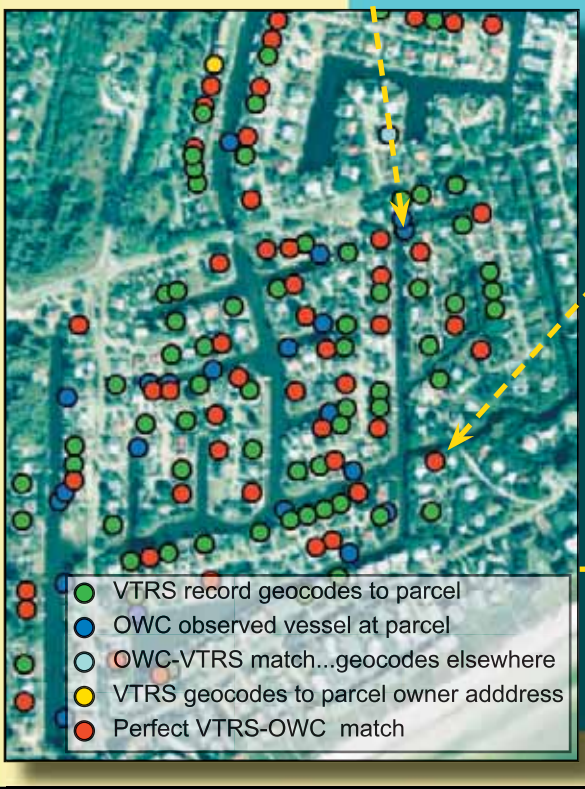
# Florida's Vessel Title Registration System as a Source of Boat Locations and Characteristics

## A Case Study in Lee and Manatee Counties

Sea Grant Florida




Hillsborough

Pinellas

Manatee

Sarasota

Desoto

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Lee

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# Florida's Vessel Title Registration System as a Source of Boat Locations and Characteristics:

## A Case Study in Lee and Manatee Counties

by

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To Gustavo A. Antonini—friend, colleague, mentor, and Florida Sea Grant professor emeritus—lost to us through tragic circumstances in February 2004. His dedication and tireless efforts were a constant source of inspiration. Indeed, this research project is a result of his vision and foresight.

# Abstract

To manage Florida's waterways effectively, better information is required on the characteristics and locations of boats that are moored, anchored, or docked along the state's shorelines—a need that has been identified by state, regional, and local government entities. A field-based boat census ("on-water census," or OWC)—though an effective method to obtain spatially accurate information—is expensive, time-consuming, and restrictive in scope and may omit vessels that are temporarily away from their moorings. The Florida Vessel Title Registration System (VTRS) is potentially a more robust (and economical) source of information. The VTRS is a statewide census of boats that is updated continuously, since boat owners are required to register their boats annually (in owner's birth month) with the State of Florida. The premise of this study was to use the mailing address provided by registered boat owners to develop a spatially enabled inventory of the recreational boat population in Florida. This research provides insights into the accuracy and reliability of the VTRS and a measure of confidence regarding the capability of the VTRS to supply location and attribute information for boats that ply Florida's coastal waterways. The study area comprised 12,064 residential and commercial parcels situated on salt-water accessible canals and waterways in Lee and Manatee counties—representing a range of physical, socio-economic, and demographic characteristics, thus enhancing the transferability of research results to other, similar areas in Florida. An OWC provided location and characteristics for 5,023 vessels within the study area and an additional 8,681 VTRS records were linked to study area parcels and/or OWC vessels. Discrepancies between the OWC and VTRS were explained by a stratified, random sample of 490 OWC and VTRS vessel owners, as well as owners of parcels to which neither an OWC vessel nor VTRS record was associated. Study results indicated that the VTRS captured roughly 80 percent of the study area's boat population; in contrast, the OWC captured less than 60 percent. A statistical analysis determined that no differences existed between the means, medians, and distributions of OWC and VTRS vessel drafts in the study area. A conclusion is that the VTRS is a better alternative than an OWC to categorize the boat population. Moreover, the study demonstrates that the VTRS is a reliable and valuable source of information that can be used to map boat locations and their characteristics. Implementation of the report's recommendations will improve the quality and utility of VTRS information.

# Contents

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# Abbreviations

ASCII ..... American Standard Code for Information Exchange
DBMS ..... Database Management System
DGPS ..... Differential Global Positioning System
DHSMV ..... Department of Highway Safety and Motor Vehicles
DOQQ ..... Digital Orthophoto Quarter Quadrangle
ESRI ..... Environmental Systems Research Institute
FCMP ..... Florida Coastal Management Program
FDEP ..... Florida Department of Environmental Protection
FWRI ..... Fish and Wildlife Research Institute
FSG ..... Florida Sea Grant
FWC ..... Florida Fish and Wildlife Conservation Commission
GDT ..... Geographic Data Technology
GIS ..... Geographic Information System
GPS ..... Global Positioning System
GUA ..... Geographic Unit(s) of Analysis
HIN ..... Hull Identification Number
KW-ANOVA ..... Kruskal-Wallis Analysis of Variance
LIS ..... Land Information System
MOA ..... Memorandum of Understanding
MS ..... Microsoft
NOAA ..... National Oceanic and Atmospheric Administration
OWC ..... On-Water Census(es)
PID ..... Parcel Identification Number
RP ..... Retirement Potential
RV ..... Recreational Vehicle
RWMS ..... Regional Waterway Management System
RWP ..... Retirement Wealth Potential
USCG ..... United States Coast Guard
USGS ..... United States Geological Survey
VTRS ..... Vessel Title Registration System
WCIND ..... West Coast Inland Navigation District

WP.....Wealth Potential

ZIP.....Zone Improvement Program

# Acknowledgments

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We wish to thank Henry Norris of the FWC Fish and Wildlife Research Institute (FWRI) and Frank Herhold and Martha Lord of the Marine Industries Association of South Florida for sponsoring and helping to organize the two workshops held in support of this effort. In particular, we thank the many individuals who took time out of their busy schedules to attend the workshops and provide insights that proved invaluable to the conduct of this project. Mike Scicchitano, Tracy Johns, and Janet Heffner of the Florida Survey Research Center and David Fann of Florida Sea Grant are to be congratulated for their outstanding efforts in conducting the telephone survey. We especially thank the many Lee County and Manatee County boaters who donated their time to complete telephone surveys. Mona Porter, Elayne Huebner, and David Perryman of the Florida Department of Highway Safety and Motor Vehicles provided valuable insights into the inner workings of the VTRS and they assisted in obtaining the data necessary to complete the project. Jesse Wells and his colleagues at Info-Link furnished enhanced VTRS data and provided insights stemming from their long experience working with state vessel registration systems throughout the nation. Lana Carlin Alexander, who possesses a detailed knowledge of boats, coordinated and participated in the Lee County on-water boat censuses.

# Introduction

Managing coastal development continues to be one of the critical challenges facing Florida and the nation. Recreational boating, an important part of that challenge and a key element of Florida's coastal lifestyle and economy, has increased at a rate that exceeds Florida's population growth.[1] Development along Florida's coastal waterfronts has resulted in thousands of miles of dredged channels and basins that are used as navigable waterways by many of the state's nearly one million recreational boaters (Florida Fish and Wildlife Conservation Commission [FWC] 2002). The ever-increasing use of Florida's waterways and waterfronts has created competing and conflicting pressures between boaters, waterfront users, and the natural environment. As marine resources are used to their capacity, and as natural environments decline, there is a compelling need to foster community development strategies that are compatible and sustainable. To help meet this need, the Florida Sea Grant (FSG) Boating and Waterway Management Program developed a Regional Waterway Management System (RWMS) for local and regional governments (Antonini and Box 1996). The RWMS is a standardized, science-based system that includes a geographic information system (GIS), data (boats, depths, moorings, facilities, signs, and habitat), analytical techniques, and policy recommendations with which to prioritize waterway management and maintenance options on a regional basis.

The RWMS was designed for southwest Florida's coastal waterways[2] and is consistent with municipal, county, Florida Department of Environmental Protection (FDEP), and West Coast Inland Navigation District[3] (WCIND) goals of facilitating safe boating and reducing boating impacts on natural resources (Sidman, Pearse, Haney, Burr, and Robertson 2002). The principal elements of the RWMS include: (1) documentation of existing channel centerline depths; (2) establishment of maintenance dredging requirements according to user vessel draft; (3) placement of signs to conform with boat density and traffic patterns; (4) management of boat traffic based on detailed knowledge of boat distributions and travel routes; (5) siting of habitat restoration to protect waterways; (6) regional scale permitting to accommodate water-dependent uses and to minimize environmental impacts; and (7) public education, using waterway maps and guide materials, to encourage environmental stewardship and best boating practices.

The State of Florida, in 1997, adopted the RWMS protocol through a Memorandum of Agreement (MOA), signed by the FDEP, FSG, and the WCIND (Appendix A). The MOA provided the required, state-approved framework for the RWMS and led to applications of the system in Sarasota, Manatee, and Lee counties (Antonini, Swett, Schulte, and Fann 2000; Swett, Antonini, and Schulte 2000; Swett, Fann, Antonini, and Carlin-Alexander 2000, 2001; Fann, Swett, Carlin-Alexander, and Antonini 2002; Swett, Fann, and Antonini 2002). The RWMS was a factor in the enactment of the Inland Waterway Management Law (CS/HB 3369) by the Florida Legislature (Appendix B). This general law institutionalizes statewide goals of the FSG

[1] Florida's population increased by 64% between 1980 and 2000, while recreational boat registrations increased by 82%; boat registrations in southwest Florida (Collier, Lee, Charlotte, Sarasota, and Manatee counties) increased by 97% (Florida Statistical Abstract, 1980, 2000; http://quickfacts.census.gov/qfd/states/12000lk.html).

[2] The RWMS was designed to take into account that portion of the boat population located at facilities (e.g., ramps, marinas, and residential and commercial docks and parcels) adjacent to salt-water accessible waterways.

[3] The West Coast Inland Navigation District is a multi-county special taxing district in southwest Florida, comprised of Manatee, Sarasota, Charlotte, and Lee counties, that assists in the planning and implementation of waterway projects that promote safe navigation, the enjoyment of water-based activities, and environmental stewardship.

Boating and Waterway Management Program, by broadening the mandate of the state's Inland Navigation Districts. The RWMS also provided the basis for a new Florida Administrative Code, "Chapter 62-341.490 Noticed General Permits for Dredging by the West Coast Inland Navigation District (WCIND)," which became effective in August 2002 (Appendix C). Several benefits stem from the general permit: (1) greater efficiency and effectiveness in dredging and maintaining waterways, by allowing decision-makers to assign priorities on a regional basis; (2) savings in dollars and staff time (50 discrete boat source areas or *trafficsheds*[4] are covered by this permit, thus streamlining the regulatory process); (3) better public policy through a holistic, environmentally-based decision-making process; and (4) changes in state policy that are based on "best available science."

A principal objective of the RWMS is to provide information on boats located at salt-water accessible parcels (e.g., ramps, marinas, and residential and commercial facilities), navigation channels, and potential dredging that would be required to afford boats safe access from berths to secondary channels and, ultimately, to deep, open water. The system is based on mapping water depth, boat and facility characteristics, signage, and habitat. A waterway accessibility analysis delineates and quantifies levels of boat accessibility to open waters and the location and extent of channel depth limitations. A key requirement for the analysis is comprehensive, up-to-date, accurate, and spatially-referenced boat population data. Knowledge of boat locations (where they are moored, anchored, or docked) and characteristics (draft, length, type, use) is critical as well to related planning and management efforts that address such issues as: (1) future siting of boating infrastructure, (2) origin and destination analyses, and (3) determining levels of service for waterway channel systems.

Prior efforts to characterize boating populations, boat-use patterns, and boat locations in Florida have relied on expensive, time-consuming methods that include aerial surveys (Gorzelaney 1998), mail and telephone surveys (Sidman and Flamm 2001), and on-water censuses (OWC) by GPS-equipped field crews (Antonini and Box 1996; Antonini et al. 2000; Swett, Antonini, et al. 2000; Swett, Fann, et al. 2000, 2001; Swett et al. 2002). Technological advances now allow the integration of information (e.g., boat type, length, model, and address) contained in non-spatial databases, such as Florida's Vessel Title Registration System (VTRS), with spatial data (e.g., property parcels).

The premise of this study was to use the mailing address provided by registered boat owners to develop a spatially enabled inventory of Florida's recreational boat population. The research goal was to determine whether the VTRS is an accurate and reliable information source for waterway management and planning. The research was implemented for selected areas in Lee and Manatee counties where Florida Sea Grant previously completed comprehensive waterway management projects. The following supporting objectives were pursued.

1) To determine the degree of correspondence between (a) information contained within the VTRS and (b) boat locations and characteristics obtained via comprehensive on-water censuses (OWC) conducted for Lee and Manatee counties.
2) To determine if discrepancies between the VTRS and OWC can be explained by geographic, physical, demographic, and/or socio-economic factors.

[4] A trafficshed is defined as a boat source area that contains a concentration of boats that use a common channel (or channels), exclusive to the trafficshed, to gain access to primary waterway routes that lead to deep, open water.

3) To identify, categorize, and explain discrepancies between the VTRS and OWC by conducting a telephone survey for a stratified random sample of vessel and property owners that are linked to the Lee County and Manatee County study areas.
4) To determine if VTRS information can be substituted for an OWC, through a statistical comparison of means, medians, and distributions of vessel drafts within the study area.
5) To recommend alterations to VTRS data collection procedures that can enhance the system's utility as a planning and management tool.

To achieve the research objectives, an OWC of boats was conducted along selected canals and waterways distributed throughout Lee and Manatee counties. Boat locations and characteristics were recorded for over 12,000 residential and commercial salt-water accessible parcels. The selection of the areas surveyed during the OWC was based on a broad range of geographic, physical, demographic, and socio-economic factors representative of salt-water accessible canals and waterways throughout Florida, thus enhancing the transferability of the research to other, similar areas in Florida.

GIS algorithms and database management techniques were used to extract and geocode[5] VTRS records associated with the same parcels that were surveyed during the OWC. Boats recorded during the OWC were compared to the extracted VTRS records and discrepancies (incongruence) between the two datasets were investigated by conducting a stratified, random telephone survey of 490 OWC and VTRS vessel owners, as well as owners of parcels to which neither an OWC vessel nor VTRS record was associated. Statistical tests were performed to determine if discrepancies were related to specific geographic, physical, demographic, and socio-economic factors. For the purpose of this study, the utility of the VTRS was assessed by testing its validity as an OWC replacement for the RWMS accessibility analyses conducted by FSG in Lee and Manatee counties. Validity was determined by comparing boat drafts extracted from both datasets for trafficsheds within the study area. The VTRS is deemed a valid replacement for the OWC if the accessibility analysis produces a RWMS trafficshed prioritization scheme that matches the one based on OWC data. Based on the research results, recommendations are offered that will improve the quality and utility of VTRS information.

# Methods

## *The Study Area and Representative Geographic Units of Analysis (GUA)*

The research was implemented for selected areas of Lee and Manatee counties where Florida Sea Grant previously completed comprehensive waterway management projects along salt-water accessible waterways (Swett, Antonini, et al. 2000; Swett, Fann, et al. 2000, 2001; Fann et al. 2002; Swett et al. 2002). Lee and Manatee counties represent two distinct geographic boating regions, separated by a distance of approximately 75 miles (Figure 1), which offer a broad range of physical, demographic, and socioeconomic conditions.

A geographic unit of analysis (GUA) consists of contiguous property parcels and adjacent canals and waterways that are equivalent in terms of physical, demographic, and socioeconomic

[5] The process of identifying the geographic coordinates of a location, given an address.

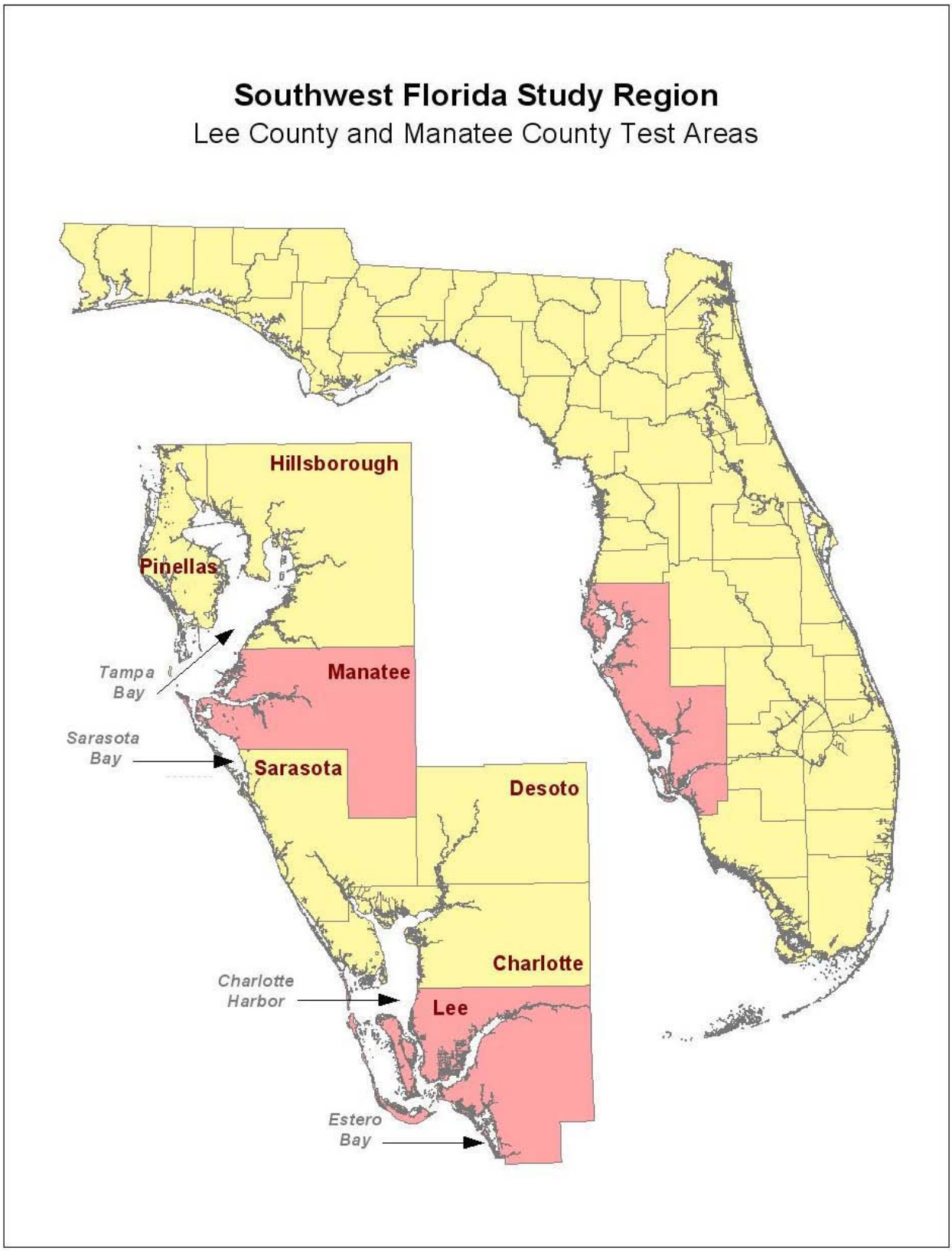


**Figure 1. Southwest Florida Study Region and Test Counties**

characteristics. Geographic units of analysis (GUA), while identified and delineated by a combination of factors, result primarily from the spatial intersection of trafficshed boundaries and block group boundaries derived from the 2000 U.S. census. A trafficshed serves as the basic unit of management for the RWMS; a total of 387 trafficsheds were defined for Lee and Manatee counties. Figure 2 shows an example of a GUA that corresponds with the boundaries of a RWMS trafficshed. Figures 3 and 4 show the distribution of GUA selected in Lee and Manatee counties: 26 GUA were selected in Lee County and 17 in Manatee County.

A study hypothesis contended that conformance (or lack thereof) between the OWC and the VTRS is related to retirement and wealth factors. For example, wealthier retirees have a greater amount of discretionary income and leisure time and, therefore, their vessels are more likely to be in use (absent) during an on-water survey. To test this hypothesis, demographic information from the 2000 census was used to differentiate GUA on the bases of retirement and wealth potential (RWP).

Retirement potential was derived from population figures for those drawing Social Security and for those greater than 65 years of age, which were divided by the total population of the block group, and expressed as a percent of the total block group population. Areas of low, medium, and high 'retirement potential' are identified as being less than 30 percent, from 30 to 60 percent, and greater than 60 percent of the block group population, respectively (Table 1).

Median household value and per-capita income variables were aggregated to classify block groups according to wealth potential. Breakpoints for low, medium, and high wealth potential were established by sorting the data; determining the upper and lower bounds of the data range; and dividing the range into three even intervals (low, moderate, and high for each variable). For example, low wealth potential in Lee County is defined as a median house value of less than $100,000 and a per capita income of less than $13,000 (Table 1).

A composite value was generated to map all combinations of low, moderate, and high retirement and wealth potential by block group (Table 1). Each composite value is composed of first the retirement potential (RP) and then the wealth potential (WP). For example, 10.3 indicates low retirement and high wealth potential; 20.3 indicates moderate retirement and high wealth potential.

