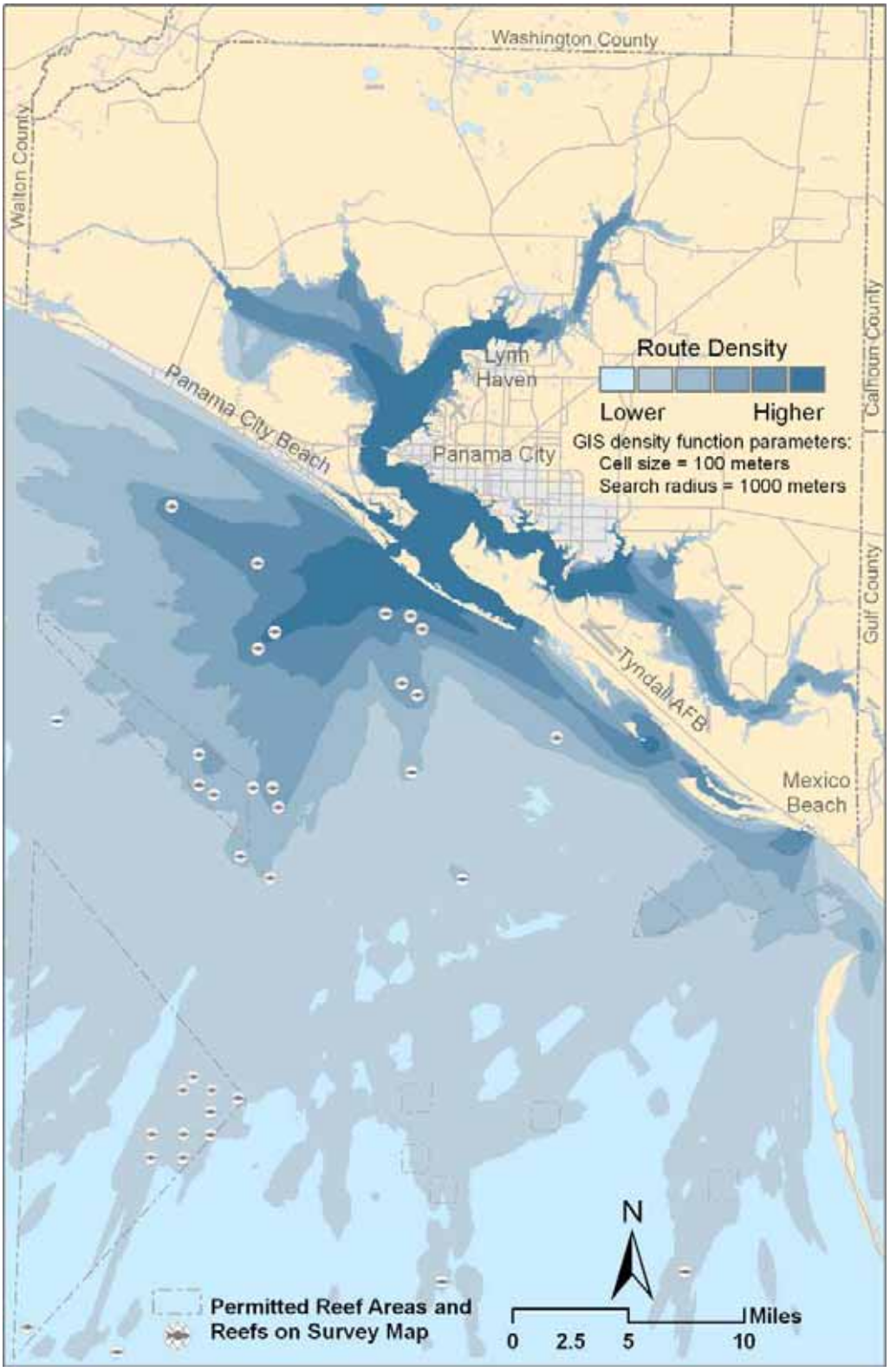

Figure 31. Route Density as Summarized with the GIS

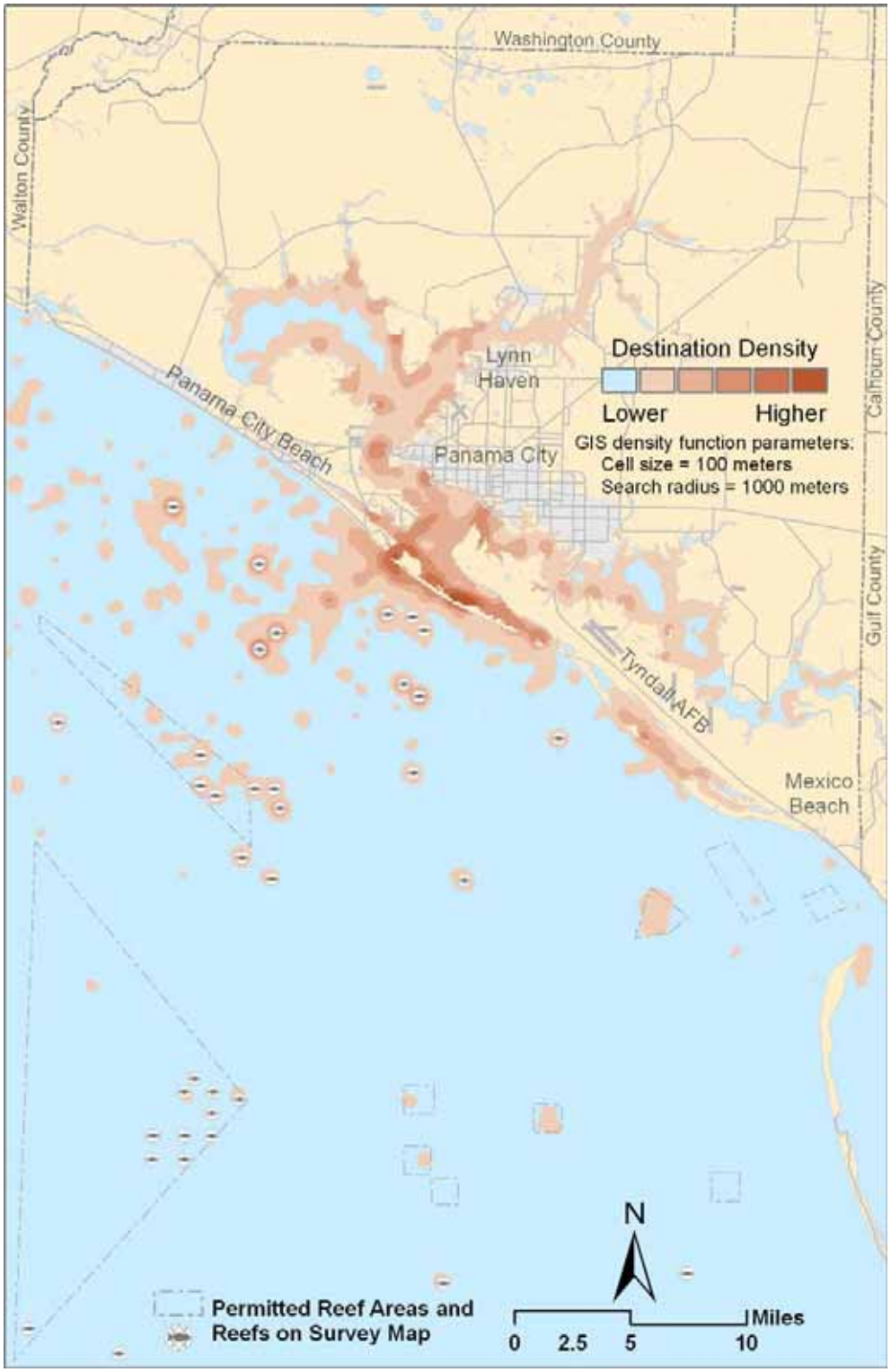

Figure 32. Favorite Destinations as Summarized with the GIS

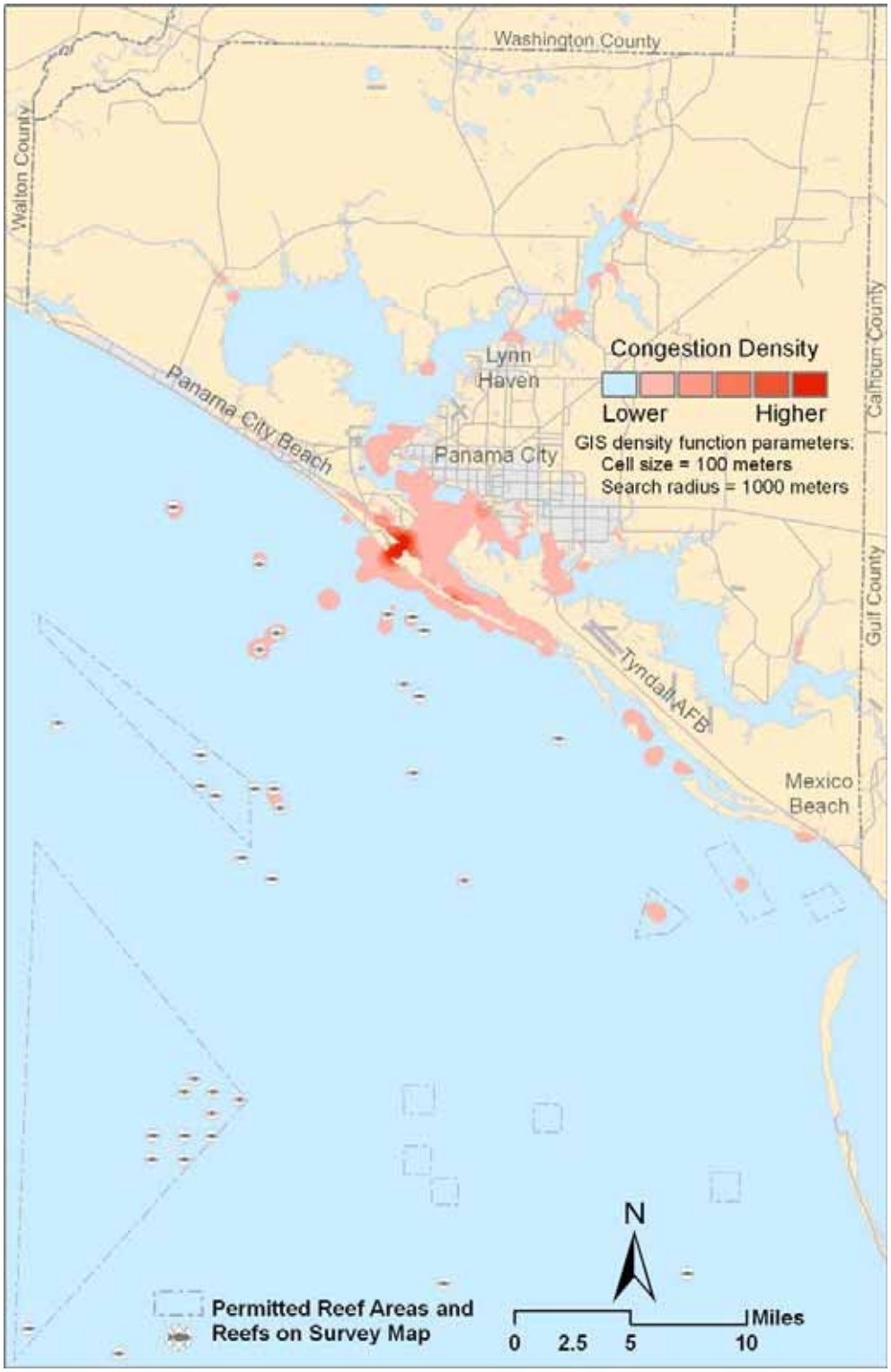

Figure 33. Congested Areas as Summarized with the GIS

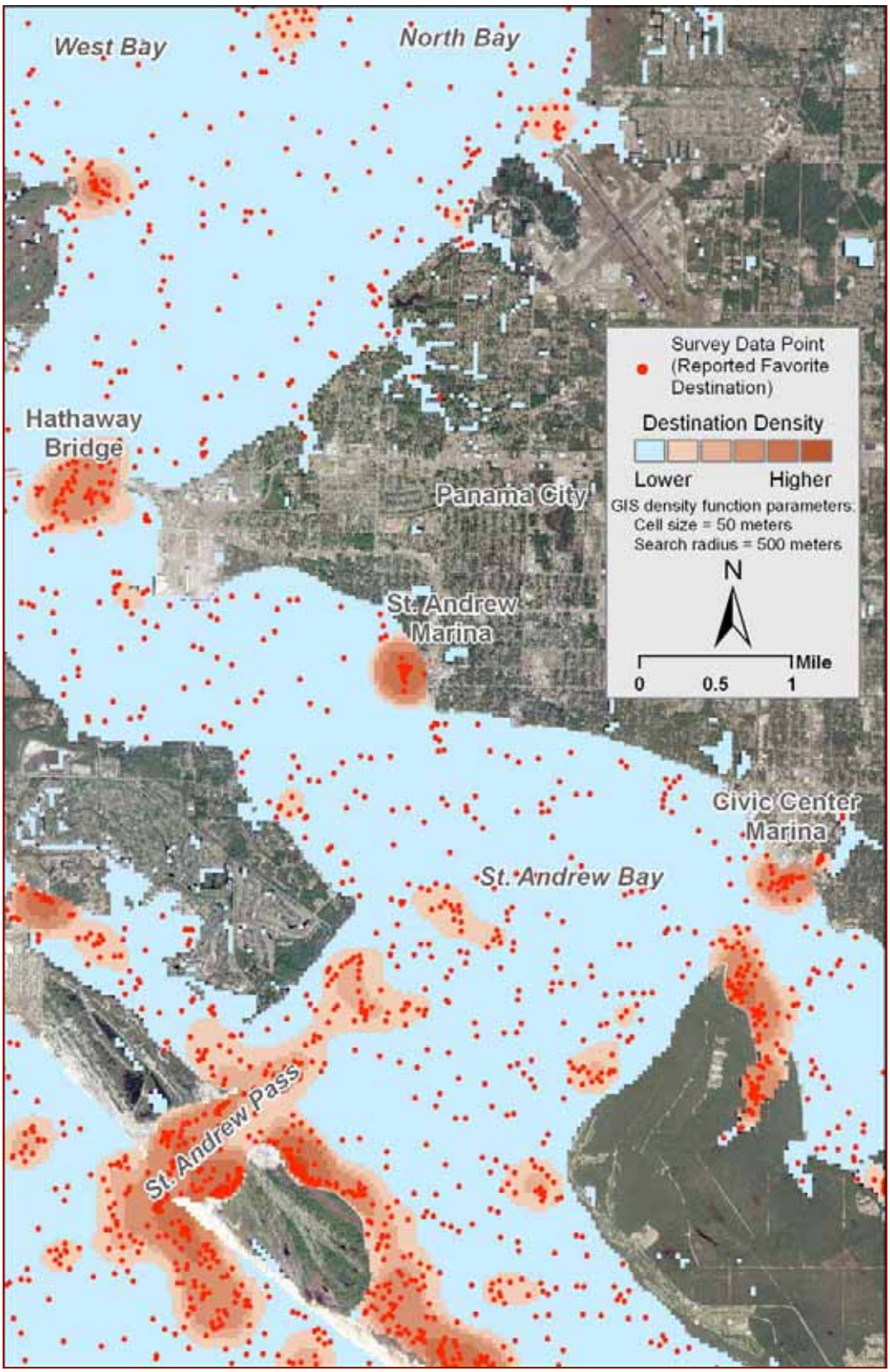

Figure 34. Close-up of some Favorite Destination Areas

Seasonal Boating Patterns

Analysis of mapped destination points reported by survey respondents identified areas where clustering occurred for each of the three seasons. The Getis-Ord G statistic (Getis & Ord, 1996) was calculated and the Z-scores of the statistic (Gi*) were rendered using ArcMap to reveal hot-spots of boating destinations.

A cluster analysis of the reported number of boating trips taken each month determined that boating destinations could be statistically grouped into a "peak," and an "off-peak" (see Part 2 for the complete seasonal analysis and identification of seasonal clusters). The peak season of boating activity was spring and summer, from April through September. The off-peak season was in fall and winter, from October through March. The boating destinations, after being digitized into a GIS, were separated into peak and off-peak seasons (using the month that the trip occurred as the identifier).

A 500 m^2 grid was created for the extent of the study area, and the number of reported destination points was counted for each grid cell. This count gave a weighted measure of the number of boating destinations per cell. The weighting was used to calculate the Getis-Ord G statistic for the center point of that cell.

The Getis-Ord G-statistic gives a measure of clustering relative to a neighborhood of values. So, if features that have high values are clustered in one area, the G-statistic will be larger than would be expected if the values were the result of random chance, and that feature is part of a "hot spot." For this analysis, the G statistic was calculated using a fairly restricted neighborhood of 1000 meters. This means that only the cells immediately adjacent to the sides of any given cell were considered in the neighborhood calculation. From these values, Z scores were calculated and those with statistically significant scores were mapped. For the analysis, any Z scores greater than 1.96 ($\alpha = 0.5$), were shown (see Figures 35 and 36). The results were mapped excluding any Z scores less than or equal to 1.96. To render the results, a Jenks natural breaks classification method was used to summarize the results into seven classes, which range nominally from the lowest levels of clustering to the highest levels of clustering. Highest levels are shown on the maps in the saturated red color, while lowest levels are shown in a light pink. Intermediate values are color-ramped in-between.

The maps show that there are some areas in the waters of Bay County that have consistent heavy clustering of recreational boating destinations throughout all three seasons. Prominent among these year-round hot spots are Shell Island, Saint Andrew Sound and some of the artificial reefs and reef areas in the Gulf of Mexico. The results also showed seasonal variations in use for some areas. In peak season, high levels of clustering occurred closer to shore near Shell Island. In off-peak season, clustering occurs in the same areas near shore, but also extends further into the Gulf of Mexico to more distant reefs and up the Econfina River to freshwater springs.