**Table 1. Criteria for County Census Block Evaluation**

| County | Category | Retirement Potential (RP) | | | Wealth Potential (WP) | | |
|---|---|---|---|---|---|---|---|
| | | RP Value | Percent Social Security Income | Percent > 65 years | WP Value | Median House Value (000s) | Per Capita Income (000s) |
| Lee | Low | 10 | < 30 | < 30 | 1 | < $100 | < $13 |
| | Moderate | 20 | 30 – 60 | 30 – 60 | 2 | $100-$200 | $13-$32 |
| | High | 30 | > 60 | > 60 | 3 | >$200 | > $32 |
| Manatee | Low | 10 | < 18 | < 30 | 1 | < $100 | < $19 |
| | Moderate | 20 | 19 – 36 | 30 – 60 | 2 | $100-$200 | $19-$38 |
| | High | 30 | > 36 | > 60 | 3 | >$200 | > $38 |


**Figure 2. A Typical Geographic Unit of Analysis (GUA) and a Regional Waterway Management System Trafficshed**

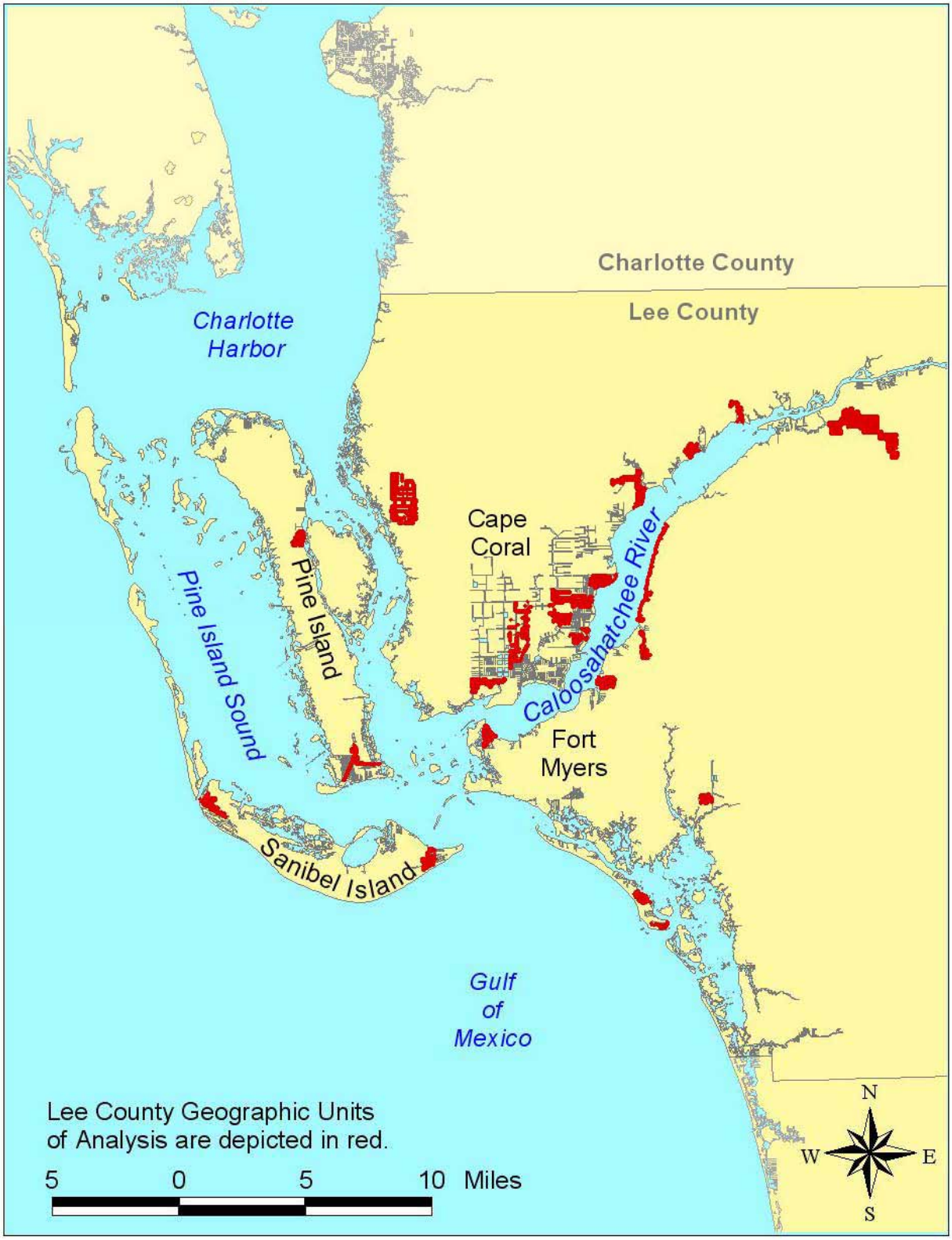


**Figure 3. Lee County: Geographic Units of Analysis (GUA)**

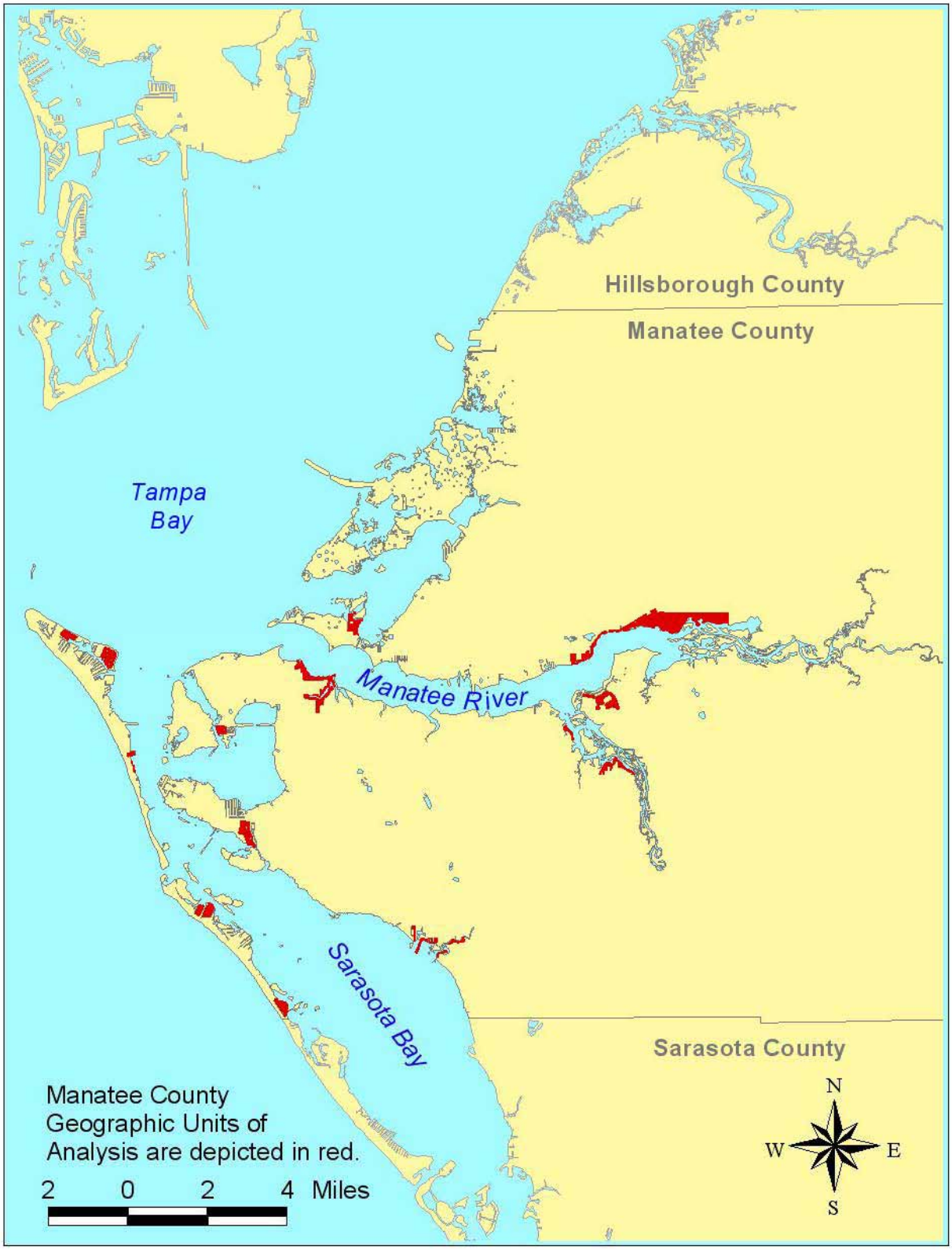


**Figure 4. Manatee County: Geographic Units of Analysis (GUA)**

The RWMS surveys provided the means to determine the number of OWC vessels to assign to each RWP category (Table 2). This information then enabled the selection of appropriate RWP GUA to be surveyed during the OWC that were conducted for this project. The objective was to survey and log a number of vessels in the selected GUA that equaled 10 percent or more of the number of vessels that were logged during the RWMS comprehensive vessel surveys. Ten percent of the original RWMS population was deemed appropriate because it provided an adequate sample size to test the study hypotheses and a sample frame sufficiently large for the telephone survey.

**Table 2. Florida Sea Grant Regional Waterway Management System Boat Censuses**

| County Location | Vessel Count | Survey Dates |
|---|---|---|
| **Manatee—Sarasota Bay** | 1,988 | 12/1991-4/1992 |
| **Manatee—North County** | 4,478 | 2/1998-3/1998 |
| **Lee—Estero Bay** | 6,123 | 1/1999-5/1999 |
| **Lee—Pine Island Sound** | 7,911 | 12/1999-5/2000 |
| **Lee—Caloosahatchee River** | 14,981 | 12/2000-5/2001 |
| **Manatee—Miguel Bay** | 102 | 4/18/2000 |
| **Manatee—Braden and Manatee Rivers** | 543 | 4/2002 |
| **TOTAL** | **36,126** | **12/1991-4/2000** |

Lastly, the GUA to be included in the study were selected based on trafficshed type. A study hypothesis states that conformance (or lack thereof) between the OWC and the VTRS is related to the geographic or physical environment (type of trafficshed) where a vessel resides (i.e., normally used). Trafficshed types are defined as a (1) canal system—single or multiple-finger canals and/or basins with one or more access channels; (2) bayfront system—a shoreline channel with one or more access channel(s); or (3) natural waterway—stream and/or creek. An effort was made to select at least one example of a low, moderate, and high RWP area for each geographic or physical trafficshed type.

## *Research Premise and Consistency Scenarios*

The research premise states that variability in the type and degree of congruence or incongruence between field observations of vessels (OWC) and VTRS information is measurable and can be explained by:

1. Geographic scale (e.g., county, trafficshed, census geographic units);
2. Trafficshed type (e.g., natural waterway, canal, bayfront);
3. Demographic characteristics of registered boat owners (e.g., labor force status, age); and/or
4. Socio-economic characteristics of registered boat owners (e.g., income, home value).

The degree to which congruence or incongruence can be quantified and accounted for determines the utility of the VTRS for planning and management applications. Furthermore, the identification of errors (partial consistencies or discrepancies) between the OWC and the VTRS should permit the development of solutions to overcome them. When evaluating the congruence between the OWC and the VTRS, one of five ‘consistency’ scenarios is possible for each

observation unit. An observation unit is defined as (1) a record extracted from the VTRS (which represents a vessel), (2) a boat logged during the OWC, or (3) a 'null' parcel (see consistency scenario number two below).

*Full Consistency Scenarios*:

1. Presence of boat and attributes conform—a match between OWC and VTRS (boat location and characteristics are consistent between databases).
2. Absence of boat—a match between OWC and VTRS (no boat present).

*Partial Consistency Scenario*:

3. Partial match between OWC and VTRS—attributes conform, but locations do not conform.

*Full Discrepancy Scenarios*:

4. VTRS indicates presence of boat, but OWC indicates absence of boat.
5. OWC indicates presence of boat, but VTRS indicates absence of boat.

Figure 5 shows an example of the consistency scenarios mapped in relation to residential parcels for a particular Lee County GUA/Trafficshed.

## *On-Water Boat Census*

The OWC was an attempt to perform a 100 percent enumeration of boats located at salt-water accessible parcels within each of the selected GUA. Errors of omission and commission, however, are inevitable. For example, boats that should be included were assuredly missed because they were hidden from view or absent at the time of the survey; other boats were included that should not have been, such as transient vessels (visitors). The degree to which these types of errors occurred was determined by a telephone survey, which is discussed later in the report. The Lee County OWC was conducted in April and May 2002 and the Manatee County OWC in February and March 2003.

A Trimble DGPS and a laser range finder were used to log vessel locations and characteristics (manufacturer make and model, an estimate of draft to the nearest 0.5-foot, and vessel length to the nearest foot), state registration numbers (bow numbers), and/or the name and hailing port when available. To assist post-OWC processing tasks—including the linkage of parcel ownership information to each vessel—and to ensure accuracy, boat locations, as encountered in the field, were marked on large-scale maps based on 1-meter resolution USGS digital orthophoto quarter quadrangle (DOQQ) images for Lee County. For Manatee County, the field technician, using the laser range finder, tagged the vessel position to a structure (e.g., house) on the property parcel to which the vessel was evidently associated. The procedure for the Manatee County OWC (which occurred subsequent to the Lee County OWC) was a methodological improvement designed to ensure greater accuracy when assigning each vessel to its associated property parcel.

To maximize quality control, the person who implemented the OWC was responsible for post-processing tasks. Vessel positions were adjusted as needed in either ArcView 3.X or ArcInfo 8.X, with 1-meter DOQQs or parcel boundaries as background themes, using the field-annotated aerial images to guide the process. Once vessel positions were validated, all surveyed vessels were linked to their associated property parcel and the parcel identification number (PID) was transferred to the vessel using an ArcView extension (NearFeat.avx). Using the PID as the

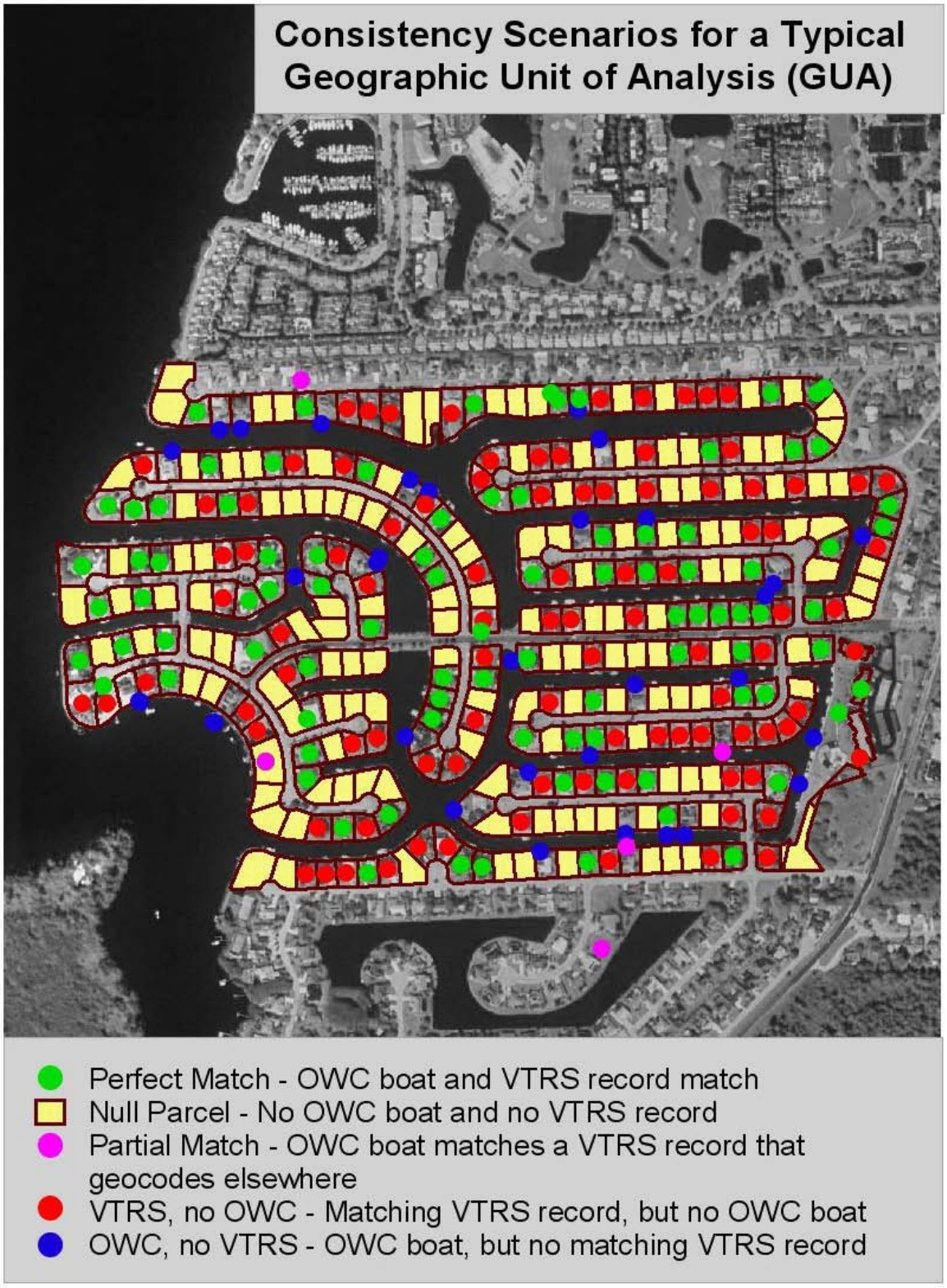


**Figure 5. Consistency Scenarios for a Typical Geographic Unit of Analysis (GUA)**

primary key, parcel owner and address information was transferred from property appraiser records to each associated vessel.

## *Florida's Vessel Title Registration System*

The Florida Department of Highway Safety and Motor Vehicles (DHSMV) maintains the state Vehicle/Vessel Title Registration System, which is a database of vehicles, vessels, and trailers that are licensed to operate on Florida's roads and waterways. It is assumed that this database represents a 100 percent enumeration of Florida's active boating population (currently registered vessels), excluding the following categories that are exempt from annual registration: (1) non-motor-powered vessels, (2) vessels used exclusively on private lakes and ponds, (3) vessels owned by the United States Government, (4) vessels used exclusively as a ship's lifeboat, and (5) vessels with a current registration number from another state or from another country and that are temporarily using Florida waters (less than 90 consecutive days).

The VTRS 'Data Sales Database'[6] was obtained from the DHSMV in March 2002, March 2003, and September 2003—dates that correspond with the Lee and Manatee counties OWC and the telephone survey. The three databases provided by DHSMV in an ASCII column-delimited format, were imported into a DBMS (Microsoft Access) using the field definitions described in Appendix D. The March 2002 database contained 2,277,908 records and included both historical records (vessels not currently registered) and contemporary records (currently registered vessels). The March 2003 and September 2003 VTRS databases included only currently registered vessels and those with registrations that had expired less than three months prior to the dataset's distribution date, which normally corresponds to the date the dataset is mailed by DHSMV. The historical vessel records provided a mechanism to account for vessels logged during the OWC that were not currently registered.

## *Extracting VTRS Records Corresponding to Study Area GUA*

A multi-step process extracted those records in the DHSMV 'Data Sales Database' that contained information linking them to study area GUA. The extracted records represented vessels whose primary berth likely was located within a study area GUA. Vessel registrants are required by Florida law to provide their current mailing address (street, city, state, and ZIP code). The address was used to select VTRS records with potential links to the study area. Every record with a ZIP code that matched a GUA ZIP code was extracted. Several techniques were used to geocode the extracted records based on the VTRS mailing address and, as necessary, using the vessel owner's name to confirm or improve partial geocodes.

Manatee County required a processing sequence that differed from the one originally devised and used for Lee County. The alternative geocoding process required for Manatee County VTRS records resulted from substantial variation in the format of parcel addresses in the Manatee County Land Information System (LIS) as compared to the format of VTRS mailing addresses. Poor results (low match[7] rates) during the initial attempt to geocode Manatee County VTRS records revealed significant peculiarities in the format and order of LIS address elements. The low match rates resulted primarily from reversed prefix and suffix elements (e.g., north,

[6] DHSMV policy for handling data requests is to distribute a version of the VTRS dataset—the 'Data Sales Database'—that contains a subset of the attributes (fields) recorded for each vessel and its owner.

[7] A match occurs when a VTRS record is correctly linked to a parcel based on a comparison of the address information contained in the property parcel record with that contained in the VTRS record.

south, east, and west) in the LIS. For example, the LIS lists ‘215 Highway 301 N’ while the VTRS lists ‘215 N Highway 301.’ Another source of error stems from a large proportion of LIS addresses that contain multiple (non-standard) street suffixes (e.g., Drive Street, Street Court). Addresses with multiple suffixes could not be properly standardized using the generic algorithms contained in the geocoding software that was used for the study. Any differences in the order or form of Manatee County and Lee County process steps are indicated in the discussion below.

ZIP codes for GUA in both counties were compiled from two sources: (1) GIS boundary (polygon) and point shapefiles contained in the ESRI ArcGIS Data & Maps 2002 product and (2) GIS parcel (polygon) shapefiles for Lee (2003) and Manatee (2003) counties, linked to county property appraiser records. The ArcGIS spatial data was created by Geographic Data Technology, Inc. (GDT) and the Environmental Systems Research Institute (ESRI) and is based on late 2001 information derived from U.S. Postal Service and other sources. County parcel boundaries and property appraiser records were obtained from the Lee County Property Appraiser Office and Manatee County Land Information System. The property appraiser records contained the physical address for each parcel, the parcel owner mailing address, and the owner name. Property appraiser records and the parcel boundary shapefiles were linked by a strap or parcel identification number (PID). The two data sources were used to compile a list of ZIP codes that corresponded to the Lee and Manatee counties study GUA (Table 3).

**Table 3. Study Area ZIP Codes for Lee and Manatee Counties GUA**

| Lee County | | Manatee County | |
|---|---|---|---|
| **ZIP Code** | **Place Name** | **ZIP Code** | **Place Name** |
| 33901 | FORT MYERS | 34207 | BRADENTON |
| 33902 | FORT MYERS | 34208 | BRADENTON |
| 33903 | NORTH FORT MYERS | 34209 | BRADENTON |
| 33904 | CAPE CORAL | 34210 | BRADENTON |
| 33905 | FORT MYERS | 34216 | ANNA MARIA |
| 33908 | FORT MYERS | 34217 | BRADENTON BEACH |
| 33911 | FORT MYERS | 34218 | HOLMES BEACH |
| 33914 | CAPE CORAL | 34219 | PARRISH |
| 33917 | NORTH FORT MYERS | 34220 | PALMETTO |
| 33918 | NORTH FORT MYERS | 34221 | PALMETTO |
| 33919 | FORT MYERS | 34222 | ELLENTON |
| 33922 | BOKEELIA | 34228 | LONGBOAT KEY |
| 33931 | FORT MYERS BEACH | 34243 | SARASOTA |
| 33932 | FORT MYERS BEACH | 34250 | TERRA CEIA |
| 33945 | PINELAND | 34260 | MANASOTA |
| 33956 | SAINT JAMES CITY | 34270 | TALLEVAST |
| 33957 | SANIBEL | 34280 | BRADENTON |
| 33991 | CAPE CORAL | 34281 | BRADENTON |
| 33993 | CAPE CORAL | 34282 | BRADENTON |
| 33994 | FORT MYERS | | |

Both the quality and utility of the information contained within the VTRS vary and, if not accounted for and/or corrected, the variation will result in a lower geocode success rate. The VTRS records were examined at each step of the process in order to identify and correct existing errors. Some data entry errors were readily apparent and easily fixed, such as missing spaces between address elements; others, however, were more subtle and harder to account for, such as incorrect spelling or missing or misplaced address elements. A significant number of records contained address information unsuitable for geocoding or that did not allow a record to be geocoded with sufficient spatial resolution (e.g., general delivery, post office box, rural route, lots).[8] Separate processes were devised, as explained later, to determine if any records with these types of problems fell within the study area. The same processes also were used for records that did not geocode successfully (i.e., partial geocode matches).

## *Geocoding VTRS Records*

To account for the aforementioned peculiarities associated with Manatee County LIS addresses, an initial step was performed before geocoding VTRS records associated with that county. First, the individual address elements were extracted and separated from the unparsed physical address contained in the LIS. The address elements include house number, prefix direction, prefix type, street name, street type, suffix direction, and zone (ZIP code). Extraction and separation were accomplished by processing the LIS data with the ArcGIS geocoder, which resulted in standardized and delimited address elements. Next, a GIS spatial select operation identified all street segments contained within a Manatee County street centerline GIS data theme that were located within 50 feet of GUA parcels. A list of 200 standardized names was generated for the selected streets. The list was compared to corresponding information contained in the VTRS records that were extracted for Manatee County. VTRS records with matching street names were retained for further analysis and non-matching records were rejected.

All Lee County and Manatee County records extracted from the VTRS on the basis of ZIP code (and, for Manatee County, on the basis of street name) were geocoded using the vessel owner's mailing address and, as reference data, the physical address contained in parcel and street GIS themes. Records that successfully geocoded were examined in a GIS and those located within each GUA were retained and the remainder were rejected. Next, the OWC vessels were compared to all VTRS records based on bow numbers (state registration numbers). If a bow number was not recorded for an OWC vessel, then its characteristics (e.g., make, length, model year) were compared to VTRS records that had geocoded in the vicinity (e.g., to the same or an adjacent parcel) to identify matches. Finally, if a parcel mailing address differed from the physical address, the mailing address was used to extract potential VTRS records. This step was an attempt to account for all VTRS records that represented vessels whose primary berth may be located in a study area GUA.

Ideally, for the purposes of the RWMS, each VTRS record geocodes to the location (or parcel) where the vessel is usually moored—the point from which a majority of recreational boating trips commence. Contemporary GIS parcel boundary files linked to property appraiser records provide the best (most accurate) reference data[9] for geocoding when data anomalies, such as those present in Manatee County LIS addresses, are corrected or accounted for during the

[8] The number and proportion of records unsuitable for geocoding is presented in the results section.
[9] Reference data contains address information and spatial information (geometry) to create a geometric representation of an address.

geocode process. A 'perfect' geocode (score=100) associates the vessel position (VTRS record) with a parcel centroid. When using street reference data to geocode, a good match occurs when the VTRS record is linked to the same street segment that is associated with, and/or near, the vessel owner's home (parcel) and when it is placed on the same side of the street segment as the parcel.

Three separate geocoding services[10]—ArcGIS 8.3, ArcView 3.3, and Tele Atlas (http://www.na.teleatlas.com)—and six different reference datasets—Wessex Streets 6.0, Dynamap 2000, Lee County and Manatee County Parcels, Manatee County street files,[11] and Tele Atlas proprietary data—were used to geocode extracted VTRS records. Each vessel registrant's mailing address was compared with the reference datasets, in succession, until either an exact match (score=100), an inexact match (score > 0 and < 100), or a non-match (score=0) resulted.

ArcGIS 8.3 and the 'US One Address with Zone (File-based)' geocoding style was the first geocode combination used to process the VTRS records. The reference data consisted of the physical addresses that were linked to Lee County and Manatee County parcel boundary shapefiles. This combination was used first since exact matches (score=100) resulted in a geocode to a parcel centroid, which is more precise (and preferable) than is a geocode to a street segment.

Before the VTRS records were processed, the parcel data were formatted to conform to the requirements of the geocoding style. The same process previously described for Manatee County was followed for Lee County. Address elements—house number, prefix direction, prefix type, street name, street type, suffix direction, and zone—were extracted and separated from the unparsed physical address contained in the property appraiser data. The delimited address elements were parsed into separate fields using Microsoft (MS) Access and the fields were then re-linked to the original parcel file using the PID. The result was a GIS-based parcel dataset properly formatted to serve as reference data for geocoding.

The output from the initial pass of the geocoding algorithm was reviewed interactively and records that received a score of less than 100 were corrected when possible. Examples of obvious corrections included differences in the spelling of street names, transposing of digits in a ZIP code, or the omission or reversal of a street prefix and suffix. Corrected records were then reprocessed. Records were reviewed in this manner after the initial pass of each geocoding service, which were applied sequentially to the VTRS records. VTRS records that received a score of 100 (perfect match) were examined in ArcGIS and those that geocoded to a study area parcel were retained and assigned the PID. Records that geocoded to a parcel outside the study area were removed from further consideration, unless they were linked to an OWC vessel by a bow (vessel registration) number.

A second geocoding service was applied to remaining VTRS records that received a score of less than 100 after having been processed and interactively reviewed using the parcel reference data. ArcView 3.3 and Wessex Streets 6.0 reference data were used to geocode Lee County records, and ArcGIS 8.3 and street data from the Manatee County Land Information System (LIS) were used to geocode Manatee County records. The Wessex reference data was

[10] A geocoding service consists of rules (algorithms) for standardizing alphanumeric descriptions of places and matching them to reference data.

[11] Street centerline files for Manatee County were obtained from the county Emergency Management Department.

used before the Dynamap data because test results indicated that, in general, it yielded geocodes that were more accurate (both along the street and on the correct side of the street). The Manatee County LIS street data was used in place of the two national street datasets (Wessex and Dynamap), because it is maintained and updated on a consistent basis by county staff and, therefore, deemed more accurate. After the initial geocode and interactive review processes were complete, records that received a score of 100 were examined spatially within ArcGIS 8.3 using the parcel boundary and street shapefiles as a basemap. Geocoded VTRS records that conformed to the range of addresses associated with study area parcels were retained and those that did not were removed from further consideration, unless they were linked to an OWC vessel by a bow number.

The third geocoding service applied to the remaining VTRS records with scores of less than 100 was ArcGIS 8.3 with Dynamap 2000 street files as the reference data. The same steps were followed that were used in the application of the previous geocoding service. Finally, remaining records that received a score of less than 100 were processed using Tele Atlas, an on-line commercial geocoding service.

### *Database Relates to Extract VTRS and U.S. Coast Guard Records*

VTRS records that matched a bow number of logged OWC vessels were extracted for inclusion in the analysis. Bow numbers were not recorded for a portion of OWC vessels, either because the numbers were absent, not visible (covered), or illegible. These OWC vessels were visually inspected in ArcGIS and their characteristics (manufacturer and length) were compared to VTRS records that geocoded to the same parcel or to adjacent parcels. The DHSMV uses a code in the state VTRS to represent the vessel manufacturer; however, the code values were unavailable for the study. The vessel manufacturer, and corrections to other vessel attributes contained in the DHSMV database (e.g., length, model year), was obtained from Info-Link, a Miami-based company that maintains a comprehensive database of registered boats and boat owners. Their proprietary algorithms use the Hull Identification Number (HIN) to correct and to enhance (add information to) DHSMV data.

Hailing port and vessel names were recorded for a portion of the OWC boats that did not have bow numbers. This information was used to extract matching records from the U.S. Coast Guard (USCG) documented vessel database. Information obtained included vessel owner name, owner address, and vessel characteristics (length, hull depth, year built), which allowed for confirmation of matches. Matching USCG vessel records were geocoded based on the address information and the resulting location was compared to the corresponding OWC vessel location.

Several steps were used to process VTRS records that remained with imperfect scores (< 100) after completion of the four geocoding steps and after comparison with the OWC vessels. The records comprised two main groups: (1) those with incomplete address information that, nonetheless, provided the possibility of assigning the record to a parcel, street segment, or specific location, and (2) records with inadequate address information for location assignment (e.g., post office box, rural route, general delivery). The first group was processed first.

A process similar to that accomplished previously for Manatee County was conducted for Lee County. A table of names for streets within Lee County GUA was compiled from the GIS reference street files and parcel data previously listed. A database field (STREETNAME) was created in the table and populated with street names converted to lower case, with spaces and

punctuation removed; a duplicate field was created, and similarly populated, in the table that contained the remaining VTRS records. An MS Access database relation was established between the two tables based on the new field (STREETNAME), and matching records were reviewed. Each address element (e.g., prefix, suffix, street name) was examined and evident errors were corrected. The corrected records were resubmitted for geocoding and those that geocoded successfully (score=100) were examined in ArcGIS. Records that geocoded to the study area GUA were retained and those that did not were removed from further consideration. Records that did not geocode were examined for the presence of information, such as facility names (e.g., marina, RV park), that would link them to a specific geographic location. Web searches were used to determine facility locations; if they were within the study area the associated records were retained, otherwise they were excluded from further consideration.

A significant portion of Lee County and Manatee County parcels had an owner mailing address that differed from the corresponding physical address listed in the property appraiser records. VTRS records were extracted based on the unique mailing addresses in an attempt to ensure that all potential records (vessels) associated with the study area GUA were captured for analysis. Two database fields were created in the parcel dataset: the first field was lower case and consisted of the owner last name, street name, and ZIP code concatenated with all spaces and punctuation removed; the second field consisted of street name and ZIP code and was constructed in the same manner as was the first field. These fields were duplicated within the state VTRS database. Study area parcels and VTRS records were related based on the two fields. Matches were examined and, if confirmed, they were assigned the PID and retained for further analysis. This method also was used to account for any VTRS records that were unsuitable for geocoding (e.g., post office boxes, rural routes, lots).

A final remaining group of VTRS records consisted of those extracted based on ZIP codes that matched study area ZIP codes, but which had mailing address information unsuitable for geocoding (post office box, general delivery, rural route). All records within this group with vessel registration expiration dates prior to 1/1/2002 were eliminated from further consideration. This decision was based on DHSMV policy to maintain as active only those vessel records less than three months out of expiration. The remaining records were then linked to the parcel datasets based on the concatenated fields as explained above and matching records were retained. Non-matching records were tallied and reported as a potential error source.

## *Assigning Consistency Scenarios*

Once all VTRS records linked to the study area were accounted for, they were examined on a case-by-case basis, in conjunction with the OWC vessels, and assigned to one of the five consistency scenarios. Two scenarios imply full consistency between OWC and VTRS information: (1) the characteristics (e.g., bow number, make, and length) of an OWC vessel matched those of a VTRS record, and its location matched the geocode position of the VTRS record; (2) the presence of a ‘null’ parcel—defined by the absence of both an OWC vessel and a VTRS record. The one partial consistency scenario (3) occurred when a VTRS record matched the characteristics of an OWC vessel, but geocoded to a different location. The last two scenarios imply full discrepancy: (4) a VTRS record geocoded to a study area parcel where no OWC vessel was logged; (5) no VTRS record geocoded to a parcel where an OWC vessel was logged.

Cases that conformed to congruency scenario number one included OWC vessels with bow numbers that matched a VTRS record (characteristics match) and that were assigned to the

same parcel (locations match). These matches were determined by establishing a database relate in MS Access, based on vessel bow number and address information, between the OWC and VTRS database tables. VTRS records that matched the bow number of an OWC vessel, but that did not geocode to the same location (e.g., same parcel), were examined more closely. If the VTRS record geocoded to a parcel located in the same trafficshed as the matching OWC vessel, then it was assigned to scenario one; otherwise it was assigned to scenario three, indicating partial consistency. The rationale for assigning matching records within the same trafficshed to scenario one is that the RWMS accessibility analysis results would not be significantly altered. VTRS records that were tagged as partially consistent included those that matched an OWC vessel, but that geocoded elsewhere in the same county; that geocoded elsewhere in Florida or the U.S; or that had foreign or otherwise inadequate address information that precluded geocoding.

Bow numbers were not recorded for a portion of OWC vessels, either because the numbers were absent, not visible (covered), or illegible. These OWC vessels were visually inspected within ArcGIS and their characteristics (manufacturer/make/model and length) were compared to VTRS records that geocoded to the same parcel, adjacent parcels, or to nearby street segments. When the characteristics and the ownership information matched (vessel owner and parcel owner names), the OWC vessel and VTRS record were linked and assigned to scenario one—full consistency. Remaining VTRS records and OWC vessels were assigned to scenarios four and five. Study area parcels where neither an OWC vessel was logged nor a VTRS record geocoded were examined and only those with a non-vacant land use code were included in consistency scenario number two.

## *Congruence Analysis and Modeling*

The objectives of the congruency analysis were three-fold: (1) to determine if statistical regularity exists in the occurrences of VTRS/OWC record matches/non-matches (by location or category); (2) to assess the degree to which matches/non-matches may be explained by selected spatial, economic, and demographic variables; and (3) to provide general descriptive information on the nature of congruence within the study region. The economic and demographic variables were obtained from the 2000 U.S. Census at the block group level. The techniques used in the analysis included:

1. Descriptive statistics (measures of central tendency, dispersion, and intervals)
2. Kruskal-Wallis analysis of variance (KW-ANOVA): Equality of median tests
3. Equality of means and variance tests (Z-statistics, t-statistics)
4. Logistic Regression—Forward Selection Procedure
5. Equality of proportions tests (Z-statistics)

Logistic regression is recommended and preferred for binary response models where the dependent variable equals one or zero. Therefore, this statistical technique was appropriate for testing the congruency scenarios. (Classical linear regression is not a viable option for estimation of models containing binary dependent variables, as this method suffers from an inability to meet the underlying assumptions—normality of error, constancy of variance, and efficient standard error estimates. Violation of these assumptions invalidates hypothesis testing and confidence interval construction.) The variables that were used in the analysis and modeling are listed in Appendix E.

## *Regional Waterway Management System Verification Analysis*

An analysis was undertaken to determine if differences exist between the means, medians, and distributions of the drafts of all OWC vessels within a trafficshed versus those OWC vessels that matched a VTRS record and those that did not. The purpose of the analysis was to test the potential for using VTRS-derived vessel information (e.g., draft) to supplement or replace OWC information for use in the RWMS accessibility analysis. The RWMS method currently used by WCIND, FSG, and FDEP to determine the dredge depth (and estimated dredge volume) for a particular trafficshed or channel system is to compare channel depths to the cumulative distribution of drafts[12] for all vessels upstream of the channels in question. The OWC has served as the RWMS methodological 'tool' to determine the population of upstream vessels. However, if no significant difference exits between the means, medians, and distributions of OWC vessel drafts versus the VTRS-derived drafts, then the VTRS could replace (or supplement) the OWC within the RWMS methodology.

## *Telephone Survey*

A telephone survey was implemented to account for and to explain apparent incongruities between the OWC and vessel location information that was extracted from the VTRS at the time the OWC was conducted. Five separate cases[13] were identified and a separate survey questionnaire was developed for each (Appendix P). Case 1 observations included instances when a VTRS record geocoded to the physical address of a study area parcel (or street), but no corresponding OWC was logged (full discrepancy). Case 2 observations included instances when an OWC vessel was logged at a parcel, but no corresponding VTRS record geocoded to the parcel physical address (full discrepancy). Case 3 treated situations where a VTRS record matched the characteristics of an OWC vessel (e.g., vessel registration number), but geocoded to a different location (partial consistency). Case 4 included instances when a VTRS vessel record matched a parcel owner's mailing address (as opposed to the parcel physical address), but no corresponding OWC boat was logged at the parcel (full discrepancy). Case 5 included 'null' parcels—those parcels where no OWC vessel was logged and to which no VTRS record was linked by either the parcel physical address or the parcel owner's mailing address (full consistency). Null parcels were included since the possibility existed that a vessel was absent on the day of the OWC or inadequate VTRS information existed to link an associated vessel record to the parcel. OWC vessels and VTRS vessel records that matched each other based on characteristics and location were not included in the telephone survey, the assumption being that they mutually verify each other.

The sample size was determined based on (1) the population of interest and (2) available funds. The population of interest coincided with that targeted for the RWMS and included all boats berthed along salt-water accessible canals and waterways. In 2002, there were 43,674 recreational vessels registered in Lee County and 19,228 in Manatee County (DHSMV). The comprehensive RWMS OWC conducted by FSG in salt-water accessible canals and waterways yielded 7,111 vessels in Manatee County, roughly 37 percent of all vessels registered in the county; and 29,015 vessels in Lee County, about 66 percent[14] of all registered vessels (Table 2).

[12] OWC vessel drafts recorded in the field were to the nearest 0.5-foot.

[13] Note: These cases are not the same as the five "consistency scenarios" discussed earlier.

[14] The higher percentage of registered vessels captured in the Lee County survey likely is explained by the fact that, though the two counties are nearly equal in area, Lee County has over three times as much salt-water accessible

The sample size necessary to obtain a confidence level of 95 percent and a confidence interval of 5 percent using a target population of roughly 40,000 is 381 respondents.

The sample was distributed proportionally among the five cases based (weighted) on the number of records contained in each case. The vessel owner name and mailing address from VTRS records were used to construct a sample frame of telephone numbers for cases one, three, and four. Owner name and address information from study area parcels was used to construct a sample frame of telephone numbers for cases two and five. Telephone numbers were obtained from CAS Inc., Omaha Nebraska. The telephone survey for cases 1 through 4 was conducted by the Florida Survey Research Center located at the University of Florida; Florida Sea Grant conducted the survey for Case 5—'null' parcels.

During implementation of the phone survey, an updated copy of the VTRS was obtained in order to assess whether any changes in vessel ownership or registration occurred between the time of the OWC and the phone survey. In particular, if a vessel was not recognized by a respondent and the updated VTRS indicated that the vessel in question had changed ownership or was no longer registered, that observation was not tallied in the final analysis.

# Results and Discussion

## *On-Water Census*

The OWC of residential canals and waterways for the Lee County GUA was conducted during April and May 2002 and 3,573 vessels were logged, which represents 13 percent of the total number of vessels surveyed during the RWMS OWC. The OWC for Manatee County GUA occurred during February and March 2003 and resulted in 1,450 vessels, or 21 percent of the total number of vessels logged during the original RWMS OWC. The total number of OWC vessels surveyed represents approximately 8 percent of all registered vessels in each county. Table 4 shows the vessel counts for each county by the trafficshed type in which they were logged. Residential canal systems dominate both counties, as reflected by the number of boats logged within that trafficshed type. Lee County, however, has a much greater prevalence (92 percent) of boats within canal systems than does Manatee County (66 percent).

**Table 4. Vessel Counts by Trafficshed Type**

| Trafficshed Type | Lee County | Column Percent | Manatee County | Column Percent | Total | Column Percent |
|---|---|---|---|---|---|---|
| **Canal** | 3,282 | 92% | 956 | 66% | **4,238** | **84%** |
| **Natural Waterway** | 134 | 4% | 343 | 24% | **477** | **9%** |
| **Bayfront** | 157 | 4% | 151 | 10% | **308** | **6%** |
| **Total** | **3,573** | **100%** | **1,450** | **100%** | **5,023** | **100%** |

Table 5 presents counts of OWC vessels according to retirement-wealth classes. In all classes, where OWC vessels were observed, a vessel count equal to or greater than 10 percent of

shoreline (e.g., residential canal systems) than does Manatee County. Therefore, one can expect a greater proportion of all Lee county boating facilities—docks, marinas, ramps—and boats to be situated along that shoreline than in Manatee County.

the number of boats logged during the RWMS comprehensive OWC was achieved. In Lee County, the percentages ranged from a low of 10 percent (20.1) to a high of 87 percent (30.3); in Manatee County they ranged from a low of 15 percent (10.1) to a high of 63 percent (30.3). There was no area representative of low retirement/medium wealth potential (10.2) in Lee County and no area was representative of low retirement/high wealth potential (30.1) in Manatee County.

**Table 5. Vessel Counts by Aggregate Retirement-Wealth Potential Areas**

| Retirement Potential (code) | Wealth Potential (code) | Lee County | | | Manatee County | | | Both Counties | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | RWMS Count | OWC Count | Row Percent | RWMS Count | OWC Count | Row Percent | RWMS Count | OWC Count | Row Percent |
| **Low (10)** | **Low (1)** | 577 | 215 | 37% | 371 | 56 | 15% | 948 | 271 | 29% |
| **Moderate (20)** | **Low (1)** | 10,082 | 1,025 | 10% | 141 | 61 | 43% | 10,223 | 1,086 | 11% |
| **High (30)** | **Low (1)** | 3,314 | 569 | 17% | 0 | 0 | n/a | 3,314 | 569 | 17% |
| **Low (10)** | **Moderate (2)** | 0 | 0 | n/a | 1,719 | 332 | 19% | 1,719 | 332 | 19% |
| **Moderate (20)** | **Moderate (2)** | 6,076 | 852 | 14% | 2,618 | 456 | 17% | 8,694 | 1,308 | 15% |
| **High (30)** | **Moderate (2)** | 1,306 | 154 | 12% | 532 | 161 | 30% | 1,838 | 315 | 17% |
| **Low (10)** | **High (3)** | 353 | 112 | 32% | 481 | 109 | 23% | 834 | 221 | 26% |
| **Moderate (20)** | **High (3)** | 4,721 | 501 | 11% | 1,004 | 226 | 23% | 5,725 | 727 | 13% |
| **High (30)** | **High (3)** | 167 | 145 | 87% | 78 | 49 | 63% | 245 | 194 | 79% |
| **TOTALS** | | **26,596** | **3,573** | **13%** | **6,944** | **1,450** | **21%** | **33,540** | **5,023** | **15%** |

## *Geocoding VTRS Records*

To begin the geocode process, 120,534 records with mailing address ZIP codes that matched study area GUA ZIP codes were extracted from the VTRS: 70,881 for Lee County and 49,653 for Manatee County. Both historical records (vessels not currently registered) and contemporary records (currently registered vessels) were extracted. The results obtained for Lee County are presented first, followed by those obtained for Manatee County.

Eighty-two percent of the 70,881 Lee County VTRS records were successfully geocoded (score=100) using the physical site address contained in the parcel reference data. An additional 9 percent of Lee County records were geocoded (score=100) using street reference data. Manual inspection and correction of address elements yielded an additional 4 percent of Lee County VTRS records that geocoded. In total, 95 percent of Lee County VTRS records were geocoded (score=100) using either parcel or street reference data. The remaining 3,775 Lee County VTRS records (5 percent) had inadequate address information for location assignment (e.g., post office box, rural route, general delivery) and could not be geocoded or linked to an OWC vessel. Seventy-five percent of the remaining records had registrations that had expired more than 6 months prior to the OWC survey date and were eliminated from further consideration. Of the

remaining 932 records with current vessel registrations, 44 percent (408) were matched to county parcels using address elements and DBMS techniques. The remaining 524 records that could not be geocoded or linked to an OWC vessel represent 0.7 percent of the original 70,881 Lee County VTRS records.

Ninety-one percent (45,158) of the 49,653 Manatee County VTRS records were successfully geocoded (score=100) to a parcel or to a street segment associated with Manatee County GUA. Due to the peculiarities inherent to Manatee County addresses, as discussed in the methods section, 38 percent of the records required manual inspection and correction of address elements to enable a successful geocode. The remaining 4,495 Manatee County VTRS records (9 percent) had inadequate address information for location assignment (e.g., post office box, rural route, general delivery) and could not be geocoded or linked to an OWC vessel. Fifty-one percent of the remaining records had registrations that had expired more than 6 months prior to the OWC survey date and were eliminated from further consideration. Of the remaining 2,194 records with current vessel registrations, 27 percent (588) were matched to county parcels using address elements and DBMS techniques. The remaining 1,606 records that could not be geocoded or linked to an OWC vessel represent 3 percent of the original 50,107 Manatee County VTRS records.