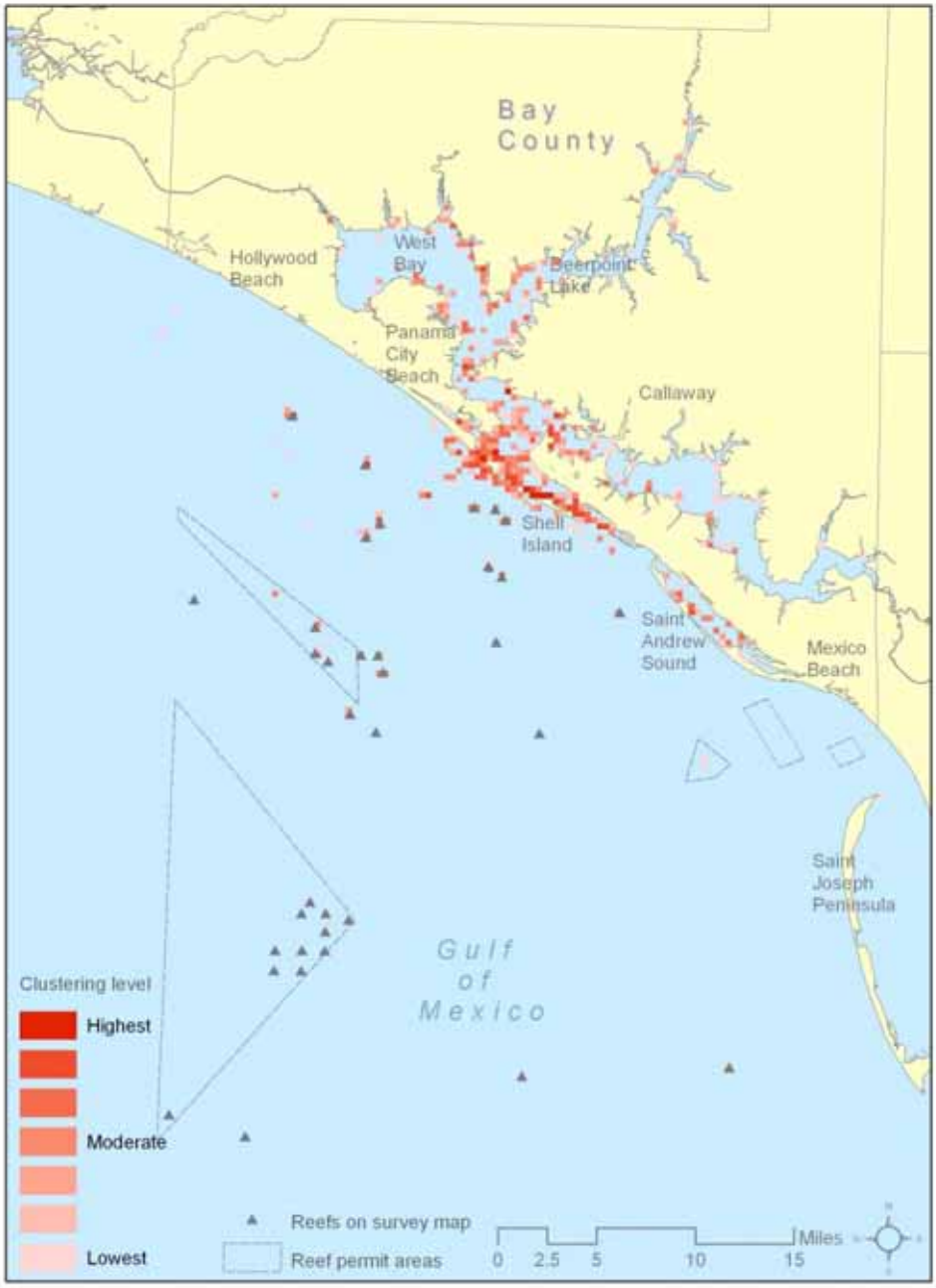

Figure 35. Destination Clustering for the "Peak" Boating Season

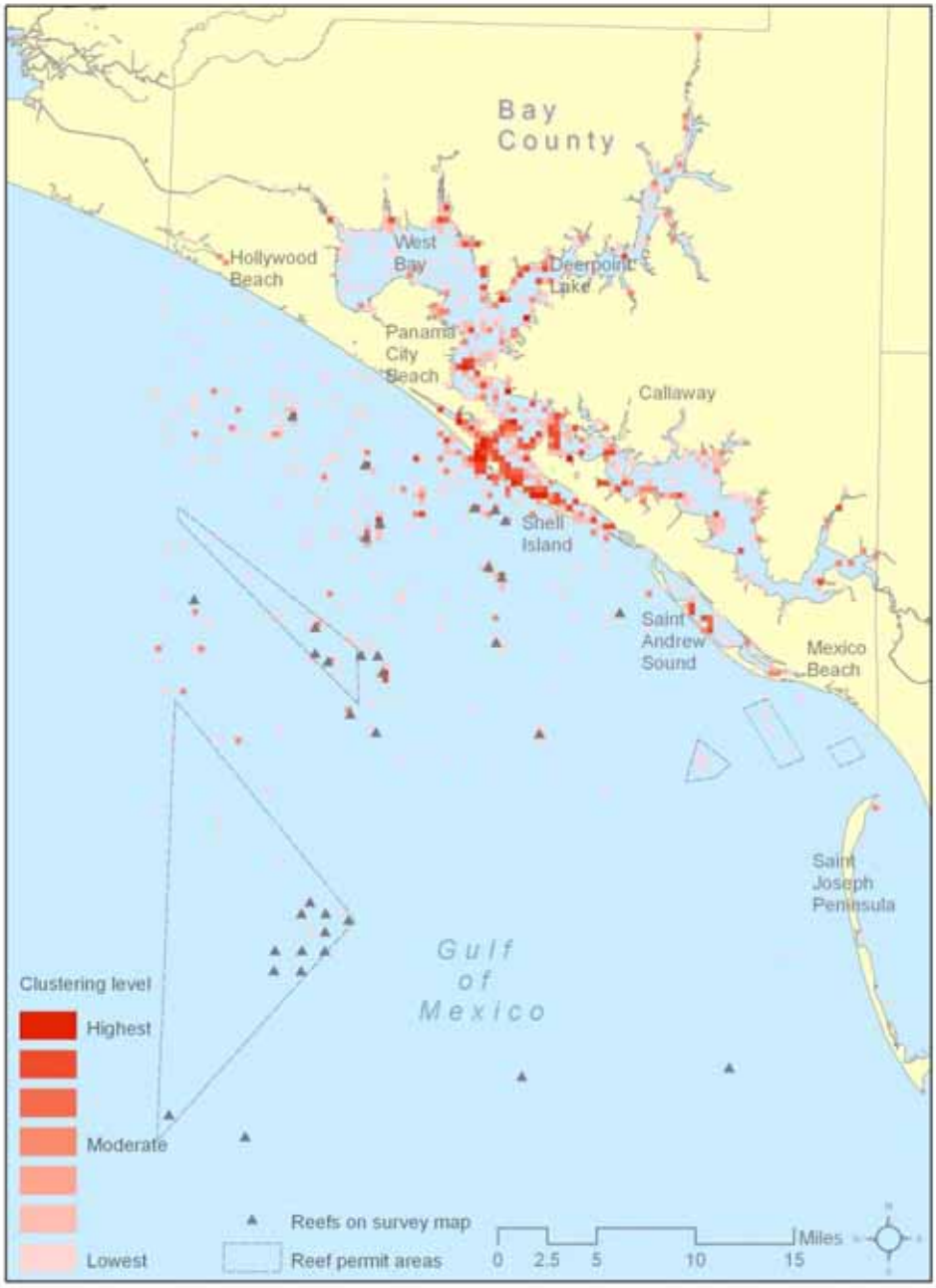

Figure 36. Destination Clustering for the "Off-Peak" Season

Part 4–Summary and Conclusions

The purpose of this study was (1) to quantify and map public access facility use through an inventory of marinas and boat ramps, and (2) to characterize the use patterns of boaters on waterways within and around Bay County by season and by waterway access type. The analysis presented in this report was based upon information collected during visits to marinas and boat ramps and through the distribution of three waves of mail surveys that targeted boaters who accessed the water from marina wet slips, marina dry-storage facilities, public ramps, and private docks. A compilation of the responses to a subset of survey questions reveals that a typical respondent to the survey can be described as follows:

- Is a year-round Florida resident and is approximately 55 years of age;
- Has, on average, 19 years of boating experience on Florida waterways and has taken a boating safety or seamanship course;
- Owns an open fishing vessel about 23 feet in length;
- Takes an average of three to four trips per month (primarily on weekends), with more trips taken during the spring and summer months (April through September) and fewer trips during fall and winter months (October through March);
- Begins a trip at approximately 8AM and spends about 6 hours on the water;
- Shows a preference for the following water-based activities in order of importance: fishing, swimming, and cruising;
- Perceives that a lack of seamanship and courtesy in other boaters (primarily bad PWC operators), waterway congestion, and water quality issues detract most from recreational boating enjoyment, and, lastly;
- Believes that infrastructure improvements (chiefly dredging of the East Pass), more access via better ramps, and more boater education as to safety, etiquette, and rules of the road would do most to improve recreational boating enjoyment.

The analysis first relied on the identification of primary boating periods by use of a cluster analysis based on the reported number of days per month that respondents spent boating. The cluster analysis revealed the presence of two distinct boating periods: a peak season (April through September) and an off-peak season (October through March). These boating periods differed from those recently determined for Brevard County, highlighting regional differences in boating use in a state known for its “year-round boating season” (Sidman, et al. 2007).

The second analytical element involved the evaluation of seasonal trends among the four waterway access user groups. The analysis highlighted trends in (a) trip frequency, (b) trip departure times, (c) trip durations (d) weekend vs. weekday use patterns, and (e) boating activities by season. Although trip frequency for most respondents from all user groups for a given season

did not differ from the seasonal mean, there were distinct user group characteristics as to trip departure times and trip durations.