## *OWC Vessels and Matching VTRS Records*

Table 6 lists results obtained from relating (linking) OWC vessel information to the VTRS database and to the USCG documented vessels database. Overall, 74 percent (3,698) of OWC vessels logged in both counties were successfully linked to a record in the VTRS database based on bow numbers (‘Registration match’); 9 percent (445) matched a VTRS record based on vessel characteristics (‘Comparison match’); and 1 percent (52) were linked to records in the USCG database (‘Match to USCG’), using vessel name and hailing port information recorded during the OWC.

**Table 6. Relating On-Water Census Vessels to State Registration Data and U.S. Coast Guard Records**

| Characteristics Match | Location Match | Lee County | | Manatee County | | Total | |
|---|---|---|---|---|---|---|---|
| | | Vessel Count | Row Percent | Vessel Count | Row Percent | Vessel Count | Row Percent |
| **No record match** | **No record match** | 544 | 15% | 284 | 20% | 828 | 17% |
| **Registration match** | **Same parcel** | 1,734 | 49% | 659 | 45% | 2,393 | 48% |
| **Registration match** | **Proximate[1]** | 54 | 1.5% | 147 | 10% | 201 | 4% |
| **Registration match** | **Separate[2]** | 757 | 21% | 271 | 19% | 1,028 | 20% |
| **Registration match** | **No geocode** | 63 | 1.8% | 13 | 0.9% | 76 | 1.5% |
| **Comparison match** | **Same parcel** | 387 | 11% | 48 | 3.3% | 435 | 8.7% |
| **Comparison match** | **Proximate[1]** | 5 | 0.1% | 5 | 0.3% | 10 | 0.2% |
| **Match to USCG** | **Same parcel** | 19 | 0.5% | 22 | 1.5% | 41 | 0.8% |
| **Match to USCG** | **Proximate[1]** | 1 | 0.03% | 1 | 0.1% | 2 | 0.04% |
| **Match to USCG** | **Separate[2]** | 9 | 0.3% | | | 9 | 0.2% |
| **Total** | | 3,573 | 100.0% | 1,450 | 100% | 5,023 | 100% |

[1]The geographic locations of an OWC vessel and its matching VTRS record are not at the same parcel, but they are sufficiently close as to be considered a match (e.g., within the same trafficshed).
[2]The geographic locations of an OWC vessel and its matching VTRS record are not sufficiently close as to be considered a match (e.g., located in separate trafficsheds, counties, or states).

Seventeen percent (828) of the OWC vessels could not be linked to either the VTRS or the USCG database using the available information ('No record match'): 13 percent (107) had Florida bow numbers that did not match any VTRS record, 5 percent (43) had out-of-state bow numbers that did not match any VTRS record; 76 percent (628) had bow numbers that could not be read for various reasons (e.g., covered or unreadable) or did not have registration markings of any kind; and 6 percent (50) were documented vessels that could not be linked to a record in the USCG database based on the information recorded in the field.

The locations of 61 percent (3,082) of OWC vessels that successfully linked to a VTRS record or to a USCG documented vessel record matched the geocode location of the associated record. They are identified in Table 6 by 'Characteristics Match' entries of either (1) 'Registration match'—the bow number matched a VTRS vessel registration number, (2) 'Comparison match'—an OWC vessel matched a VTRS record based on characteristics (e.g., manufacturer/make/model and length), or (3) 'Match to USGS'; *and* 'Location Match' values of either (1) 'Same Parcel'—the OWC vessel and geocoded VTRS record were at the same parcel or (2) 'Proximate'—the OWC and the geocoded VTRS record were located in the same trafficshed.

Twenty-one percent of OWC vessels (1,037) matched a VTRS or USCG record, but were not logged at the same location as the geocode position of the matching record. They are identified in Table 6 with a Location Match entry of 'Separate'; of these, 55 percent (569) geocoded to a location in the same county as the OWC vessel, but not within the same trafficshed; 28 percent (295) to a location in another Florida county; and 17 percent (173) to a location in another state. Seventy-six matching VTRS records could not be geocoded ('No

geocode'); four because they had foreign addresses; three because of missing address information; and 56 whose owners opted to block their personal information.

In Lee County, 84 percent (3,000) of the 3,573 OWC vessels were successfully linked to a corresponding VTRS record and 0.8 percent (29) to a USCG record (Table 6). Fifteen percent (544) of the OWC vessels could not be matched. The location of 62 percent (2,200) of OWC vessels—ones that had successfully linked to a VTRS record or to a USCG documented vessel record—matched the geocode location of the record to which it was linked. Twenty-two percent (800) of OWC vessels—although matching a VTRS or USCG record—were not logged at the same location as the geocode position of the matching record. There were 63 matching VTRS records (1.8 percent) that could not be geocoded.

In Manatee County, 79 percent (1,143) of the 1,450 OWC vessels were successfully linked to a corresponding VTRS record and 1.8 percent (26) to a USCG record. Twenty percent (284) of OWC vessels could not be matched. The location of 61 percent (882) of OWC vessels—ones that successfully linked to a VTRS record or to a USCG documented vessel record—matched the geocode location of the matching record. Nineteen percent (271) of OWC vessels—although matching a VTRS or USCG record—were not logged at the same location as the geocode position of the record to which it was linked. There were 13 matching VTRS records (0.9 percent) that could not be geocoded (name and address were blocked by owner request).

## *Extraction of VTRS Records Based on Parcel Mailing Addresses*

Of 10,193 parcels within the Lee County study area, 40 percent (4,101) had owner mailing addresses that differed from the physical address of any study area parcel. The unique parcel owner mailing addresses, in conjunction with corresponding parcel owner names were used to extract 562 matching VTRS records. There were 1,871 parcels within the Manatee County study area, and 34 percent (632) had owner mailing addresses that differed from the physical address of any study area parcel. The unique parcel owner mailing addresses, in conjunction with corresponding parcel owner names were used to extract 42 additional Manatee County matching VTRS records.

## *Congruency Analyses*

### Consistency Scenarios and Congruency Proportions by Geographic Scale

A total of 9,509 vessels (OWC vessels and/or VTRS records) were linked to the study area; 6,787 in Lee County and 2,722 in Manatee County (Figure 6). In addition, there were a total of 3,050 residential parcels in both areas—2,718 in Lee County and 332 in Manatee County—that satisfied consistency scenario number two.[15] Table 7 shows the distribution of record counts for each of the five consistency scenarios. The largest consistency group contains 4,486 (36 percent) VTRS records that did not match an OWC vessel (full discrepancy). Thirty-one percent were records linked to a physical address (parcel or street) and 5 percent were linked to a parcel owner mailing address. The next largest group of records consisted of scenario one (full consistency) for Manatee County and scenario two ('null' parcels) for Lee County. Vessel match-types for a typical GUA are presented in Figure 5, while figures 7 and 8 illustrate the distribution of consistency scenarios (match types) for the Lee and Manatee counties GUA.

[15] A parcel with which no OWC vessel or VTRS record was associated

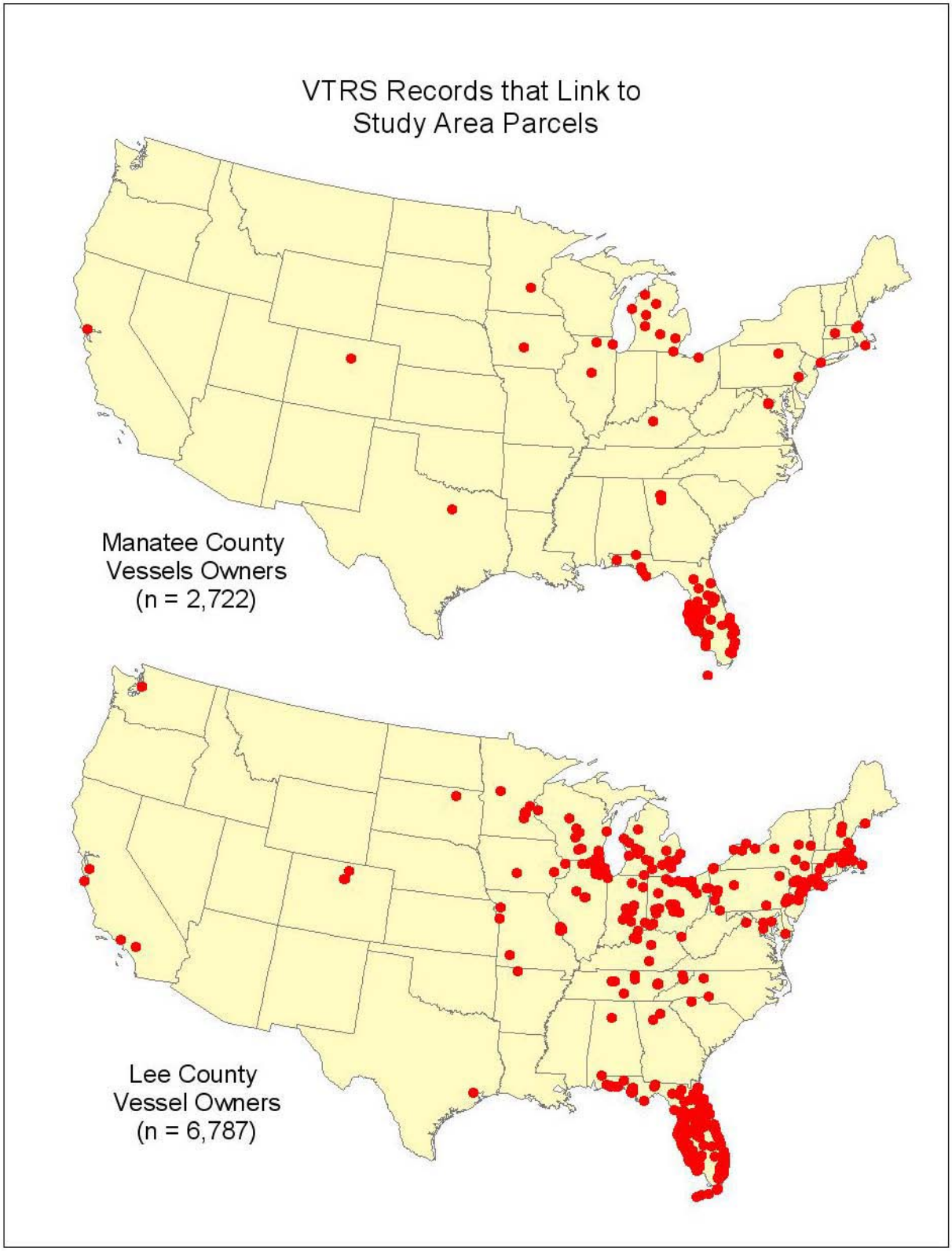


**Figure 6. Distribution of VTRS Records that Link to Study Area Parcels**

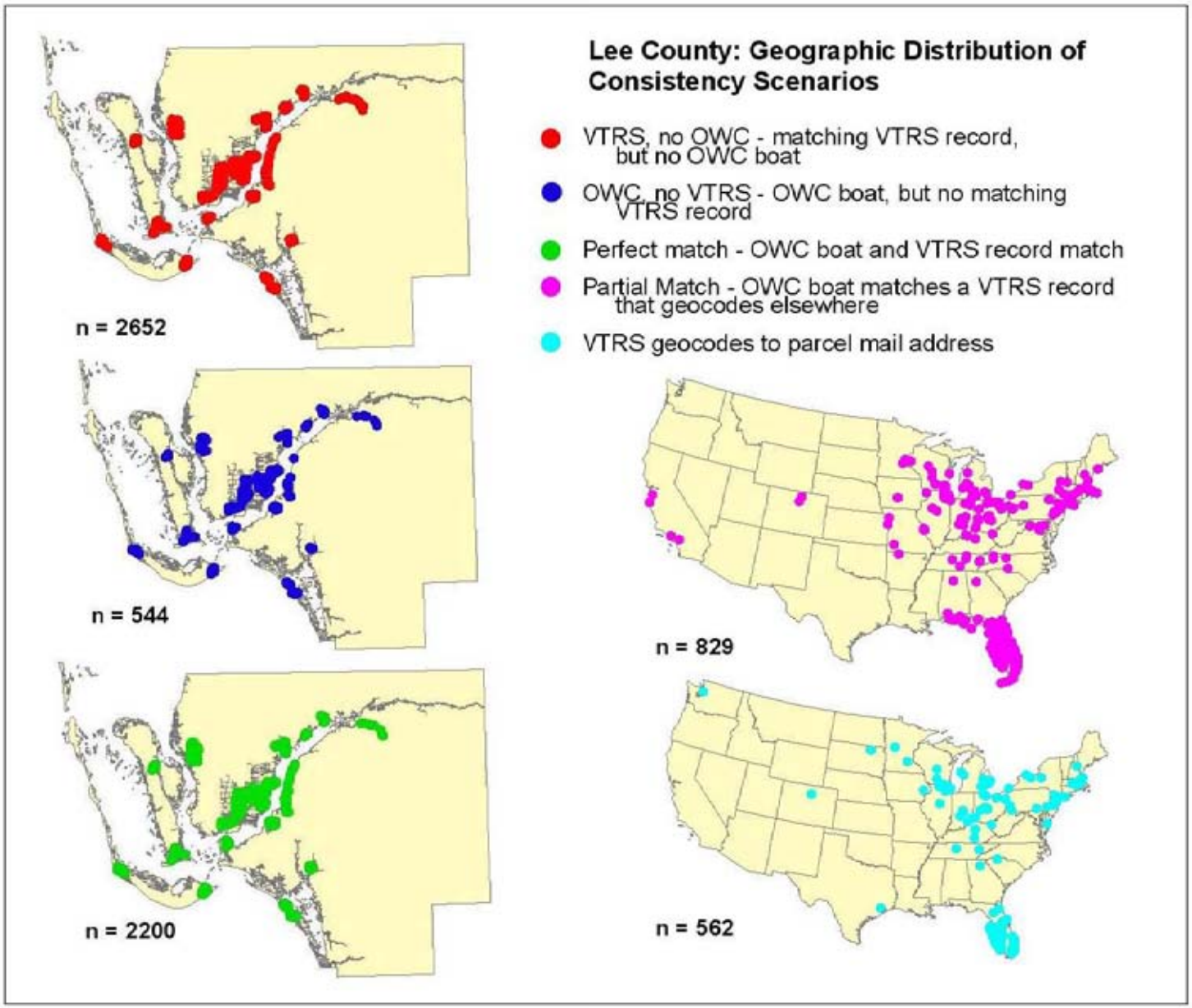


**Figure 7. Lee County: Geographic Distribution of Consistency Scenarios**

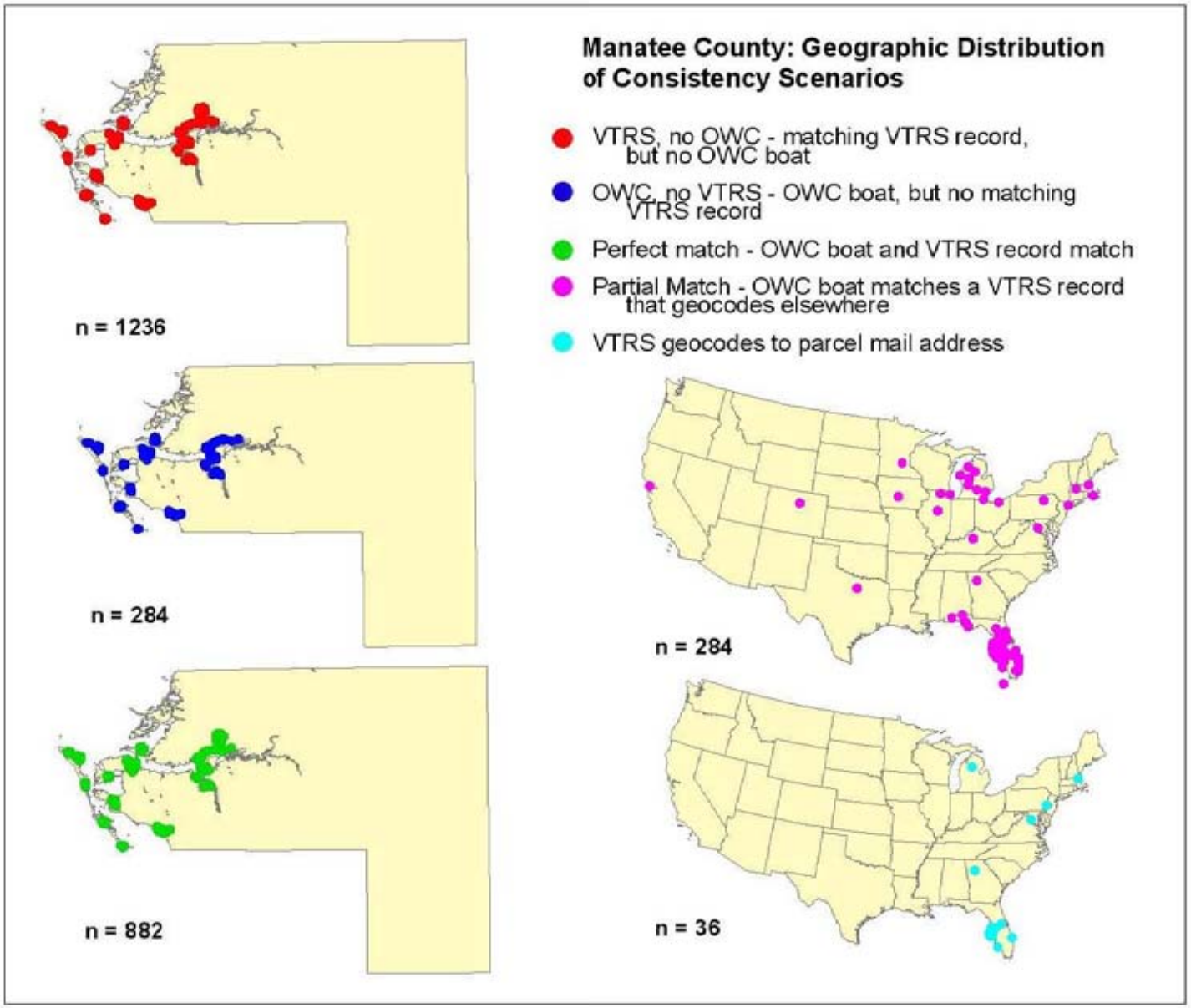


**Figure 8. Manatee County: Geographic Distribution of Consistency Scenarios**

**Table 7. Counts of Vessels within Each Consistency Scenario**

| Consistency Scenarios | | Lee County | | Manatee County | | Total | |
|---|---|---|---|---|---|---|---|
| | | Count | Column Percent | Count | Column Percent | Count | Column Percent |
| 1 | Perfect Match | 2,200 | 23% | 882 | 29% | 3,082 | 25% |
| 2 | Null Parcels | 2,718 | 29% | 332 | 11% | 3,050 | 24% |
| 3 | Partial Match | 829 | 9% | 284 | 9% | 1,113 | 9% |
| 4 | VTRS, No OWC | 3,214 | 34% | 1,272 | 42% | 4,486 | 36% |
| | Site address | 2,652 | 28% | 1,236 | 40% | 3,888 | 31% |
| | Mail address | 562 | 6% | 36 | 1% | 598 | 5% |
| 5 | OWC, no VTRS | 544 | 6% | 284 | 9% | 828 | 7% |
| | Total | 9,505 | 100% | 3,054 | 100% | 12,559 | 100% |

The first study objective was to determine the degree of correspondence between (a) information contained within the VTRS and (b) boat locations and characteristics obtained via comprehensive OWC in Manatee and Lee counties. In particular, it was hypothesized that variability in the degree and type of correspondence (i.e., error) can be explained by geographic scale: county, trafficshed, and census geographic units. As explained in the methods section, GUA were defined and delineated by the intersection of RMWS trafficsheds and census geographic units (block groups).

Lee County versus Manatee County: A match (full and partial consistency) between an OWC vessel and a VTRS record occurred 44.2 percent of the time in Lee County and 42.8 percent of the time in Manatee County (Table 8).

**Table 8. On-Water Census and Vessel Registration Consistency Measures**

| Parameters | Lee | Manatee |
|---|---|---|
| Number of Observations | 6,787 | 2,722 |
| Number Consistent | 3,787 | 1,556 |
| Number non-Consistent | 3,000 | 1,166 |
| Mean Congruency Proportion | 0.442 | 0.428 |
| Standard deviation | 0.497 | 0.494 |
| Standard Error | 0.006 | 0.009 |
| 95% Lower Confidence Interval | 0.430 | 0.410 |
| 95% Upper Confidence Interval | 0.454 | 0.447 |

There is no evidence that these congruency (consistency) proportions are significantly different from one another at the 95% confidence level (Table 9). In other words, the propensity for VTRS/OWC congruence is statistically similar in both counties.

**Table 9. A Comparison of Congruency Proportions: Lee County vs. Manatee County**

| Null Hypothesis (Ho): Equality of Proportions--p(Lee) = p(Manatee) | | | | |
|---|---|---|---|---|
| Alternative Hypothesis | Fisher's Probability | Z-test | Probability | Decision |
| p(Lee)-p(Manatee)<>0 | 0.003377 | 2.9476 | 0.003202 | Reject Ho |
| p(Lee)>p(Manatee) | 0.001703 | 2.9479 | 0.001601 | Reject Ho |

Lee County GUA: Substantial variation in the congruency proportion (for VTRS/OWC matches) existed across the 25 different GUA within the Lee County study area, as demonstrated by the computed congruency proportions (Appendix F, Table F1). The distribution of congruency values in the Lee County study area takes on the characteristics of a normal distribution (Appendix F, Figure F1), as verified by a normality test that indicated that the distribution is not significantly different from a normal distribution at the 95% confidence level (Appendix F, Table F2 and Figure F2).

The congruency proportions for Lee County ranged from a minimum of 0.2318 for GUA 20.1.6[16] and a maximum value of 0.8352 for GUA 20.3.3 (Appendix F, Table F1). There is statistical evidence in 10 out of 25 cases of a significant difference in the observed congruency proportion for a given GUA versus the observed congruency proportion for all GUA in Lee County. Table F1 shows that the congruency proportions associated with four GUA (10.1.1, 20.3.3, 30.1.2, 30.3.1) are significantly greater than the overall (average) congruency proportion for the county (i.e., when considering all GUA), using a one-tailed test (97.5% confidence level). The congruency proportions associated with six GUA (20.1.4, 20.1.6, 20.2.1, 20.3.4, 20.3.5, 30.1.3) are significantly less than the average un-weighted congruency proportion (0.4402) for the county (i.e., when considering all GUA). When compared to the average weighted observed congruency proportion for all Lee County GUA (0.4317), the congruency proportions for GUA 20.3.3 and 30.3.1 are shown to be significantly larger, while the congruency proportions for GUA 20.1.6 and 30.1.3 are significantly smaller (Appendix F, Figure F3, tables F3 and F4).

The GUA with congruency proportions statistically greater than the county average proportion pertain to interior canals within the city of Cape Coral and are dominated by single-family homes (85 percent of the GUA parcels are single-family) on small lots (1/4-acre average). In contrast, the GUA with congruency proportions statistically lower than the average overall proportion consist of St. James City (20.2.1) on Pine Island and Blind Pass (30.1.3) on Captiva Island, both of which have a high incidence of seasonal residents; Matlacha Isles (20.1.4), an area for which 56 percent of the parcels were vacant; the Orange River (20.1.6), which is heavily wooded with large lots and residences set back from the river; Plato Canal (20.3.4) on the Caloosahatchee River, which is 86 percent condominiums and apartment complexes; and the Old Bridge Mobile Home Park (20.3.5), which has a community marina.

Where single family homes predominate—with standard-shaped (e.g., rectangular) relatively small lots that front a canal—it is easier to associate a moored vessel with the correct parcel. Furthermore, owners are more likely to moor or berth their boat in clear view of the canal.[17] In contrast, the task of locating or viewing a vessel becomes more difficult when a mixture of buildings (apartments or condos) or heavy vegetation may block a number of vessels from view; or when a community has a community docking area that can be accessed by a large portion of landlocked residences (parcels)—such as is the case for the mobile home park. In these instances, the VTRS likely provides a clear advantage over an OWC. In areas where

[16] 20.1.6 is a composite value for retirement-wealth potential and geographic area: the first number refers to retirement potential, the second number to wealth potential, and the third number to a geographically unique clustering of parcels. See Table 1 for explanation of the retirement-wealth values.

[17] "Mooring" in this context includes keeping a boat on its trailer in a yard, garage, or carport; visibility of boats and trailers in an OWC is, thus, highly variable.

seasonality or transience predominates, it is likely that an OWC—conducted during the peak boating (tourist) season—will capture vessels that use local waterways better than the VTRS.

Manatee County GUA: Similar to Lee County, substantial variation in the congruency proportion (for VTRS/OWC matches) exists within Manatee County, as illustrated by the congruency proportions computed for the 17 GUA that comprise the study area (Appendix G, Table G1). A normality test indicated that the distribution of congruency proportions (p) for GUA in Manatee County is not significantly different from a normal distribution at the 95% confidence level (see Appendix G, Table G2, Figure G1 and G2). The overall, unweighted congruency proportion for Manatee County is 0.4283, with values ranging from a minimum of 0.1240 for GUA 20.1.1 and a maximum value of 0.6133 for GUA 10.1.1. Statistical evidence exists that the observed congruency proportion of 7 of 17 GUA are significantly different than the overall (average) congruency proportion for the county (i.e., when considering all GUA) (Table G1, G3, and G4, Figure G3). Specifically, the congruency proportions associated with GUA 10.1.1, 20.2.3, 30.2.1, and 30.3.1 are significantly greater than the average congruency proportion for the county (using a one-tailed test at 97.5% confidence level). The congruency proportions associated with GUA 10.2.5, 20.1.1, and 20.2.1 are significantly less than the average congruency proportion for the county at large.

As in Lee County, the congruency results for Manatee County reflect the inherent inadequacies of an OWC versus the VTRS, rather than pointing to influences brought to bear by factors of retirement-wealth or trafficshed type. The GUA with high congruency rates were dominated by single family homes—with standard-shaped (e.g., rectangular) relatively small lots that fronted a canal. In contrast, the GUA with the lowest congruency rates were located on the Manatee and Braden Rivers. Factors that contributed to the low congruency rates on the rivers included heavy vegetation that likely blocked a number of vessels from view, large lots set-back from the shoreline, and a mobile home community (Colony Cove) with a community marina and a large proportion of residences (parcels) not accessible by water (landlocked).

## Congruency Proportions by Trafficshed Type

It was hypothesized that variability in the degree and type of correspondence or incongruity (i.e., error) between an OWC vessel and a VTRS record can be explained by trafficshed type—natural waterway (e.g., river or creek), canal, or bayfront. A test of congruency proportions and intervals by trafficshed types indicated that canal systems have the highest proportion of VTRS/OWC matches in both Lee (44.9 percent) and Manatee (45.4 percent) counties (Table 10). These results conform to those obtained previously when testing the influence of geographic scale. Congruency proportions are reversed for the two counties when comparing bayfront and natural waterway categories: in Lee County, the bayfront congruency proportion is 0.383 and the natural waterway proportion is 0.359. In contrast, the natural waterway congruency proportion is 0.439 in Manatee County and the bayfront proportion is 0.307.

**Table 10. Congruency Proportions and Confidence Intervals by Trafficshed Type**

| Parameter | Lee County | | | Manatee County | | |
|---|---|---|---|---|---|---|
| | Natural Waterway | Bayfront | Canal | Natural Waterway | Bayfront | Canal |
| **Number of Observations** | 276 | 311 | 6,200 | 503 | 436 | 1,783 |
| **Congruency Rate (p)** | 0.359 | 0.383 | 0.449 | 0.439 | 0.307 | 0.454 |
| **95% Lower Confidence Interval** | 0.302 | 0.329 | 0.436 | 0.96 | 0.264 | 0.432 |
| **95% Upper Confidence Interval** | 0.415 | 0.437 | 3,461 | 0.483 | 0.351 | 0.478 |

There is statistical evidence of a significant difference in the congruency proportions in Lee County for natural waterway and canal systems and for bayfront and canal systems, but not for natural waterway and bayfront systems (Appendix H, Table H1). In contrast, in Manatee County there is statistical evidence of a significant difference in the congruency proportions for natural waterways and bayfront systems and for bayfront and canal systems, but not for natural waterways and canal systems (Appendix H, Table H2). When comparing the three trafficshed types between the two counties, there is strong statistical evidence the congruency proportions are not equal (Appendix H, Table H3). The evidence supports the contention that the congruency proportions in Lee County are significantly greater for bayfronts and significantly less for natural waterways than the corresponding Manatee County proportions; however, there is no significant difference between the two counties in the congruency proportions for canals (Appendix H).

Logistic regression models were also conducted for each trafficshed type (bayfront, canal, and natural waterway) by county. In general, the results are similar to the overall models discussed with one notable exception, which is presented in Table I1 (Appendix I). In Manatee County the percent correctly classified for bayfront systems was 80.5 percent, producing surprisingly strong results in terms of its ability to predict the dependent variable (FLM12).[18]

## The Effects of Socio-Economic and Demographic Characteristics on Congruency

It was hypothesized that variability in the degree and type of correspondence or incongruity (i.e., error) between an OWC vessel and a VTRS record can be explained by demographic characteristics (e.g., labor force status, age) and/or socio-economic characteristics of registered boat owners (e.g., income, home value). The 32 independent variables listed in Appendix E were included in the initial run of the logistic regression models to test the effects of socio-economic and demographic characteristics on OWC/VTRS congruency. However, only those variables that added explanatory power to the model are included in the results discussed below and reported in Appendix J (Lee County) and Appendix K (Manatee County).

Lee County: The logistic regression model for Lee County was 58.1 percent accurate (Appendix J, Table J1) in replicating the values of the dependent variable (FLM12). The model for Lee County indicates a statistically significant relationship between values of FLM12 and the Y-coordinate/axis. Results for Lee County suggest a higher probability of a match (FLM12=1) for census blocks with a greater proportion of elderly females, and a positive relationship with employed civilian population age 16 or older (P050001), aggregate wage or salary income (P068001), and median contract rent (H056001). This indicates that as the number of employed

[18] FLM12 indicates whether a VTRS record matches an OWC vessel: 0=no match; 1=registration numbers match or characteristics (make, length, model year) match.

civilian population goes up, so does the likelihood of observing a match. Moreover, as the aggregate wage or salary income or median contract rent on rental housing increase, so does the likelihood of observing a match between VTRS records and observed OWC vessels.

Negative statistical relationships were found between FLM12 and total households with wage or salary income (P059002), aggregate social security income (P071001), and per capita income (P082001). In other words, the probability of a match decreases as the total number of households with wage or salary income increases. Furthermore, the probability of observing a match declines as aggregate earnings, aggregate social security income, or per capita income increase by census block.

Manatee County: The logistic regression model for Manatee County (Appendix K, Table K1) was 58.8 percent accurate in replicating the values of the dependent variable (FLM12). The model results indicate a statistically significant relationship between the values of FLM12 and location coordinates.

The model suggests a lower match probability in census areas with a higher proportion of elderly (Pop62). A positive relationship also exists between the value of FLM12 and aggregate earnings (P067001), aggregate social security income (P071001). In short, as aggregate earnings or social security income increase by census area, so does the likelihood of observing a match between the VTRS and OWC records. A negative statistical relationship was found between FLM12 and aggregate wage or salary income (P068001). Thus, in Manatee County the probability of observing a VTRS/OWC match (FLM12=1) decreases as wage or salary income increases, and increases as aggregate earnings and aggregate social security income increase.

Summary: The empirical findings suggest that the propensity for congruence between a VTRS record and an OWC vessel is not random; the models explain a significantly greater percentage of accuracy than would have come about "randomly." In other words, there is statistical evidence of systematic relationships between congruency and the site and situational variables associated with vessels in the study areas. Definite spatial regularities have been uncovered, and distinct and significant relationships are shown to exist between the value of the dependent variable (FLM12) and explanatory variables such as income, earnings, rent, and other demographic factors (e.g., elderly population). Model performance could be improved with greater resolution of the economic and demographic data; that is, using data for individual households versus data from the entire census block. Nevertheless, the results obtained do not offer any particular advantage in selectively targeting an OWC versus using the VTRS when assessing the boat population for an area. ***In conclusion, the congruency results obtained are more reflective of the inherent limitations of an OWC versus the VTRS, rather than pointing to any influences brought to bear by factors of retirement-wealth or trafficshed type***.

## *Telephone Survey Results for Lee and Manatee Counties*

The objective of the telephone survey was to identify, categorize, and explain discrepancies between the VTRS and the OWC by conducting a survey on a stratified random sample of vessel and property owners within the study area. The telephone survey provided the basis to estimate the proportion of the boat population within the study area that: (1) the VTRS accurately reflects, (2) the VTRS would likely miss, and (3) would result in false positives (e.g., boats assigned to the study area by the VTRS mailing address, but normally kept in another location).

There were 490 surveys completed for all five cases. Table 11 shows, for cases 1 through 4, the targeted number of surveys, the actual number of surveys completed, and the difference between the targeted and completed amount. A total of 408 telephone surveys were completed by the Florida Survey Research Center for cases one through four. There were 82 completed surveys for Case 5, which was conducted by Florida Sea Grant personnel. Overall, the 490 completed surveys were sufficient to explain the congruencies and discrepancies between the OWC and the VTRS with a confidence level of 95 percent and a confidence interval of 5 percent.

**Table 11. Distribution of Telephone Survey Responses by Case**

| Case Number | Lee County | | | Manatee County | | | Both Counties | | |
|---|---|---|---|---|---|---|---|---|---|
| | Targeted Number of Responses | Actual Number of Responses | Difference | Targeted Number of Responses | Actual Number of Responses | Difference | Targeted Number of Responses | Actual Number of Responses | Difference |
| **1** | 165 | 187 | 22 | 77 | 63 | -14 | 242 | 250 | 8 |
| **2** | 34 | 41 | 7 | 18 | 13 | -5 | 52 | 54 | 2 |
| **3** | 52 | 59 | 7 | 18 | 24 | 6 | 70 | 83 | 13 |
| **4** | 35 | 19 | -16 | 2 | 2 | 0 | 37 | 21 | -16 |
| **Totals** | 286 | 306 | 20 | 115 | 102 | -13 | 401 | 408 | 7 |

## Case 1 Results

There were 250 completed telephone surveys that elicited information on VTRS records that geocoded to the physical site address of a study area parcel where no vessel was logged during the OWC. Ninety-two percent (230) of respondents said that someone at the location owned the vessel in question, while 8 percent (20) said that no one at the address owned the vessel (Table 12).

Each of the negative responses was examined in detail by comparing the parcel ownership information with corresponding information from two distinct VTRS datasets: one that was contemporaneous with the OWC and another that was contemporaneous with the telephone survey. The vessel owner name and address contained in the three databases were identical for 18 of the boats, but the address information had changed for two of the boats. Half of the 20 respondents said that no one in the household owned a boat and the other half said that, while a boat was owned by a household member, it had different characteristics (make, length, and model year) than the boat in question. The respondent for 9 of the 10 households with an associated boat said that it was registered at the time of the OWC, that the location address served as the VTRS registration address, and that it was normally kept at the location.

Of the 230 boats that elicited a positive response from respondents, 89 percent (205) were normally kept at the location where it geocoded and 11 percent (25) were normally kept at a different location: 4 percent (9) at another residence, 5 percent (12) at a facility (e.g., marina), 1 percent (3) of respondents didn't know where the boat was kept, and 1 person (0.4 percent) refused to answer. Twenty-one percent (44) of owners, who normally kept their vessel at the geocode location, trailered it to a facility or ramp for launching.

**Table 12. Telephone Survey Results for Case 1: Registration Records**

| Kept at Parcel Location? | Kept at Another Residence or Facility? | Boat Trailered to Ramp or Facility? | Vessel Count | Column Percentage |
|---|---|---|---|---|
| Yes | - | No | 160 | 64% |
| Yes | - | Yes | 44 | 17.6% |
| No | Facility | - | 12 | 4.8% |
| No | Residence | No | 5 | 2.0% |
| No | DK[1] | | 3 | 1.2% |
| No | Residence | Yes | 3 | 1.2% |
| No | Refuse[2] | - | 1 | 0.4% |
| No | Residence | | 1 | 0.4% |
| Yes | - | DK | 1 | 0.4% |
| Valid VTRS Record Not Recognized | | | 20 | 8.0% |
| **TOTAL** | | | **250** | **100%** |

[1]DK stands for don't know
[2]Refused to answer

Vessel registration information pertaining to each of the 230 boats was compared for two time periods: one contemporaneous with the OWC and the other contemporaneous with the phone survey. The VTRS address for 49 percent of the boats (112) remained the same, but changed for 14 percent (32). Thirty-seven percent (86) of the vessels were not registered at the time of the phone survey and, thus, their records were absent from the VTRS dataset distributed by the DHSMV at the time of the phone survey. This discrepancy may point to a tendency of vessel owners to let registrations lapse during periods of non-use. Lapsed registrations (not currently registered) remain in the DHSMV system, but they are not distributed with the data sales database. These results suggest that boat populations will be more accurately inferred by using VTRS data from several time periods, rather than just one.

## Case 2 Results

There were 54 completed telephone surveys that provided information about OWC boats that did not match a VTRS record. Eighty-one percent of the respondents (44) recognized the boat logged at the property during the OWC: one of which belonged to a previous owner and three others that were transient vessels. Nineteen percent (10) of the respondents did not recognize the boat as belonging to them or to a neighbor: 13 percent (7) said that they did not own a boat; 6 percent (3) owned a boat, but the characteristics did not match the vessel in question.

The owners of 88 percent (35) of recognized boats (not including the vessel belonging to a previous owner or the three transient vessels) lived at the address where the vessel was logged (Table 13). Thirteen percent (5) of the vessels were normally kept at the parcel even though the owner did not live there (e.g., the boat belonged to a neighbor or an acquaintance). Forty-three percent of the recognized vessels (17) were registered in Florida at the time of the OWC and the registration renewal address of 14 of these (35 percent) was the same as where the vessel was logged. Fifteen percent (6) were vessels with out-of-state registrations and five percent (2) were

documented by the USCG. Overall, 93 percent (37) of the OWC vessels were normally kept at the location where they were logged.

**Table 13. Telephone Survey Results for Case 2: On-Water Census Vessels**

| Owner Lives at Address? | Vessel Registered or Documented during OWC? Where? | Parcel Address is Renewal Address? | Kept at Parcel Location? | Vessel Count | Column Percentage |
|---|---|---|---|---|---|
| Yes | Yes, Florida | Yes | Yes | 14 | 35% |
| Yes | No | - | Yes | 5 | 12.5% |
| Yes | DK[1] | - | Yes | 5 | 12.5% |
| No | - | - | Yes | 5 | 12.5% |
| Yes | Yes, Out of State | - | Yes | 3 | 7.5% |
| Yes | Yes, Out of State | - | No | 2 | 5.0% |
| Yes | USCG[2] | - | Yes | 2 | 5.0% |
| Yes | Yes, Florida | No | Yes | 2 | 5.0% |
| Yes | Yes, Out of State | | DK[1] | 1 | 2.5% |
| Yes | Yes, Florida | DK[1] | Yes | 1 | 2.5% |
| **TOTAL** | | | | **40** | **100%** |

[1]DK stands for don't know
[2]Vessel documented by the U.S. Coast Guard

## Case 3 Results

There were 83 completed surveys that provided information for situations where a VTRS record matched the characteristics (e.g., vessel registration number) of an OWC vessel but geocoded to a different location. Eighty-eight percent (73) of the respondents recognized the vessel in question and 12 percent (10) did not; 3 (4 percent) did not live at the location at the time of the OWC and 8 percent (7) said that they did not own a boat.

Eighty-one percent (59) of the respondents who recognized the vessel indicated that it was normally kept at the residence where the OWC vessel was logged and 19 percent (14) said that it was normally kept at another residence (Table 14). Sixty-nine percent (41) of those who kept the vessel at the OWC location said that it was their home; 7 percent (4) said it was their property; 12 percent (7) said an acquaintance let them keep the boat there, 5 percent (3) rented a slip at the property, and 7 percent (4) gave other reasons (which were not recorded).

**Table 14. Telephone Survey Results for Case 3: Partial Matches**

| Kept at Parcel Location? | Parcel Address is Owner Home? | Kept at Another Residence or Facility? | Boat Trailered to Ramp or Facility? | Vessel Count | Column Percentage |
|---|---|---|---|---|---|
| Yes | Yes | - | | 37 | 51% |
| Yes | No | - | | 16 | 22% |
| No | Yes | Residence | | 9 | 12% |
| Yes | Yes | - | Yes | 4 | 5% |
| No | Yes | Residence | Yes | 3 | 4% |
| Yes | No | - | Yes | 2 | 3% |
| No | No | Residence | Yes | 1 | 1% |
| No | No | Residence | | 1 | 1% |
| **TOTAL** | | | | **73** | **100%** |

## Case 4 Results

There were 21 completed surveys that provided information for situations when a VTRS record was linked to a study area parcel based on the parcel owner's mailing address, rather than the parcel physical address. Seventy-one percent (15) of the respondents said that someone at the residence owned the boat, while 29 percent (6) said that it was not owned by anyone at the residence: 5 (24 percent) did not own a boat and 1 (5 percent) did not live at the location at the time of the OWC.

Sixty-seven percent (10) of the 15 boats that were recognized were normally kept at the same parcel and 40 percent (4) of these were trailered to a ramp or facility when used (Table 15). Thirty-three percent (5) of the boats were kept at another residence.

**Table 15. Telephone Survey Results for Case 4: Mail Matches**

| Kept at Parcel Location? | Parcel Address is Owner Home? | Boat Trailered to Ramp or Facility | Vessel Count | Column Percentage |
|---|---|---|---|---|
| Yes | Yes | | 6 | 40% |
| Yes | Yes | Yes | 4 | 27% |
| No | Yes | | 2 | 13% |
| No | Yes | Yes | 2 | 13% |
| No | No | | 1 | 7% |
| **TOTAL** | | | **15** | **100%** |

## Case 5 Results

There were 82 completed surveys that provided information for 'null' parcels—non-vacant, residential parcels where neither an OWC vessel was logged nor a VTRS record was geocoded, nor to which a VTRS record was linked (e.g., via the parcel owner mailing address). Only three (3.6 percent) respondents indicated that they owned a boat: two of them normally kept the boat at the parcel (2.4 percent) and the other person kept the boat at a facility (1.2

percent). (The facility is near the respondent's summer residence, in another state, to which the boat is moved each year.)

## VTRS Vessel Capture Rates

A total of 8,681 VTRS records were extracted for the study area GUA. Eighty percent of those records (6,970) were extracted based on geocoding a VTRS mailing address to a parcel physical address or to a street address: 44 percent (3,082) matched both the location and the characteristics (i.e., vessel registration number) of an OWC vessel and are assumed to be kept at the location. Based on the telephone survey, the expectation is that 82 percent of the remaining 3,888 records (Case 1 records that did not match an OWC vessel), or 3,188 vessels, would normally be kept at the residence where they geocoded. Thus, the expectation, when taking into account the 3,082 perfect VTRS/OWC matches (full consistency) and the 3,188 VTRS Case 1 records (full discrepancy), is that 90 percent of VTRS records that geocode to the physical site address of a parcel will normally be kept at the parcel [(3,082 + 3,188) / 6,970)]. The phone survey results inform us that 56 percent of the remaining 700 Case 1 VTRS records (3,888 – 3,188) are false positives—records that geocode to a parcel but that are kept elsewhere, and 44 percent are questionable (not recognized by the owner, thus not validated). Thus, overall, we can expect that 90 percent of VTRS records that geocode to a parcel physical address are valid (i.e., they geocode to the location where they are used), 5.6 percent represent false positives, and 4.4 percent represent questionable records.

There were 598 extracted VTRS records that matched a parcel mailing address (Case 4). The telephone survey results indicate that 50 percent of the vessels would be kept at the associated parcel, 25 percent would be considered false positives, and 25 percent would be questionable (not recognized by owner, thus not validated).

The telephone survey results indicate that a currently registered vessel, with a renewal address matching the parcel site address would be found at 4 percent of the 3,050 'null' parcels, but a corresponding VTRS record would be lacking (or non-identifiable). One percent of these vessels would be kept at a facility, rather than at the parcel location.

The telephone survey provided statistically valid estimates of the proportion of the boat population for an area that can be adequately captured using the VTRS. Table 16 shows the distribution of proportions across the various consistency scenarios that would be expected based on the results obtained from the telephone survey. Table 16 also provides the basis to compare the relative adequacy of the VTRS versus the OWC to portray the boat population for the study areas***. Using the proportions derived from an analysis of phone survey responses, it is apparent that 6,569 boats would have been correctly assigned to the study area using the VTRS data. In contrast, the OWC only captured 4,527 boats that would have normally been kept within the study areas, which represents only 70 percent of the amount assigned by using the VTRS (or approximately one-third fewer boats)***.