The third analytical component of this study focused on (1) the spatial distribution of ramp patrons, and (2) spatial patterns of waterway use and period-specific boating patterns from reported trip data captured by the three mail survey waves. The Getis & Ord G*-statistic (a measure of localized spatial dependence) was used to map and evaluate favorite boating destinations identified by mail survey respondents. A visual inspection of the resulting maps shows that some boating "hot-spots" are popular throughout the year (e.g., Shell Island), while others (e.g., farther offshore reefs in the Gulf of Mexico) experience some seasonal differences in use intensity.

The results underscore the importance of collecting boating data throughout the course of a year via multiple contacts (i.e., survey waves that allow for the collection of data during different boating seasons). Of equal importance, the analysis supports the targeting of the four waterway access groups – user groups that show statistically significant variability in trip behavior, trip characteristics, and use patterns over boating seasons.

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Appendices

Appendix A. Questionnaire and Correspondence

Recreational Boating in St. Andrew Bay, Florida

A Survey Conducted by the University of Florida Sea Grant College Program, Bay County, and the Florida Fish and Wildlife Conservation Commission

Dear Boat Owner / Operator,

We are asking you to participate in a boating study being conducted by the University of Florida Sea Grant College Program and the Bay County Planning Department. The study seeks to characterize boating in Bay County waterways, including St. Andrew Bay and reefs in the Gulf of Mexico. Your responses will be very important to help Bay County determine demand for public access facilities (marinas and boat ramps), expand existing or site new facilities, and to prioritize and improve waterway and facility maintenance.

The questionnaire should take about 20 minutes to complete. We would appreciate your returning it as soon as possible. We have provided a self-addressed, postage-paid return envelope. **Please be assured that the information you provide will be held in the strictest confidence. Answers will NOT be traced to individuals and your name or address will NOT be made available to anyone else**. Your participation is completely voluntary – you do not have to answer any question that you do not want to. The questionnaire control number is used only to track survey returns.

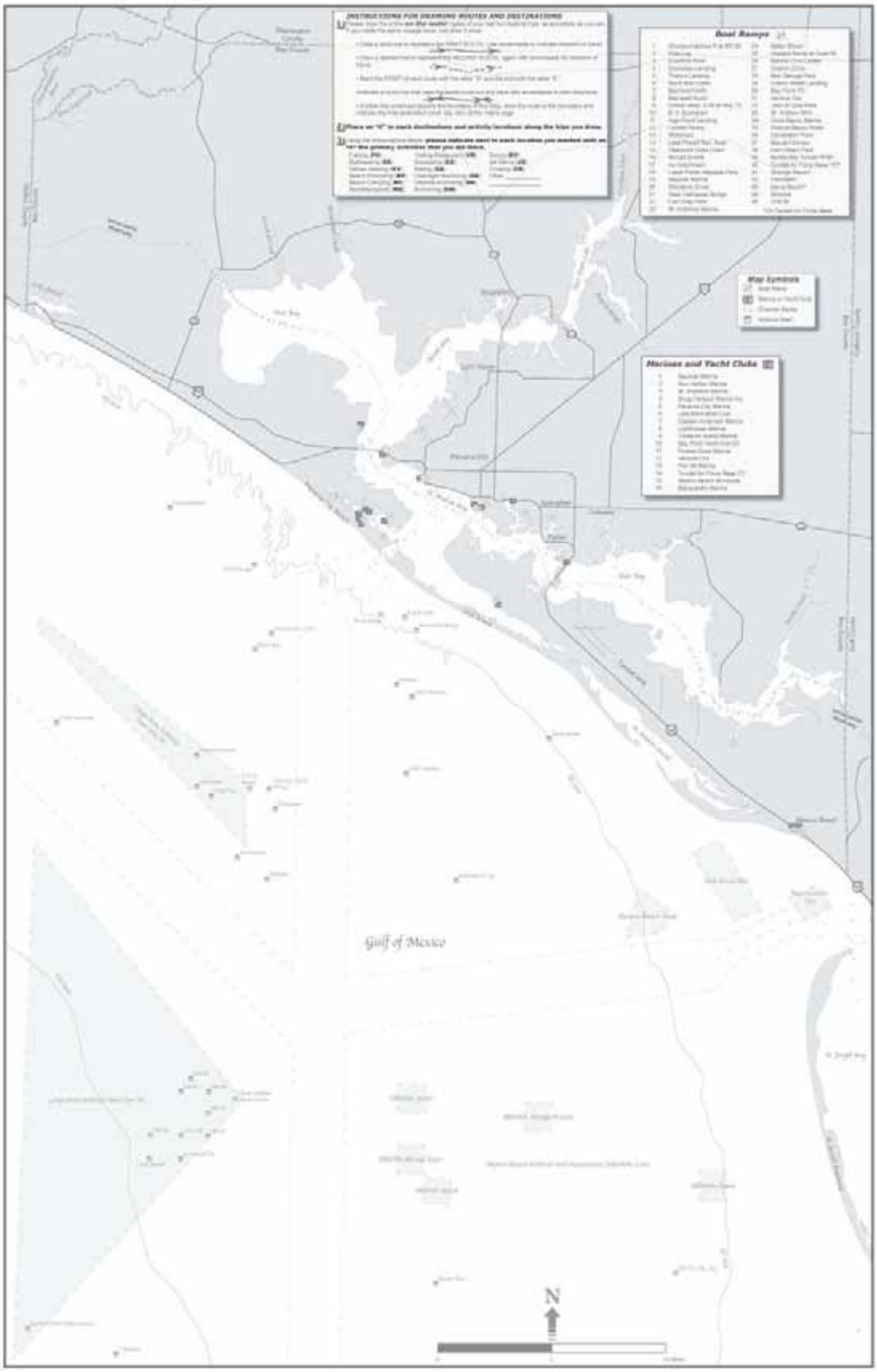
You are one of a targeted group of boaters using Bay County waterways to have received this survey, and your input is very important. Furthermore, as a selected user, you may receive a follow-up survey near the end of this year and in the spring of 2008. This will enable us to evaluate facility use and boating patterns for the entire year.

For questions about your rights as a research participant, you may contact the University of Florida Institutional Review Board at PO Box 112250, Gainesville, FL 32611 or 352-392-0433. If you have any questions about this survey you may contact Charles Sidman at the University of Florida (352) 392-6233, or Elliott Kampert at the Bay County Planning Department (850) 784-4024 or by email at boatsurvey@ifas.ufl.edu

We are most grateful for your assistance in this important project.

Charles Sidman, Ph.D.
Coastal Planning Specialist
Florida Sea Grant
P.O. Box 110405
Phone: (352) 392-6233

Elliott Kampert, AICP
Principal Planner
Bay County Planning Division
707 Jenks Ave. Ste. B
Phone: (850) 784-4024



Questionnaire Map

PART 1. PLEASE DRAW THE ROUTES OF YOUR LAST TWO BOATING TRIPS

On the other side of this questionnaire is a map of the St. Andrew Bay boating region. We would like you to provide information regarding your last two boating trips in this area within the past 12 months. This will include marking your launch or departure sites, drawing your boating travel routes, and marking your boating activity spots or destinations along those routes. ***Please refer to the "instructions for drawing routes and destinations" box on the map for completion of this part of the questionnaire. Thank you.***

PART 2. PLEASE DESCRIBE YOUR LAST TWO BOATING TRIPS

Question 1. About what time did you get on the water for each of the two trips that you drew on the map? *(For example, 7:30AM)*

First Trip (**solid line**)	AM	PM
Second Trip (**dashed line**)	AM	PM

Question 2. About how long were you on the water on each of the two trips that you drew on the map? *(Please write in the number of hours or days.)*

First Trip (**solid line**)	Hours	Days
Second Trip (**dashed line**)	Hours	Days

Question 3. Please circle the day(s) of the week that you took each of the two trips that you drew on the map.

First Trip (**solid line**)	Mon Tues Wed Thurs Fri Sat Sun
Second Trip (**dashed line**)	Mon Tues Wed Thurs Fri Sat Sun

Question 4. Please circle the month in which you took each of the two trips that you drew on the map.

First Trip (**solid line**)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Second Trip (**dashed line**)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Question 5. From the list below, please check the box beside the type of boat that you used on each of the two trips that you drew on the map.

Trip 1	Boat Type	Trip 2
☐	Jet Ski / Personal Watercraft	☐
☐	Kayak / Row / Canoe	☐
☐	Sailboat (no cabin)	☐
☐	Sailboat (with cabin)	☐
☐	Speed: Runabout / Jet Boat (no cabin)	☐
☐	Speed: Scarab / Cigarette (with cabin)	☐
☐	Open Fisherman / Flats / Skiff / John boat	☐
☐	Offshore Sportfisherman (with cabin)	☐
☐	Power Cruiser (with cabin)	☐
☐	Deck Boat	☐
☐	Pontoon Boat	☐
☐	Other (specify)_____	☐

Question 6. Please enter the length and draft of the boat(s) that you identified above. *(Draft is how far below the water surface your prop or hull extends.)*

First Trip (**solid line**)	**Length (feet)**	**Draft *(feet / inches)***
Second Trip (**dashed line**)	**Length (feet)**	**Draft (feet / inches)**

Question 7. Please indicate the departure site type for your first and second trips by checking the appropriate box.

Trip 1	Departure Site Type	Trip 2
☐	Boat Ramp	☐
☐	Shoreline / Causeway	☐
☐	Marina wet slip	☐
☐	Home dock	☐
☐	Condominium dock	☐
☐	Marina dry storage	☐
☐	Other (specify)_____	☐

Question 8. When you took your last two trips were you a visitor to or a resident of Bay County?

First Trip (**solid line**)	Visitor ☐	Resident ☐
Second Trip (**dashed line**)	Visitor ☐	Resident ☐

Question 9. What is the five digit zip code of your primary residence? _____

If you departed from a ramp, marina, or shoreline/causeway, please answer the following questions. If you departed from a residential or condominium dock, please skip to Question 14.

Question 10. Please provide the name or location of the ramp, marina, or shoreline/causeway from which you departed on each of your last two trips that you drew on the map.

First Trip: _____

Second Trip: _____

Question 11. About how long does it take to drive from your home to the ramp(s), marina, or shoreline/causeway that you identified in Question 9.

First Trip: Hours _____ Minutes _____

Second Trip: Hours _____ Minutes _____

Question 12. Is there a boat ramp that you would like to use but avoid? Yes ☐ No ☐

If yes, please name the ramp_____ (*See map for a listing of ramp names.*)

Please check all of the following that apply to the ramp that you would like to use but avoid.