**Table 16. Estimates of Consistency Scenario Proportions Based on Telephone Survey Results**

| Consistency Scenarios | ALL | Positive ID—Boat present[1] | | | Boat Not Identified[2] | | | Boat Kept Elsewhere[3] | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Count | Column | Row | Count | Column | Row | Count | Column | Row |
| **Perfect Match** | 3,082 | 3,082 | 38% | 100% | 0 | 0% | 0% | 0 | 0% | 0% |
| **Null Parcels[4]** | 3,050 | 73 | 1% | 2% | n/a | n/a | n/a | 37 | 5% | 1% |
| **Partial Match** | 1,113 | 821 | 10% | 74% | 97 | 14% | 9% | 195 | 24% | 18% |
| **VTRS, No OWC** | | | | | | | | | | |
| **Site Address** | 3,888 | 3,188 | 39% | 82% | 308 | 43% | 8% | 392 | 48% | 10% |
| **Mail Address** | 598 | 299 | 4% | 50% | 150 | 21% | 25% | 149 | 18% | 25% |
| **OWC, No VTRS** | 828 | 624 | 8% | 75% | 157 | 22% | 19% | 47 | 6% | 6% |
| **Total** | **12,559** | **8,087** | **100%** | **64%** | **712** | **100%** | **6%** | **820** | **100%** | **7%** |

[1] This section of the table provides estimates, based on telephone survey response rates, of the number of boats that would be correctly identified as belonging to the study areas.
[2] This section of the table provides estimates, based on telephone survey response rates, of the number of boats that could not be positively identified as belonging to the study area (i.e., questionable).
[3] This section of the table provides estimates, based on telephone survey response rates, of the number of boats that would be incorrectly associated with the study areas (i.e., false positives).
[4] 96.4 percent (2,940) of the 'null' parcels would not have an associated boat based on the telephone survey.

Table 17 simplifies the information contained in Table 16 in order to more clearly portray the proportions and counts of study area boats that can be captured using information derived from the VTRS. Additionally, estimates are provided for the proportions and numbers of vessels that likely would be incorrectly assigned to the study areas (false positives), or, missed completely (i.e., 'null' parcels and OWC vessels with no matching VTRS record). The rows in Table 17 provide estimated counts of boats and proportions for (1) Positive Identification—vessel is positively associated with a study area parcel, (2) Identification not Possible—questionable (e.g., vessel not recognized by a respondent), and (3) False Positive Identification—vessels that are false positives (incorrectly assigned to a study area parcel or street segment). The columns provide proportions and counts of the boat population that potentially could be captured using VTRS information versus the proportion of the population that could not be captured using VTRS information. It is instructive to interpret the 712 vessels that were captured (either by VTRS or OWC) but that were not identified (identification questionable) in two ways—representing opposing extremes: the first scenario, as representing boats that do belong to the study area, and the second, as representing boats that do not belong to the study area.

**Table 17. Proportions and Counts of Vessels Captured Using the VTRS**

| Boat Identified as Belonging to Study Area? | VTRS Capture Possible | Column % | Row % | VTRS Capture Not Possible | Column % | Row % | Total | Column % | Row % |
|---|---|---|---|---|---|---|---|---|---|
| **Positive Identification** | 6,569 | 87% | 81% | 1,518 | 74% | 18% | 8,087 | 84% | 100% |
| **Identification not Possible** | 458 | 6% | 64% | 254 | 12% | 37% | 712 | 7% | 100% |
| **False Positive Identification** | 541 | 7% | 66% | 279 | 14% | 33% | 820 | 9% | 100% |
| **Total** | **7,568** | **100%** | **79%** | **2,051** | **100%** | **21%** | **9,619[1]** | **100%** | **100%** |

[1]The total differs from Table 16 (12,559) because 96.4 percent (2,940) of 'null' parcels would not have an associated boat.

Scenario 1 (questionable boats are assumed to belong to the study area): 7,568 vessels would be captured based on VTRS information; of this total, 93 percent (7,027=6,569+458) would represent positively identified boats (the total includes boats for which identification was not possible) and 7 percent (541) would represent boats that should not be included (false positives). The 7,027 boats would represent 80 percent of the total 'true' boat population (8,799= 6,569+458+1,518+254) that should be associated with the area based on the assumptions assigned to this scenario. Capture using the VTRS would not be possible for 20 percent (1,772=1,518+254)) of the boat population. A number of boats (541) that are false positives would be extracted from the VTRS and incorrectly assigned to the study area. The false positives would represent an additional 6 percent above and beyond the 'true' boat population. Their presence would offset, in some measure, the aggregate number of boats that belong to the study area but that could not be captured from the VTRS.

Scenario 2 (questionable boats are assumed to not belong to the study area): As in scenario 1, 7,568 boats would be captured for the study area based on VTRS information; of this total 87 percent (6,569) would represent positively identified boats and 13 percent (999=458+541) would represent boats that should not be included (false positives and identification not possible). The 6,569 positively identified, and captured, boats would represent 81 percent of the total 'true' boat population (8,087=6,569+1,518) that should be associated with the area based on the assumptions assigned to this scenario. Capture using the VTRS would not be possible for 19 percent (1,518) of the 'true' boat population. The presence of the 541 false positives and 458 questionable records would offset, in some measure, the aggregate number of boats belonging to the study area that could not be captured from the VTRS.

***The analysis presented for scenarios 1 and 2 indicates that the VTRS can be relied upon to capture between 80 to 81 percent of the boat population that would normally be kept within the study area***. Additionally, 6 to 7 percent more boats above the 'true' population total would be captured as false positives. ***In contrast, the OWC likely would capture only 51 percent (4,527÷8,799) to 56 percent (4,527÷8,087) of the 'true' boat population***. Clearly, the VTRS is better than the OWC for characterizing the boat population.

## *Vessel Draft Analysis: On-Water Census versus Florida's VTRS*

The objective of the vessel draft analysis was to determine if VTRS information can be substituted for an OWC during implementation of an RWMS. The specific hypothesis states that no significant difference in vessel draft exists between OWC and VTRS information. The hypothesis was tested by a statistical comparison of mean, medians, and distributions of vessel drafts obtained from matching and non-matching OWC and VTRS records within 47 RWMS trafficsheds located within the study areas. Descriptions of the variables used in the draft analyses reported below are given in Appendix E, as are detailed results for the statistical tests performed for Lee County (Appendix L), Manatee County (Appendix M), an inter-county comparison (Appendix N), and an analysis of both counties combined with all personal watercraft (PWC) removed (Appendix O). The results for each of these analyses are discussed below.

Lee County: There were 2,709 OWC vessels logged in Lee County for which a draft value was recorded (DRAFT),[19] thus allowing them to be used in the draft analysis: 2,165

[19] DRAFT—draft for all OWC vessels

vessels matched a VTRS record (DRAFTC),[20] and 544 did not (DRAFTNC).[21] The distributions of all three populations (DRAFT, DRAFTC, and DRAFTNC) were determined to be non-normal, largely uni-modal, and positively skewed (Appendix L, tables L1, L2, and L3; figures L1, L2, and L3). Figure L4 suggests that the distributions of DRAFTC and DRAFTNC are different from one another. There is also evidence to suggest that the mean draft for congruent vessels is slightly and significantly larger than the mean draft for non-congruent OWC vessels (Table L4). This implies that using the VTRS would produce an overall estimate of draft that slightly exceeds the true value (an error on the side of caution when it comes to estimating draft). The results imply that there is a low probability of underestimating the average draft within Lee County using the VTRS. Further investigation and analysis, which is described at the end of this section and detailed in Appendix O, was conducted to determine the source of the statistical difference in draft when comparing DRAFTC and DRAFTNC.

There was no statistical difference at the 95 percent confidence level in the means, medians, or distributions (Table L5 and Figure L5) when comparing all OWC vessel drafts (DRAFT) to the subset of OWC vessels that matched a VTRS record (DRAFTC). The same result held when comparing vessel drafts within the twenty-four (out of 25) Lee County trafficsheds that had an adequate sample size. For all trafficsheds, there was sufficient statistical evidence to suggest that the means, medians, and distributions of the variables DRAFT and DRAFTNC were not significantly different from one another at the 95 percent confidence level (Table L6).

Manatee County: There were 1,395 OWC vessels logged in Manatee County for which a draft value was recorded (DRAFT), thus allowing them to be used in the draft analysis: 859 vessels that matched a VTRS record (DRAFTC), and 536 that did not (DRAFTNC). As in Lee County, the distributions of all three populations (DRAFT, DRAFTC, and DRAFTNC) were determined to be non-normal, largely uni-modal, and positively skewed (Appendix M, tables M1, M2, and M3; figures M1, M2, and M3). Figure M4 suggests that the distributions of DRAFTC and DRAFTNC are not different from one another. There is statistical evidence that the mean of DRAFTC is significantly greater than that of DRAFTNC at the 95 percent confidence level (Table M4); but there is no statistical evidence that the medians or distributions are different from one other (Table M4). Further investigation and analysis, which is described at the end of this section, was conducted to determine the source of the statistical difference in mean draft when comparing DRAFTC and DRAFTNC.

There was no discernible statistical differences in means, medians, or distributions when comparing the drafts of all OWC vessels (DRAFT) with the subset of OWC vessels that did not match a VTRS record (DRAFTNC)—(Table M5 and Figure M5). The same result held when comparing vessel drafts within 23 (out of 42) Manatee County trafficsheds that had an adequate sample size. For all trafficsheds, there was sufficient statistical evidence to suggest that the means, medians, and distributions of the variables DRAFT and DRAFTNC were not significantly different from one another at the 95 percent confidence level (Table M6). There were an additional 19 Manatee County trafficsheds with less than 5 observations each. The less-than-adequate/recommended sample size precluded a formal testing of the hypothesis for these cases.

[20] DRAFTC—draft for OWC vessels congruent with a VTRS record
[21] DRAFTNC—draft for OWC vessels that are not congruent with a VTRS record

Inter-County Comparison: Table 18 compares the average draft for Lee and Manatee counties OWC vessels. The 95 percent Confidence Intervals do not overlap, which suggests that the average estimated draft in Lee County is significantly greater than the average estimated draft in Manatee County. There are numerous large/extreme outliers in Lee County, as illustrated by the box plots in Figure N1 (Appendix N); their presence, however, does not account for the relatively large statistical differences in the average draft between these two counties. As shown in Table 18, even with removal of 12 extreme outliers, the 95 percent Confidence Intervals for Lee and Manatee counties do not overlap. Tests for equality of means and variance provide additional strong evidence that (1) the average draft in Manatee and Lee counties are significantly different from each other at the 95 percent confidence level and (2) the Lee County average draft is significantly greater than that of Manatee County (tables N1 and N2).

**Table 18. Draft Comparisons: Lee County vs. Manatee County**

| Statistics | Lee County | Lee County[1] | Manatee County |
|---|---|---|---|
| **Vessel Count (n)** | 2,709 | 2,696 | 1,395 |
| **Mean Vessel Draft** | 1.992 | 1.975 | 1.843 |
| **Standard Deviation** | 0.882 | 0.845 | 0.726 |
| **95% Lower Confidence Level** | 1.956 | 1.943 | 1.805 |
| **95% Upper Confidence Level** | 2.026 | 2.006 | 1.881 |

[1] 12 extreme outliers removed

The presence of shallower draft vessels in Manatee County is not surprising, given the shallower waterways found there. Comprehensive bathymetric surveys of channel centerlines undertaken as part of RWMS applications in those two counties reveal an average depth (MLLW) of 4.8 feet (±2.46 ft) for Manatee County and 5.9 feet (±3.74 ft) for Lee County (Antonini and Box 1996; Antonini et al. 2000; Swett, Fann, et al. 2000, 2001; Swett et al. 2002; Fann et al. 2002).

Given that DRAFTC and DRAFTNC were significantly different for Lee County (Table L4) and Manatee County (Table M4), further analysis was conducted after investigating potential explanations for the difference. The subset of non-congruent OWC vessels were noted to contain a large proportion of PWC, for which no registration number was logged—either because the bow number was absent or illegible, or because the PWC was covered. The standard draft recorded for PWC was 0.5-foot, which contributes to the lower average draft for non-congruent OWC vessels (DRAFTNC). To account for this anomaly, and because PWC are inconsequential to the RWMS accessibility analysis (due to their shallow draft), the draft analysis was re-run for OWC vessels with drafts of 1 foot or greater (vessel drafts were estimated and recorded to the nearest 0.5-foot during the OWC).

The test results reported in Appendix O indicate that there is no statistical evidence to indicate a difference in the mean draft (Table O1) or the median draft (Table O2) for all three sub-populations (DRAFT5, DRAFTNC5, and DRAFTC5)[22] examined. Furthermore, the results indicate that no statistical evidence exists to suggest that the distributions are dissimilar at the 95% confidence level for the three sub-populations (Table O3, Figure O2). In other words, there

[22] DRAFT5—OWC vessels with drafts 1 foot or greater; DRAFTNC5—OWC vessels with drafts 1 foot or greater, which are not congruent with a VTRS record; DRAFTC5—OWC vessels with drafts 1 foot or greater, which are congruent with a VTRS record.

exists no significant difference in the distributions of draft across the three sub-populations examined. This result indicates that the VTRS can serve to replace the OWC for RWMS analyses.

## Conclusions and Recommendations

The Florida VTRS is the only available statewide census of boats. It was originally designed as an accounting system to levy fees and to document vessel ownership. As the boating population has grown, however, the demands on this information source have surpassed the original intent. Counties and municipalities rely on it as a source of rollback funds through the Boating and Improvement Trust Fund Program to build and maintain local boating facilities and to provide for marine safety. Coastal counties that face heavy boating pressures may levy a surcharge on registrations and renewals to defray expenses. Currently, overriding local, regional, and statewide needs exist for accurate information on boats—their characteristics and locations—for planning purposes and for management of local waterways, particularly since the alternative—a field-based boat census (OWC)—is expensive, time-consuming, and restrictive in scope.

Three study objectives were (1) to determine the degree of correspondence between information contained within the VTRS and boat locations and characteristics obtained via comprehensive OWC; (2) to determine if discrepancies between the VTRS and the OWC can be explained by geographic, physical, demographic, or socio-economic factors; and (3) to identify, categorize, and explain discrepancies between the VTRS and the OWC via a telephone survey.

Congruency analyses show that there is statistical evidence of systematic relationships between congruency and the site and situational variables associated with vessels in the study areas. Nevertheless, the results are more reflective of the inherent inadequacies of an OWC to comprehensively identify vessels in a GUA, rather than pointing to any influences brought to bear by factors of geography, retirement-wealth, socio-demographic, or trafficshed type.

The telephone survey results indicate that, overall, the VTRS provides a more comprehensive spatial representation of the population of boats within coastal canals and waterways in southwest Florida than does an OWC. Indications are that the VTRS can provide a reliable assessment for approximately 80 percent of the boat population[23] in an area. In contrast, the OWC provided a reliable assessment for less than 60 percent of the boat population in the same area. While in general the VTRS outperforms an OWC, there are situations when the VTRS should be supplemented with an OWC. These situations include areas with a large transient or seasonal boater population. Combining VTRS information with an OWC, while increasing costs relative to the VTRS method alone, will provide a better assessment of the boat population than using one of the methods in isolation.

A fourth study objective was to determine if the VTRS has potential to replace, or augment, an OWC as a source for obtaining vessel drafts. Results from a statistical comparison of the means, medians, and distributions of vessel drafts indicate that the VTRS can more than adequately serve this purpose. Unfortunately, entry of vessel draft when registering or renewing the registration of a boat is not mandatory. Furthermore, the VTRS data field that contains vessel draft is not included in the ‘Data Sales Database’ that is distributed by the DHSMV.

[23] The boat population is defined as those vessels that are normally kept and used in the area.

The fifth and final objective was to recommend alterations to the VTRS that will improve its utility for planning and management applications. The recommendations, discussed below, address the inconsistencies and limitations that hinder use of the VTRS for planning and managing Florida's waterways. Many of the recommendations listed result from two workshops held to (1) identify current uses of boat and boater data; (2) establish information needs from business, law enforcement, regulatory, and resource management perspectives; and (3) develop strategies to implement user recommendations. A synopsis of the workshops is included in Appendix Q.

**Issue 1**: An important piece of information for planning and waterway management in coastal areas is knowledge of the geographic location where owners moor their vessels (i.e., where most voyages or trips begin). Currently, the only location information provided by the DHSMV in the 'Data Sales Database' is the mailing address of the vessel owner. Estimating the boat population (locations) based on mailing address is subject to errors since, as the study reveals, the mailing address may not correspond to the geographic location of a vessel.

Recommendation 1: A potential solution is to require that, during registration and renewal, vessel owners enter an address that corresponds to the Florida location where their vessel is principally used (moored). The address should be one that can be geocoded to a street or parcel (i.e., not a PO Box, Rural Route, General Delivery, etc.). The location could be the street address of a wet slip, the principal waterway and ramp used by a trailered boat, or the facility (e.g., dry stack, marina) from which the vessel is launched, etc.

**Issue 2**: Data entry errors, such as misspellings or incomplete or poorly formed addresses, contribute to lower success rates when geocoding VTRS address information. Address information contained on vessel registration renewal forms is keyed into a series of VTRS data fields: street address, apartment number, city, state, ZIP5, and ZIP4. The street address field contains several address elements that are important inputs to the geocode process. These include house number, prefix direction, street name, street type, and suffix direction.

Recommendation 2a: Create separate data fields in the VTRS to store the elements that are currently placed in the street address field. Additionally, the DHSMV should implement procedures to standardize address information to meet U.S. Postal Service Coding Accuracy Support System (CASS) standards and should distribute that information as a component of the 'Data Sales Database.' Considerable duplication of effort (i.e., expenditure of public money) occurs when separate government entities, such as state research institutions, need to standardize the same VTRS information when satisfying their respective public mandates. If address information submitted by boat owners were entered into the VTRS in a standardized format (e.g., CASS) before distribution by the DHSMV, considerable cost savings to the State would be achieved.

Recommendation 2b: Implement standard database error-checking procedures at the point of data entry.[24] Input masks restrict the way that data is keyed into a field so that, for example, ZIP codes or vessel registration numbers would be entered in a standard format. A data validation rule checks information as it is keyed to ensure that it conforms to the rule; if it does not, the user is prompted to provide the correct information. Validation rules could be used to ensure that individual address elements mutually validate each other; to ensure, for example, that street

[24] A number of entities are involved in entering vessel registration information, including the DHSMV, county tax assessor offices, and private firms that have been contracted to provide the service.

name, city, and ZIP code correspond to each other, or to verify that keyed house numbers conform to existing street address ranges. Validation rules also could be used to address the limitless variations in the spelling of vessel manufacturer names found within the VTRS. These, and other misspellings, impede linking the VTRS with BUC[25] and other national boat indexing systems and marine internet databases from which physical specifications can be derived for research and management needs. Finally, lookup tables can reduce data errors and speed-up data entry by providing pre-defined choices for certain fields.

**Issue 3**: A boat owner who changes addresses is required to provide the State with the new address and to check the 'Address Correction' box on the decal renewal form. If the box is not checked, the new address will not be recorded in the VTRS.

Recommendation 3a: To eliminate this error source, the check box on the renewal form should be eliminated and the data entry technician should verify that the address on the renewal form conforms to the address currently in the VTRS.

Recommendation 3b: The DHSMV could institute policies, such as reduced renewal fees, to encourage on-line (Web) registration of vessels (and vehicles). Savings in data entry costs (i.e., time and money) would likely offset any revenue losses. Furthermore, the data entry procedures discussed above could be incorporated, which would further reduce costs and error sources.

**Issue 4**: The Lee County and Manatee County study areas include a large number of condominiums and apartments. In many instances, residential units can only be differentiated by an apartment (condominium) number, since the remaining address elements are identical. The apartment (condominium) number is required to assign a vessel to the correct residential unit (owner) when using parcel data as reference.

Recommendation 4: Enhance existing geocoding algorithms and reference data sources to increase geocode success rates and location accuracy. Altering existing geocoding algorithms to account for apartment (condominium) numbers would help resolve this issue.

**Issue 5**: The study demonstrates that geocoding VTRS records based on parcel reference data will more accurately locate vessel positions than will street reference data. Furthermore, parcel data carries additional information (e.g., owner names) that can be used to corroborate the reliability and suitability of a geocode.

Recommendation 5a: Develop hybrid (enhanced) geocoding algorithms that use the additional information to more reliably and accurately assign VTRS records to parcels.

Recommendation 5b: Develop a statewide, comprehensive parcel dataset to greatly enhance the geocode process. The parcel dataset should be developed so that it conforms to the requirements of existing or enhanced (Recommendation 5a) geocoding algorithms. Tasks involved would include (among others) the standardization and parsing of address elements and the creation of lookup (alias) tables to account for address elements with multiple variations (e.g., street names or prefix and suffix). Furthermore, peculiarities or differences in the format of addresses that are unique to particular geographic areas (e.g., Manatee County) should be accounted for during the geocode process. The development of an appropriate parcel dataset and hybrid (enhanced) geocode algorithms to process each unique case would entail an initial investment of time and resources (e.g., programming). Once completed, however, only periodic maintenance would be

[25] A Web-based marine marketing and listing software.

necessary to account for changes in the community that affect the underlying data and algorithms (e.g., future residential development and street naming conventions).

**Issue 6**: There is a need to develop a standardized typology/hierarchy of vessel types based on usage or other criteria.

Recommendation 6: Develop a standardized typology to enable comparison between databases and/or research studies. Once developed, the typology should be incorporated into the vessel type and vessel use categories on the VTRS renewal form. Examples of meaningful recreational boat categories include row, day sail, cruise sail, race sail, speed, fish, or cabin cruiser (this list is not meant to be exhaustive).

**Issue 7**: Vessel draft is vital for a number of applications, such as national security, disaster preparedness, and waterway planning and management. Currently, entry of vessel draft on the renewal form or in the VTRS is voluntary.

Recommendation 7: Given its importance, draft should be a mandatory field for all vessels, regardless of length.[26] Additionally, an operational definition of vessel draft is needed—hull versus engine draft; engine up or down; sail (fixed keel, centerboard) (up/down); power (idle, plane).

**Issue 8**: The hull identification code (HIN)[27] is required by law and is contained in the VTRS. The first three letters of the hull identification code contain the vessel manufacturer code. Using this information to determine the boat manufacturer can be problematic, as the code doesn't necessarily correspond to the correct manufacturer. For instance, WPI stands for Williams, the assets of which were acquired by Fiesta (FVP). (In one instance during the study, a VTRS record with a manufacturer code of WPI matched a 20 foot Fiesta OWC vessel.) Thus, using this information can lead to the incorrect assignment of vessel manufacturer.

Recommendation 8: Incorporate additional VTRS fields to provide for entry of more detailed information on vessel make and model. This would permit linkage to third party (e.g., industry) datasets to obtain, or verify, vessel characteristics, such as draft. An intriguing possibility offered by a workshop participant is to modify the HIN so that it contains additional information (e.g., draft, make, and model).

**Issue 9**: A need exists for improved accessibility to VTRS data, including the ability to make special requests (e.g., historical data) and to perform expeditious database inquires.

Recommendation 9a: Provide on-line Web access to VTRS information. If the DHSMV is unable to institute this solution, it is recommended that a third party entity, such as Florida Sea Grant or the FWC Fish and Wildlife Research Institute (FWRI), establish an agreement with the DHSMV to provide an access point to vessel information.

Recommendation 9b: Explore potential linkages to third-party databases in order to provide for information not contained within the VTRS. Commercial databases (e.g., BUC, ABOS, Boats.com) often have detailed vessel information that may be accessed by linking to key fields contained within the VTRS.