☐ Water is too shallow ☐ Lane(s) too narrow ☐ Bad or no pavement
☐ Slope is too steep ☐ Slope is not steep enough ☐ Inadequate parking
☐ No restrooms ☐ Too crowded ☐ Inadequate docks
☐ Other reason for avoiding ramp (*specify*) _____

Question 13. What is important to you in selecting a ramp, marina, or shoreline/causeway? (*For a-n in the table below, check the box that best describes how important each factor is to you.*)

Statement	Very Important	Important	Neutral	Unimportant	Very Unimportant
a) Deep-water access	☐	☐	☐	☐	☐
b) Availability of restrooms	☐	☐	☐	☐	☐
c) No parking or launching fee	☐	☐	☐	☐	☐
d) Well-marked access channels	☐	☐	☐	☐	☐
e) Proximity to my favorite boating spots	☐	☐	☐	☐	☐
f) Adequate parking	☐	☐	☐	☐	☐
g) Availability of fishing supplies, bait	☐	☐	☐	☐	☐
h) Short wait to launch	☐	☐	☐	☐	☐
i) Gas, pump-out, or maintenance service	☐	☐	☐	☐	☐
j) Nearby amenities (e.g., restaurant)	☐	☐	☐	☐	☐
k) Proximity to my home	☐	☐	☐	☐	☐
l) Ease of launching and retrieving boat	☐	☐	☐	☐	☐
m) Safe and secure parking area	☐	☐	☐	☐	☐
n) Other (*specify*)	☐	☐	☐	☐	☐

PART 3. PLEASE DESCRIBE YOUR TYPICAL BOATING TRIPS

Question 14. In the boxes below, please write the number of days per month that you operated your boat in the St. Andrew Bay mapped area during the past year.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Question 15. Which of the following are important to you in selecting your typical boating routes? (*For a-j in the table below, check the box that best describes your opinion.*)

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a) I try to avoid congested areas / crowds.	☐	☐	☐	☐	☐
b) I try to avoid shallow water.	☐	☐	☐	☐	☐
c) The fishing is good.	☐	☐	☐	☐	☐
d) I prefer well-marked channels.	☐	☐	☐	☐	☐
e) I prefer calm protected waters.	☐	☐	☐	☐	☐
f) None are important. I just cruise around.	☐	☐	☐	☐	☐
g) Easy access to supplies or fuel	☐	☐	☐	☐	☐
h) Quick access to my favorite boating spots	☐	☐	☐	☐	☐
i) I enjoy the scenic beauty.	☐	☐	☐	☐	☐
j) Other (*specify*)	☐	☐	☐	☐	☐

Question 16. What are your activities on your typical boating trips? (*Check all that apply.*)

☐ Beach Picnicking (**BP**) ☐ Nature Viewing (**NV**) ☐ Sightseeing (**SS**)
☐ Cruising (**CR**) ☐ Daytime Anchoring (**DA**) ☐ Socializing (**SO**)
☐ Diving (**DV**) ☐ Overnight Anchoring (**OA**) ☐ Visiting Restaurant (**VR**)
☐ Fishing (**FH**) ☐ Sailing (**SA**) ☐ Swimming (**SW**)
☐ Ski / Water Sports (**WS**) ☐ Beach Camping (**BC**) ☐ Jet Skiing (**JS**)
☐ Other (**O**) (*specify*) _____

Question 17. In which areas, if any, have you experienced the greatest amount of boat congestion? **Please mark congested areas on the map with the letter "C."** (*"Congestion" refers to the presence of more boats than you would prefer.*)

PART 4. PLEASE DESCRIBE YOURSELF

Question 18. How long have you been operating a boat in the St. Andrew Bay area? _____(*Years*)

Question 19. Have you ever taken a boat safety or seamanship course? Yes ☐ No ☐

Question 20. In what year were you born? _____

Question 21. What detracts most from your St. Andrew Bay area boating experience?

Question 22. What is needed most to improve your St. Andrew Bay area boating experience?

PLEASE RETURN THE QUESTIONNAIRE AND MAP IN THE ENCLOSED POSTAGE-PAID ENVELOPE
THANK YOU VERY MUCH FOR YOUR TIME AND PARTICIPATION!

Questionnaire Control Number
(used only to keep track of survey returns)

Questionnaire

Appendix B. Ramp Sampling Days

Ramp survey dates in chronological order:

Date	Day	Date	Day
6/8/2007	Friday	9/29/2007	Saturday
6/11/2007	Monday	10/6/2007	Saturday
6/12/2007	Tuesday	10/7/2007	Sunday
6/15/2007	Friday	10/27/2007	Saturday
6/19/2007	Tuesday	11/10/2007	Saturday
6/20/2007	Wednesday	11/25/2007	Sunday
6/21/2007	Thursday	12/9/2007	Sunday
6/26/2007	Tuesday	12/30/2008	Sunday
6/28/2007	Thursday	1/13/2008	Sunday
6/29/2007	Friday	1/20/2008	Sunday
7/5/2007	Thursday	2/10/2008	Sunday
7/6/2007*	Friday	2/23/2008	Saturday
7/8/2007	Sunday	2/29/2008	Friday
7/21/2007	Saturday	3/8/2008	Saturday
7/25/2007	Wednesday	3/15/2008	Saturday
7/26/2007	Thursday	3/23/2008	Sunday
7/29/2007	Sunday	4/6/2008	Sunday
7/30/2007	Monday	4/9/2008	Wednesday
7/31/2007	Tuesday	4/11/2008	Friday
8/2/2007	Thursday	4/13/2008	Sunday
8/3/2007	Friday	4/22/2008	Tuesday
8/5/2007	Sunday	4/27/2008	Sunday
8/10/2007	Friday	4/30/2008	Wednesday
8/12/2007	Sunday	5/3/2008	Saturday
8/22/2007	Wednesday	5/4/2008	Sunday
8/23/2007	Thursday	5/6/2008	Tuesday
8/25/2007	Saturday	5/8/2008	Thursday
8/26/2007	Sunday	5/9/2008	Friday
8/27/2007	Monday	5/10/2008	Saturday
8/28/2007	Tuesday	5/25/2008	Sunday
8/30/2007	Thursday	5/26/2008	Monday*
9/1/2007	Saturday	6/1/2008	Sunday
9/2/2007	Sunday	6/14/2008	Saturday
9/3/2007	Monday*	6/28/2008	Saturday
9/23/2007	Sunday		