[26] The VTRS registration renewal form requests draft for vessels 26 feet or greater in length and for all sailboats.
[27] Federal law requires all boats manufactured or imported on or after 1 November 1972 to bear a HIN. The HIN is a 12-character serial number that uniquely identifies a boat.

**Issue 10**: Florida law requires only motorized vessels to be registered, which does not provide a complete accounting of all boats that use Florida waterways. This incomplete picture of the boating population impedes planning and management efforts. Furthermore, all vessels require the services of law enforcement officers and registration monies returned to counties can be used to enhance facilities used by all categories of boats (e.g., kayaks/canoes) (www.boating.org).

Recommendation 10: Require registration of all types of vessels, motorized and non-motorized.

While this study has focused on the VTRS, it is important to recognize that strategies are needed to quantify and categorize vessel populations that are not captured by the VTRS. These sub-populations may include documented vessels, foreign registered vessels, and out-of-state vessels that are used on Florida's waterways.

In conclusion, the study has demonstrated that the VTRS is a reliable and valuable source of information that can be used to map boat locations and their characteristics. Moreover, numerous recommendations have been presented that, if implemented, will lead to improvements in the quality and utility of VTRS information. To implement the recommendations, the collaborative efforts of a wide range of organizations will be necessary. The workshops held in support of this study served to identify individuals and organizations throughout the state that would support and benefit from VTRS enhancements. A final recommendation is to marshal this statewide coalition to develop and implement a strategy that endorses and promotes the transformation of the VTRS into a tool that will serve vital needs in areas such as law enforcement, tax collection, homeland security, resource management, and tourism as well as other interests in the private sector (e.g., marine industry).

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# Appendix A. Memorandum of Agreement

MEMORANDUM OF AGREEMENT

Among

The Florida Department of Environmental Protection
Florida Sea Grant College Program
and
West Coast Inland Navigation District

Relating to

A REGIONAL WATERWAY MANAGEMENT SYSTEM

**Article I**

**Whereas**, it is recognized by all parties that the waterways of Southwest Florida have high recreational and ecological value and are subject to a wide variety of uses; and

**Whereas**, it is recognized by all parties that significant use is by recreational vessels traversing sensitive bay habitats while navigating to varied destinations; and

**Whereas**, it is acknowledged by all parties that a management framework is needed now to deal with issues and problems associated with increasing use; and

**Whereas**, all parties have the common goal of preserving the recreational and ecological values of southwest Florida waterways in a manner that balances vessel access with respect for shore community concerns and adequate protection of marine resources; and

**Whereas**, all parties recognize the benefit of comprehensive planning and associated regional project review for public safety and resource preservation; and

**Whereas**, all parties are desirous of creating a regional management framework for southwest Florida that uses science and extension education to fashion environmentally acceptable ways of maintaining boat access in bays and estuaries; and

**Whereas**, all parties recognize that Net Ecosystem Benefit must be identified and provided concurrent with development and implementation of a regional permitting/planning framework.

**NOW THEREFORE**, in accordance with the purposes of this Memorandum of Agreement, the parties hereto agree to work together in implementing a standardized regional approach to waterway planning , permit review and project application, utilizing methodologies being developed by the Florida Sea Grant College Program and the West Coast Inland Navigation District, and included herein as Attachment I.

**Article II**

A. This agreement shall become effective upon execution by all parties.

B. This agreement may be terminated at any time by mutual consent, or any party may withdraw by providing 60 days written notice to all other parties.

C. This agreement includes waterways of Manatee, Sarasota, Charlotte and Lee Counties.

D. This agreement provides an effective avenue for pursuing changes to existing laws, rules, or policies that are determined to be problematic. Although encouraging appropriate changes in support of the principals in Article I, this agreement in and of itself in no way waives or modified any existing laws, rules, or policies governing the activities of any party.

E. Local governments and local waterfront community organizations are recognized as critical players and all parties to this agreement will actively seek their participation.

F. This agreement serves as a basis and commitment to enter into an agreement in order to take on regional approach with all affected parties to accomplish the objectives of ecosystem management.

- The rest of this page is left intentionally blank.

**IN WITNESS WHEREOF**, his memorandum of agreement has been executed by the undersigned duly authorized parties on 26 September, 1997.

Department of Environmental Protection

Virginia B. Wetherell
Secretary

Florida Sea Grant College Program

James C. Cato, Ph.D.
Director

West Coast Inland Navigation District

Charles W. Listowski
Executive Director

**Attachment 1**
**A Regional Waterway Management System (Plan)**
**for Southwest Florida**

A. Introduction and Background

Florida's coasts have been transformed over the past two decades as population growth and unprecedented demand for individual shore access to bays and estuaries have led to the creation of residential canal developments. Thousands of miles of channels and basins have been dredged as a by-product of this urbanization process. These navigable waterways are being stressed by boat traffic and canalside activities. Southwest Florida's boating population is increasing at twice the state's rate of change and the region's coastal population is experiencing double the national growth rate. Resource managers, scientists and informed users agree that a holistic, place-based region-wide system is needed to deal with waterway problems associated with channel maintenance, habitat restoration, traffic and signage, and boat maintenance. Such a system can ensure safe, environmentally sustainable waterways for the boating public. Implementation of this system provides a continued opportunity to demonstrate the feasibility of the non-regulatory approach to waterway management on a regional basis.

B. Management Goals

The overall goal of this management initiative is to preserve the ecological and recreational values of southwest Florida waterways. Achieving success will require the following:

- fitting channel maintenance to boat draft requirements
- minimizing impacts on surrounding bay habitats
- prioritizing and evaluating management alternatives on a regional basis
- developing maintenance standards for secondary/arterial waterways
- developing map and other information products for boaters and shore residents to encourage environmental awareness and stewardship by users of the neighborhood waters and boat access channels.
- providing waterway communities and boating organizations with information and technical support to enable them to take an active role in managing their waterways

These goals will be pursued through a combination of management tools, with a focus on acquiring the necessary information on waterway and user characteristics in order to map and evaluate boat access needs, providing waterway communities with technical support to develop local management implementation strategies, and disseminating map and guide products to waterway residents which foster stewardship and environmentally responsible boating practices.

Development and implementation of these management tools will be a joint effort between the Florida Department of Environmental Protection (DEP), Florida Sea Grant (FSG), and the West Coast Inland Navigation District (WCIND). Local governments, local waterway communities and boating groups are recognized as critical players and are encouraged to participate.

B. Creating the Regional Waterway Management System

The Gulf Intracoastal Waterway System (GICW) was dedicated in 1967 prior to most of the coastal development in evidence today. Over the past 30 years, the need has grown for the development and maintenance of appropriate secondary access channels to accommodate boat traffic from residential waterways to the arterial GICW, bays, estuaries, and Gulf waters. The WCIND recognizes the need to provide data for proper decision-making. The WCIND also acknowledges the need for productive agency partnerships to provide cost-efficient public service/resource preservation.

- WCIND to establish the Regional Waterway Management system (RWMS) via a M.O.A.

- Define the RWMS and System Components
  - Date Sources
  - Information Coordination and Storage
  - Analysis (cartographic, statistical, carrying capacity, simulation)
  - Output (map, policy)
  - Application (region, county, local community)

A. Participants and Their Roles

- Florida Department of Environmental Protection
  - Adopt FSG/WCIND data base initiatives
  - Regional permit review and approval
  - Local site technical evaluation/cooperative effort

- Florida Sea Grant
  - Field surveying
  - GIS inventory and evaluation
  - Regional waterway planning
  - Publication and dissemination of map and guide products to boaters and shore residents
  - Technical support to waterway communities in local planning and site evaluation

- West Coast Inland Navigation District
  - Coordination of RWMS
  - Networking with counties and municipalities
  - Funding of public waterway projects through its Waterway Development Program

- Other Participants
  - Waterfront homeowners associations (and informal groups)
  - Local boating organizations

CWL:mms
9/12/97

# Appendix B. Inland Waterway Management Law (CS/HB 3369)

CHAPTER 98-326

Committee Substitute for House Bill No. 3369 [28]

An act relating to inland waterway management; amending s. 374.976, F.S.; authorizing the Florida Inland Navigation District and the West Coast Inland Navigation District to enter into cooperative agreements with the Federal Government, participate with the United States Army Corps of Engineers in waterway maintenance projects, engage in anchorage management programs and beach renourishment projects, and enter into ecosystem management agreements with the Department of Environmental Protection; conforming language relating to existing matching fund requirements; repealing s. 374.976(5), F.S., as amended by ch. 96-320, Laws of Florida, to clarify legislative intent with respect to duplicate provisions; amending s. 403.061, F.S.; providing a supplemental process for issuance of joint coastal permits and environmental resource permits for regional waterway management activities; amending s. 311.105, F.S.; correcting cross references; repealing s. 8 of ch. 90264, Laws of Florida, relating to Sundown review and repeal of the West Coast Inland Navigation District; providing an effective date.

Be It Enacted by the Legislature of the State of Florida:

Section 1. Section 374.976, Florida Statutes, as amended by chapter 96425, Laws of Florida, is amended to read:

374.976 Authority to address impacts of waterway development projects.—

(1) Each inland navigation district, except the district created pursuant to s. 374.301, is empowered and authorized to undertake programs intended to alleviate the problems associated with its waterway or waterways, including, but not limited to, the following:

(a) The district may act as a local interest sponsor for any project designated as a "Section 107, River and Harbor Act of 1960" project authorized and undertaken by the U.S. Army Corps of Engineers and, in this regard, may comply with any or all conditions imposed on local interests as part of such project.

(b) It is the intent of the Legislature that the district may sponsor or furnish assistance and support to member counties and local governments within the district in planning and carrying out beach renourishment and inlet management projects. Such assistance and support, if financial in nature, shall be contributed only after a finding by the board that inlet management projects are a benefit to public navigation in the district and that the beaches to be nourished have been adversely impacted by navigation inlets, navigation structures, navigation dredging, or a navigation project. Such projects will be consistent with Department of Environmental Protection approved inlet management plans and the statewide beach management plan pursuant to s. 161.161. Inlet management projects that are determined to be consistent with Department of Environmental Protection approved inlet management plans are declared to be a benefit to public navigation.

(c) The district is authorized to aid and cooperate with the Federal Government, state, member counties, and local governments within the district in planning and carrying out public navigation, local and regional anchorage management, beach renourishment, public recreation, inlet management, environmental education, and boating safety projects, directly related to the waterways. The district is also authorized to enter into cooperative agreements with the United States Army Corps of Engineers, state, and member counties, and to covenant in any

[28] Words ~~stricken~~ are deletions; words underlined are additions.

such cooperative agreement to pay part of the costs of acquisition, planning, development, construction, reconstruction, extension, improvement, operation, and maintenance of such projects.

(d) The district is authorized to enter into cooperative agreements with navigation-related districts to pay part of the costs of acquisition of spoil disposal sites.

(e) The district is authorized to enter into ecosystem management agreements with the Department of Environmental Protection pursuant to s. 403.075.

(2) A district that sponsors a program pursuant to this section shall adopt rules to govern the program, pursuant to chapter 120. At a minimum, such rules shall prohibit the encumbrance of funds for a project beyond 3 years following approval of the project and, except for funds provided to enhance public navigation, law enforcement on the waterways, or environmental education projects within its district, shall prohibit financial support unless matching funds are provided by the recipient of such financial support. The district may waive such rules for a project approved in a county that is recovering from a state of emergency declared under chapter 252.

(3) Except as provided in subsection (2), all financial assistance and support furnished by the Florida Inland Navigation District and the West Coast Inland Navigation District to member counties and local governments within the districts shall require matching funds. Such matching funds shall be clearly identified and enumerated as to amount and source. Such financial assistance and support, except as provided pursuant to paragraph (1)(a) and except for a project approved in a county that is recovering from a state of emergency declared under chapter 252, shall not exceed the proportional share of ad valorem tax collections from each county.

(4) Each district shall report to the Legislature no later than January 1, 1991, on the type of projects, amount of financial assistance, and amount and source of matching funds received for said projects. The report shall delineate the justification for awarding financial assistance and shall include the direct relationship the project has to the maintenance of the intracoastal waterways.

(5) The Florida Inland Navigation District may furnish assistance and support to seaports for the purpose of planning and carrying out dredge material management projects and other environmental mitigation projects.

Port projects shall benefit publicly maintained channels and harbors. Any port eligible for funding shall be located in a member county of the district, and each port shall contribute matching funds for funded projects. Financial assistance for such port projects shall not be included in calculating the proportional share of ad valorem tax collections of the county in which the port is located, provided the port seeking assistance demonstrates a regional benefit realized from the port's activities. However, the cost of a port project funded pursuant to this section may not exceed the proportional share of ad valorem taxation of the counties in the district which are benefited by the project.

Section 2. Subsection (5) of section 374.976, Florida Statutes, as amended by chapter 96-320, Laws of Florida, is repealed.

Section 3. Subsection (39) is added to section 403.061, Florida Statutes, to read:

403.061 Department; powers and duties.—The department shall have the power and the duty to control and prohibit pollution of air and water in accordance with the law and rules adopted and promulgated by it and, for this purpose, to:

(39) Enter into a memorandum of agreement with the Florida Inland Navigation District and the West Coast Inland Navigation District or their successor agencies, to provide a supplemental process for issuance of joint coastal permits pursuant to s. 161.055 or environmental resource permits pursuant to part IV of chapter 373 for regional waterway management activities, including, but not limited to, maintenance dredging, spoil disposal, public recreation, inlet management, beach nourishment, and environmental protection directly related to public navigation and the construction, maintenance, and operation of Florida's inland waterways.

The department shall implement such programs in conjunction with its other powers and duties and shall place special emphasis on reducing and eliminating contamination that presents a threat to humans, animals or plants, or to the environment.

Section 4. Subsections (2), (3), and (6) of section 311.105, Florida Statutes, are amended to read:

311.105 Florida Seaport Environmental Management Committee; permitting; mitigation.—

(2) Each application for a permit authorized pursuant to s. 403.061(37)(38) must include:

(a) A description of maintenance dredging activities to be conducted and proposed methods of dredged-material management.

(b) A characterization of the materials to be dredged and the materials within dredged-material management sites.

(c) A description of dredged-material management sites and plans.

(d) A description of measures to be undertaken, including environmental compliance monitoring, to minimize adverse environmental effects of maintenance dredging and dredged-material management.

(e) Such scheduling information as is required to facilitate state supplementary funding of federal maintenance dredging and dredged-material management programs consistent with beach restoration criteria of the Department of Environmental Protection.

(3) Each application for a permit authorized pursuant to s. 403.061(38)(39) must include the provisions of paragraphs (2)(b)-(e) and the following:

(a) A description of dredging and dredged-material management and other related activities associated with port development, including the expansion of navigation channels, dredged-material management sites, port harbors, turning basins, harbor berths, and associated facilities.

(b) A discussion of environmental mitigation as is proposed for dredging and dredged-material management for port development, including the expansion of navigation channels, dredged-material management sites, port harbors, turning basins, harbor berths, and associated facilities.

(6) Dredged-material management activities authorized pursuant to s. 403.061(37) or (38)(38) or (39) shall be incorporated into port master plans developed pursuant to s. 163.3178(2)(k).

Section 5. Section 8 of chapter 90-264, Laws of Florida, is repealed.

Section 6. This act shall take effect upon becoming a law.

Became a law without the Governor's approval May 30, 1998.

Filed in Office Secretary of State May 29, 1998.

# Appendix C. Florida Administrative Code Chapter 62-341.490 Noticed General Permit for Dredging by the West Coast Inland Navigation District

(1) A general permit is hereby granted to the West Coast Inland Navigation District ("WCIND") to dredge public navigation channels and canals within the trafficsheds listed in Table 1 [*See Table C1*] and Figure 1 [*See Figure C1*], and as described in the following reports:

(a) Antonini, Gustavo A., and Paul Box, 1996, A Regional Waterway Systems Management Strategy for Southwest Florida, TP-83, Florida Sea Grant College Program, Gainesville, Florida;

(b) Swett, Robert A., Gustavo A. Antonini and Sharon Schulte, 2000, Regional Waterway Management System for North Manatee County, TD-2, Florida Sea Grant College Program, Gainesville, Florida;

(c) Antonini, Gustavo A., David Fann, and Robert A. Swett, 2000, Miguel Bay, Florida: Inventory of Boats, Depths and Signs; and a Waterway Restriction Analysis, TP-2A, Florida Sea Grant College Program, Gainesville, Florida;

(d) Antonini, Gustavo A., Robert Swett, Sharon Schulte and David Fann, 2000, Regional Waterway Management System for South Sarasota County, TD-1, Florida Sea Grant College Program, Gainesville, Florida. Copies of the above reports may be obtained by contacting environmental resource permit program staff in the Southwest District Office (Tampa) of the Department and from the Department's web site: http://www.dep.state.fl.us/water/wetlands/.

(2) This general permit is further limited as follows:

(a) The area to be dredged shall not contain any live seagrass beds, oyster beds or bars, coral communities, or attached macro-marine algae communities. However, this shall not prevent dredging of incidental individual specimens or scattered (less than one percent coverage within the area to be dredged) occurrences of seagrasses, oysters, or attached macro-algae. To the extent individual or clumped oysters are to be dredged, they shall be relocated to the maximum extent practicable to locations previously approved by the Department.

(b) Channel alignments shall follow existing channels and previously dredged areas to the maximum extent practicable.

(c) Dredging shall not exceed the maximum depths shown in Table 1 [*See Table C1*].

(d) No more than 6,500 cubic yards of dredged material shall be removed over a five-year period within each trafficshed, beginning with the first project authorized under this general permit within the trafficshed. Within 30 days following the conclusion of each dredging event, a report shall be submitted to the local district office of the Department that includes the volume of material excavated from each channel and canal within the trafficshed, and the cumulative total volume of material excavated for the trafficshed under this general permit. This report shall be included with any subsequent notices to dredge channels or canals within the same trafficshed.

(e) The dredging activity is restricted to Class III waters, or Class II waters that are classified by the Department of Agriculture and Consumer Services under Chapter 62R-7, F.A.C., as unclassified, prohibited, restricted, or conditionally restricted for shellfish harvesting.

(f) For purposes of this general permit, the term "public navigation channels and canals" shall include the Intracoastal Waterway and any other waterway as determined by the WCIND Board to make a significant contribution to boat traffic in the four county district, including access channels connecting the inland waterways to residential canal systems.

(3) All work under this general permit shall be conducted in conformance with the general conditions of Rule 62-341.215, F.A.C., and the following specific conditions:

(a) Prior to submittal of a notice to use this general permit, the WCIND shall conduct at least one pre-application meeting with the Department to discuss project designs, implementation details, and any resource concerns, including approval of any oyster relocation sites in accordance with paragraph 62-341.490(2)(a), F.A.C.

(b) Each dredging event for a trafficshed shall require a separate notice to use this general permit. Multiple channels within a single trafficshed may be included in one notice. Each notice shall be submitted with:

1. Scaled plan and cross-sectional drawings that clearly identify the length, width, and depth (referenced to mean lower low water) of the area or areas to be dredged within each channel and canal, locations of any hydraulic pipelines between the dredge areas and the dredged material disposal sites, and identification of the channels, canals, and names of the trafficsheds that are to be dredged from Table 1 [*See Table C1*];

2. Identification of the source document described in subsection (1) and reference data that specifically describe the work proposed for dredging within the trafficshed. All document titles, page numbers, figures, and other relevant information to the trafficshed must be identified;

3. The location, dimensions, and estimated volumes of dredged material disposal sites, including the location of any oyster relocation or habitat restoration areas required under paragraph 62-341.490(2)(a), F.A.C. If barges or temporary stockpile areas are to be used for temporary disposal and transport, the type and volume capacity of such barges and stockpile areas, including controls that will be used to prevent dredge material runoff from the barges and stockpile areas also must be described;

4. The estimated volume of each proposed dredging area;

5. The dredging and disposal methods, and proposed duration of each;

6. Identification of any special water classifications for the areas to be dredged, such as the water class (Rule 62-302.400, F.A.C.); shellfish classification under Chapter 62R-7, F.A.C., (approved, conditionally approved, restricted, conditionally restricted, prohibited, or unclassified); Aquatic Preserve, state park, or state recreation area designation under Chapter 258, F.S.; and Outstanding Florida Water or Outstanding National Resource Water designation under Rule 62-302.700, F.A.C.;

7. An updated (prepared between May through September within one year prior to the proposed dredging) resource inventory of the areas to be dredged, including the presence of live seagrasses (distinguishing between beds and scattered seagrass growth), oysters (distinguishing between beds, bars, and scattered occurrences), coral communities, or attached macro-marine algae communities (distinguishing between beds and scattered occurrences). This resource inventory must also include all areas within any requested mixing zones associated with the dredging project (including outfall pipes from the dredge material disposal area), and all areas that will be occupied by dredging equipment (including cables, pipelines, dredges, barges, and stockpiling/disposal of dredged material);

8. If the notice applies to a trafficshed that was subject to previous use of this general permit, such notice also shall clearly identify the extent of all previously authorized dredging within the trafficshed by the WCIND; the date of all such dredging events; the estimated cubic yards excavated from each channel and canal, and for the trafficshed as a whole; and the permit numbers assigned to such prior use of this general permit for the trafficshed;

9. The estimated date the dredging activities are planned to begin and the estimated length of time it will take to complete the project. If the project will be accomplished in phases, the estimated starting and ending date of each phase must also be submitted; and

10. A plan for monitoring water quality in accordance with the requirements of paragraph (3)(e) of this general permit.

(c) All dredged material resulting from the activities authorized by this general permit shall be removed and deposited on a self-contained, upland dredged material disposal site. The only exceptions to the use of a self-contained, upland dredged material disposal site shall be: oyster relocations required under paragraph 62-341.490(2)(a), F.A.C.; or where dredged materials are to be used as part of a habitat restoration plan authorized by the Department or a water management district under Part IV of Chapter 373, F.S., in which case any discharge of dredged material shall be in compliance with all terms of that authorization. In all cases, the dredging operation, the discharge of dredged material, and the dredged material disposal site shall be designed, located, and operated such that there are no water quality violations in wetlands or other surface waters outside of a mixing zone established under paragraph (3)(d) of this general permit.

(d) The permittee shall prevent violations of state water quality standards immediately outside of a mixing zone of no more than 150 meters in radius from the dredge site and from any discharge point associated with a dredge material disposal area. This shall minimally consist of: using and maintaining in a functional condition erosion and sediment control devices and best management practices, including turbidity curtains or similar devices; managing dredge pumping rates and volumes so as to minimize discharges from dredged material disposal sites; and managing dredged material disposal site dikes, berms, and water control structures so as to minimize erosion, breaches, and discharges. Mixing zones shall be designed to avoid live seagrass beds, oyster beds and bars, and attached macro-algae communities to the maximum extent practical.

(e) Water quality monitoring shall occur following the monitoring plan required under subparagraph (3)(b)10. of this general permit. This shall minimally consist of monitoring at the dredge site, at the location of any waters receiving outfall from dredged material disposal sites, and at background and down-gradient locations in the water body where dredging is occurring and surrounding the dredged material disposal sites. This monitoring shall be designed to measure turbidity and any metals or other toxic materials that have been identified as having a likelihood of entering the water column. All monitoring for turbidity shall occur at intervals not to exceed four hours during active dredging operations and when there is a discharge from dredge material disposal sites; monitoring for other parameters shall be at intervals specified in the monitoring plan under subparagraph (3)(b)10. of this general permit. Results of this monitoring and a copy of the logs shall be submitted to the local office of the Department in accordance with the reporting plan submitted under subparagraph (3)(b)10. of this general permit.

(f) In the event the water quality monitoring required under this general permit detects violations of state water quality standards, dredging shall cease immediately until the source of the violation is resolved and the receiving waters again meet applicable water quality standards.

(g) After dredging, the trafficshed shall be marked with appropriate aids to navigation in order to prevent damage to seagrass beds and to minimize turbidity. The permittee is advised that Chapter 327, F.S., shall govern the placement and marking of such aids to navigation.

(h) The permittee shall be responsible for ensuring that all contractors and other entities implementing this general permit comply with the following standard manatee and marine turtle conditions:

1. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel shall be responsible for observing water-related activities for the presence of manatees.

2. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, and the Florida Manatee Sanctuary Act of 1978. If the dredging activity results in any manatee being harmed, harassed, or killed as a result of construction activities, the Department will refer the matter to the Florida Fish and Wildlife Conservation Commission for appropriate action.

3. Siltation barriers shall be made of material in which manatees and turtles cannot become entangled, shall be properly secured, and shall be monitored regularly to avoid manatee entrapment. Barriers shall not block manatee entry to or exit from manatee feeding areas.

4. All vessels associated with the project shall operate at “no wake/idle” speeds at all times while in water where the draft of the vessel provides less than four-foot clearance from the bottom, and such vessels shall follow routes of deep water whenever possible.

5. If a manatee is sighted within 100 yards of the project area, precautions shall be implemented by the permittee and the contractor to ensure protection of manatees. These precautions shall include not operating any equipment closer than 50 feet to a manatee, and immediately shutting down equipment if a manatee comes within 50 feet of the equipment. Activities will not resume until the manatees have departed the project area of their own volition.

6. Any collision with or injury to a manatee or marine turtle shall be reported immediately to the Florida Fish and Wildlife Conservation Commission at 1(888)404-FWCC (1(888)404-3922). Collision or injury also should be reported to the U.S. Fish and Wildlife Service in Jacksonville (904)232-2580 for north Florida or Vero Beach (561)562-3909 for south Florida.

7. Temporary signs concerning manatees shall be posted prior to and during dredging activities. All signs are to be removed by the permittee upon completion of the project. A sign measuring at least three feet by four feet which reads “Caution: Manatee Area” shall be posted in a location prominently visible to water-related construction crews. A second sign shall be posted if vessels are associated with the construction, and shall be placed visible to the vessel operator. The second sign shall be at least 8 1/2 inches by 11 inches and read: Caution: Manatee Habitat. Idle speed is required if operating a vessel in the construction area. All equipment must be shutdown if a manatee comes within 50 feet of the operation. A collision with or injury to a manatee shall be reported immediately to the Florida Fish and Wildlife Conservation Commission at 1(888)404-FWCC (1(888)404-3922). Collision or injury also should be reported to the U.S. Fish and Wildlife Service in Jacksonville (904)232-2580 for north Florida or Vero Beach (561)562-3909 for south Florida. Specific information on obtaining these signs may be obtained by contacting the Florida Fish and Wildlife Conservation Commission.

(i) Work under this general permit shall not commence until the Department has provided written confirmation to the notice required under paragraph 62-341.490(3)(b), F.A.C., that the applicant qualifies to use the general permit.

(4) The permittee is advised that, pursuant to Section 556.105, F.S., excavating contractors are required to provide certain information concerning the excavation through the one-call notification system not less than two nor more than five business days before beginning any excavation.

(5) For activities located outside of aquatic preserves and outside of state parks, state preserves, and state recreation areas, this general permit constitutes consent of use by the Board of Trustees of the Internal Improvement Trust Fund (BOT) under Chapter 253, F.S., to enter upon and use sovereign submerged lands to the extent necessary to complete the permitted activities. However, specific written authorization from the BOT is required to use or alter sovereign submerged lands within aquatic preserves, state parks, state preserves, and state recreation areas under Chapter 258, F.S.

(6) In accordance with Section 253.77, F.S., dredged material removed from sovereign submerged lands under this general permit shall be exempt from the payment of severed dredged material fees. However, dredged material with economic value, such as beach quality sand, shall be used for public purposes to the maximum extent practicable.

*Specific Authority 373.026(7), 373.043, 373.118(1), 373.406(5), 373.414(9), 373.418, 403.805(1), 403.814(1) FS. Law Implemented 253.002, 253.77(4), 373.118(1), 373.406(5), 373.413, 373.414(9), 373.416, 373.426, 403.813(2)(f), 403.813(3), 403.814(1) FS. History–New 8-4-02*

Table C1. Trafficsheds, Dredge Depth Limits, and Trafficshed Report Identification Numbers for Use in Noticed General Permit 62-341.490

| Trafficshed (Note: all waters are in Sarasota and Manatee Counties only) | Total Channel Length (ft)[1] | Public Channel[2] Length (ft)[1] | Maximum Proposed Depth of Public Channel (ft)[3] | Trafficshed Report Identification Number | | | ID Number on NGP Location Map |
|---|---|---|---|---|---|---|---|
| | | | | Sarasota Bay TP-83 | South Sarasota TD-1 | North Manatee TD-2 | |
| **Aqualane Estates** | 6,117 | 1,591 | 4.0 | | 30 | | 38 |
| **Bay Acres** | 3,493 | 0 | 5.0 | | 132 | | 44 |
| **Bay Island 1** | 12,698 | 2,188 | 5.0 | | 4 | | 32 |
| **Bay Island 2** | 12,510 | 2,293 | 5.0 | | 6 | | 33 |
| **Bay Isles/Longboat Key Moorings** | 19,300 | 1,909 | 6.0 | 11 | | | 26 |
| **Baywood** | 6,334 | 972 | 5.0 | | 41 | | 40 |
| **Bimini Bay/Key Royale** | 70,358 | 6,612 | 5.5 | | | 2 | 16 |
| **Boca del Rio Marina** | 2,937 | 2,937 | 5.5 | | | 15 | 14 |
| **Bowlees Creek** | 28,116 | 14,065 | 6.0 | 44 | | | 29 |
| **Braden Castle Park/Carleton Arms** | 9,576 | 5,894 | 3.0 | | | 150 | 10 |
| **Buttonwood Harbor** | 29,959 | 8,702 | 5.0 | 10 | | | 25 |
| **City of Anna Maria** | 9,506 | 2,945 | 3.5 | | | 1 | 15 |
| **Coral Cove** | 4,249 | 1,387 | 3.5 | | 54 | | 41 |
| **Cove Sound Moorings** | 2,708 | 1,187 | 6.0 | | | 216 | 21 |
| **Curry Creek** | 21,113 | 4,353 | 5.0 | | 266 | | 49 |
| **Cuts Edge Marina** | 3,178 | 3,178 | 5.0 | | | 243 | 5 |
| **Fisherman Village** | 5,322 | 1,584 | 3.0 | | | 84 | 8 |
| **Flamingo Cay West** | 11,378 | 6,262 | 4.0 | | | 190 | 19 |
| **Forked Creek** | 24,513 | 4,392 | 4.0 | | 371 | | 51 |
| **Golf & Bay Estates I** | 9,569 | 3,946 | 3.0 | | | 237 | 3 |
| **Gottfried Creek** | 28,973 | 9,814 | 3.0 | | 434 | | 53 |
| **Grand Canal** | 50,385 | 2,306 | 4.5 | | 9 | | 35 |
| **Hidden Harbor** | 4,112 | 1,164 | 5.0 | | 21 | | 36 |
| **Holiday Harbor** | 4,429 | 3,146 | 3.5 | | 80 | | 42 |
| **Holmes Beach Marina** | 10,066 | 7,449 | 4.0 | | | 10 | 17 |
| **Hudson Bayou/Harbor Acres** | 12,711 | 794 | 7.0 | 37 | | | 31 |
| **Lemon Bay Park (Marina Access Channel)** | 14,631 | 5,510 | 6.5 | | 431 | | 52 |
| **Lyons Bay** | 28,617 | 7,370 | 5.0 | | 242 | | 47 |
| **Manati Shores** | 10,119 | 2,602 | 5.0 | | | 56 | 12 |
| **Marlow Marina** | 538 | 535 | 5.5 | | | 244 | 6 |
| **Mt. Vernon/Coral Shores** | 18,533 | 5,825 | 5.0 | 47 | | | 23 |

**Table C1, Continued**

| Trafficshed (Note: all waters are in Sarasota and Manatee Counties only) | Total Channel Length (ft) | Public Channel[2] Length (ft)[1] | Maximum Proposed Depth of Public Channel (ft)[3] | Trafficshed Report Identification Number | | | ID Number on NGP Location Map |
|---|---|---|---|---|---|---|---|
| | | | | Sarasota Bay TP-83 | South Sarasota TD-1 | North Manatee TD-2 | |
| **Oyster Bay** | 11,300 | 781 | 4.0 | | 5 | | 34 |
| **Palma Sola Estates** | 94,910 | 25,272 | 4.0 | | | 189 | 18 |
| **Phillippi Creek** | 34,590 | 8,174 | 4.0 | | 2 | | 37 |
| **Regatta Pointe** | 6,525 | 6,525 | 7.0 | | | 128 | 11 |
| **Riverdale/The Inlets** | 17,407 | 3,241 | 3.5 | | | 113 | 9 |
| **San Remo Shores** | 21,031 | 4,162 | 5.0 | | | 215 | 20 |
| **Sea Grape Harbor** | 6,112 | 4,443 | 4.0 | | | 220 | 22 |
| **Shakett Creek** | 75,720 | 7,652 | 4.5 | | 210 | | 48 |
| **Siesta Key Marina** | 1,000 | 1,000 | 4.5 | | 46 | | 39 |
| **Sorrento Shores South** | 6,090 | 1,073 | 5.5 | | 189 | | 46 |
| **South Creek** | 16,233 | 535 | 4.0 | | 154 | | 45 |
| **Tarawitt** | 6,502 | 858 | 5.0 | 8 | | | 24 |
| **Trailer Estates East** | 6,256 | 2,444 | 5.0 | 45 | | | 28 |
| **Trailer Estates West** | 10,196 | 3,034 | 5.0 | 46 | | | 27 |
| **Tree Lakes** | 3,634 | 3,634 | 3.0 | | | 228 | 2 |
| **Tropic Isles** | 11,990 | 2,051 | 5.0 | | | 240 | 4 |
| **Tropical Harbor** | 4,020 | 974 | 3.0 | | | 67 | 7 |
| **Turtle Beach** | 11,908 | 11,908 | 5.0 | | 113 | | 43 |
| **Warners Bayou** | 16,978 | 3,456 | 5.0 | | | 97 | 13 |
| **Whitaker Bayou** | 4,446 | 2,391 | 5.0 | 42 | | | 30 |
| **Total** | **984,080** | **310,178** | | | | | |

[1]Dredge and channel length estimates of WCIND public jurisdiction are subject to additional field or legal review, as such they are to be considered preliminary and approximate.

[2]Public channel designation includes the Intracoastal Waterway and any other waterway as determined by the WCIND Board to make a significant contribution to boat traffic in the four county district, including access channels connecting the inland waterways to residential canal systems (see P. Perrey letter to R. Combs, 1/12/2000).

[3]Maximum proposed depth of access channels and canals, based on providing access for all boats using public navigation channel; overdredging not allowed.

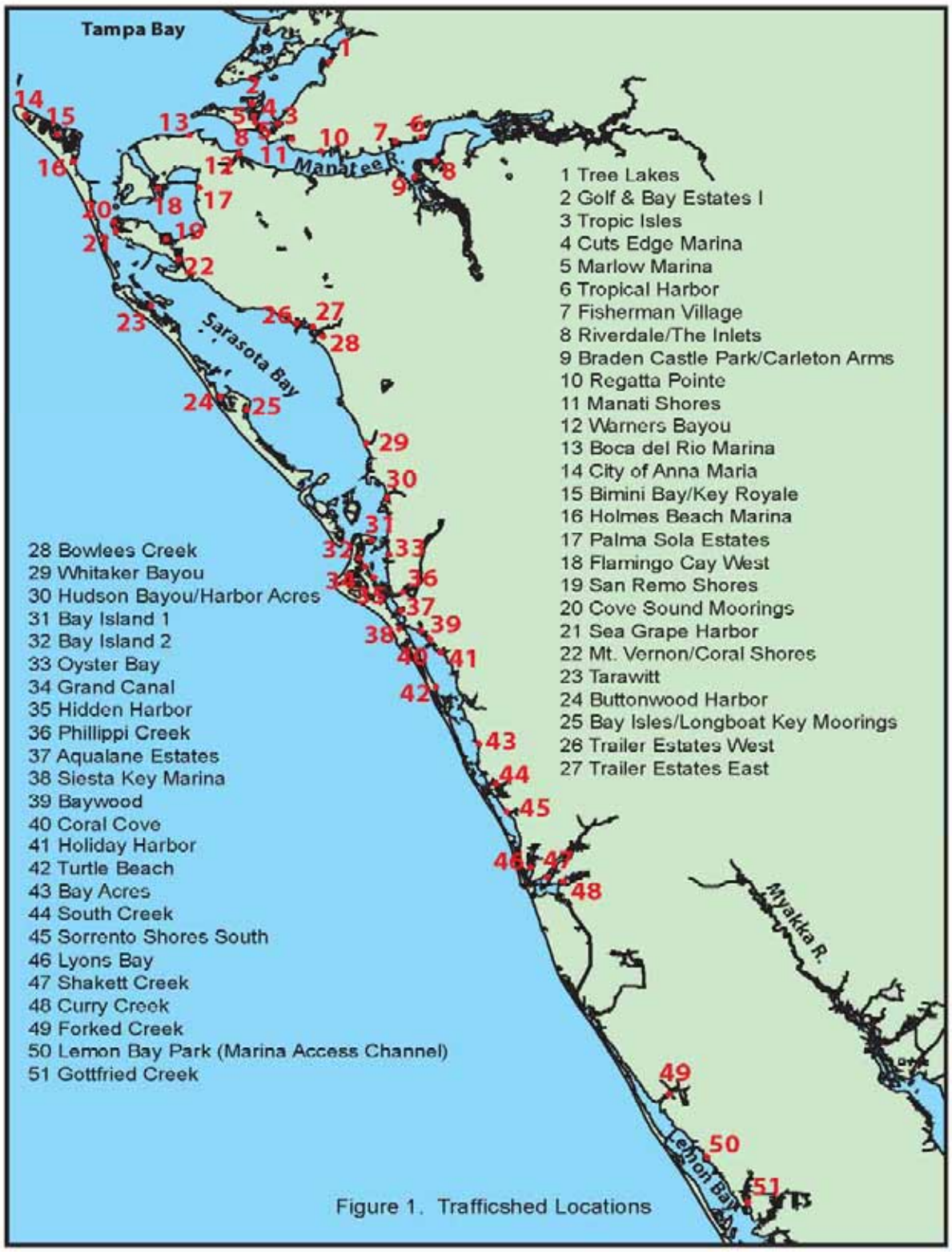



**Figure C1. Trafficshed Locations for the Manatee and Sarasota Counties Noticed General Permit**

# Appendix D. Vessel Title Registration System Data Fields and Data Structure

| Element Number | From | Thru | Size | Elem. Char. | Data Element Name And/ Or Description |
|---|---|---|---|---|---|
| **1** | 1 | 10 | 10 | N | VEHICLE NUMBER |
| **2** | 11 | 11 | 1 | A/N | CUSTOMER TYPE |
| **3** | 12 | 31 | 20 | A/N | REGISTRANT 1 LAST NAME |
| **4** | 32 | 47 | 16 | A/N | REG 1 FIRST NAME |
| **5** | 48 | 63 | 16 | A/N | REG 1 MIDDLE NAME |
| **6** | 64 | 64 | 1 | A/N | REG 1 SUFFIX |
| **7** | 65 | 114 | 50 | A/N | STREET ADDRESS |
| **8** | 115 | 119 | 5 | A/N | APT NUMBER |
| **9** | 120 | 149 | 30 | A/N | CITY |
| **10** | 150 | 151 | 2 | A/N | STATE |
| **11** | 152 | 156 | 5 | N | ZIP5 |
| **12** | 157 | 157 | 1 | A/N | FILLER |
| **13** | 158 | 161 | 4 | N | ZIP4 |
| **14** | 162 | 163 | 2 | A/N | RESIDENT COUNTY |
| **15** | 164 | 171 | 8 | N | REG 1 DOB |
| **16** | 172 | 172 | 1 | A/N | REG 1 SEX |
| **17** | 173 | 192 | 20 | A/N | REGISTRANT 2 LAST NAME |
| **18** | 193 | 208 | 16 | A/N | REG 2 FIRST NAME |
| **19** | 209 | 224 | 16 | A/N | REG 2 MIDDLE NAME |
| **20** | 225 | 225 | 1 | A/N | REG 2 SUFFIX |
| **21** | 226 | 233 | 8 | N | REG 2 DOB |
| **22** | 234 | 234 | 1 | A/N | REG 2 SEX |
| **23** | 235 | 239 | 5 | A/N | VEHICLE MAKE CODE |
| **24** | 240 | 243 | 4 | N | YEAR MAKE |
| **25** | 244 | 246 | 3 | A/N | COLOR ONE |
| **26** | 247 | 249 | 3 | A/N | COLOR TWO |
| **27** | 250 | 251 | 2 | A/N | BODY CODE |
| **28** | 252 | 254 | 3 | N | LENGTH FEET |
| **29** | 255 | 275 | 21 | A/N | IDENTIFICATION NUMBER |
| **30** | 276 | 285 | 10 | N | TITLE NUMBER |
| **31** | 286 | 293 | 8 | N | TITLE ISSUE DATE |
| **32** | 294 | 295 | 2 | A/N | TITLE STATUS CODE |
| **33** | 296 | 297 | 2 | A/N | PREVIOUS TITLE STATE |
| **34** | 298 | 305 | 8 | N | PREVIOUS TITLE ISSUE DATE |
| **35** | 306 | 315 | 10 | A/N | LICENSE PLATE NUMBER |
| **36** | 316 | 325 | 10 | A/N | DECAL NUMBER |
| **37** | 326 | 329 | 4 | N | DECAL YEAR |
| **38** | 330 | 337 | 8 | N | REGISTRATION EXPIRATION DATE |
| **39** | 338 | 340 | 3 | A/N | LICENSE PLATE CODE |
| **40** | 341 | 343 | 3 | N | VEHICLE CLASS CODE |

| | | | | | |
|---|---|---|---|---|---|
| **41** | 344 | 345 | 2 | A/N | ACTIVITY COUNTY |
| **42** | 346 | 347 | 2 | A/N | FUEL TYPE |
| **43** | 348 | 354 | 7 | N | ODOMETER MILEAGE |
| **44** | 355 | 362 | 8 | N | ODOMETER DATE |
| **45** | 363 | 363 | 1 | A/N | ODOMETER STATUS |
| **46** | 364 | 365 | 2 | A/N | VESSEL PORPULSION TYPE |
| **47** | 366 | 367 | 2 | A/N | HULL MATERAIL TYPE |
| **48** | 368 | 369 | 2 | A/N | VESSEL TYPE |
| **49** | 370 | 377 | 8 | N | ACTIVITY DATE |
| **50** | 378 | 383 | 6 | N | GROSS WEIGHT |
| **51** | 384 | 389 | 6 | N | NET WEIGHT |
| **52** | 390 | 391 | 2 | N | WIDTH FEET |
| **53** | 392 | 393 | 2 | A/N | VEHICLE TYPE |
| **54** | 394 | 395 | 2 | A/N | REGISTRATION USE |
| **55** | 396 | 396 | 1 | A/N | VEHICLE USE |
| **56** | 397 | 425 | 29 | A/N | FILLER |

# Appendix E. List of Variables Used in the Congruency and Draft Analyses

**Dependent Variables:**

FLM1 Florida Vessel Title Registration (VTRS)/On-Water Census (OWC) FL Number Match (0 = no match; 1 = FL Number Match) [Note: FLM1 is a binary variable]

FLM12 Florida Vessel Title Registration (VTRS)/On-Water Census (OWC) FL Number Match (0 = no match; 1 = FL Number Match or VTRS Record Matches an OWC Boat Based on Characteristics) [Note: FLM12 is a binary variable]

**Independent Variables:**

Location Coordinates:

X X-coordinate based on geocode of VTRS mailing address (could be to parcel centroid, street, or ZIP code) or the OWC record (parcel centroid) [location coordinate for latitude, divided by 1,000]

Y Y-coordinate based on geocode of VTRS mailing address (could be to parcel centroid, street, or ZIP code) or the OWC record (parcel centroid) [location coordinate for longitude, divided by 1,000]

Polynomial Expansion of {X, Y} coordinates (up to order m=3):

| | | |
|---|---|---|
| X2 | X*X | (X-squared) |
| Y2 | Y*Y | (Y-squared) |
| XY | X*Y | (X multiplied by Y) |
| X2Y | X2*Y | (X-squared multiplied by Y) |
| Y2X | Y2*X | (Y-squared multiplied by X) |
| X3 | X2*X | (X-cubed) |
| Y3 | Y2*Y | (Y-cubed) |

Note: a polynomial expansion of X and Y to order m=3 tests for spatial trends that are either linear, curvilinear (quadratic), or cubic. The interaction variables (i.e., terms that combine X and Y) are used to test for spatial trends that are off-axis or diagonal.

**Other Location Variables:**

DST — Distance between the VTRS record geo-coded coordinates and the matching OWC coordinates); -9999 where no match; -8888 where match but no address info in VTRS record (blocked or unknown)

PX — The X-coordinate associated with the centroid of the parcel to which the record belongs (usually VTRS, but OWC if non-match or if VTRS record does not geocode)

PY — The Y-coordinate associated with the centroid of the parcel to which the record belongs (usually VTRS, but OWC if non-match or if VTRS record does not geocode)

WGEO — Location info on VTRS mailing address: 1 – VTRS mail address geocodes to study area (in or next to parcel); 2 – location in county; 3 – location in the state of Florida; 4 – location outside the state of Florida (and within U.S.); 5 – foreign address (outside the U.S.); 6 – bad address information (e.g., unknown state or ZIP code); 7-9 – neighborhood uses study are ramp/entry point. [Note: WGEO coded as 1 if in state; coded as 0 if outside of state]

**Trafficshed-Type Descriptors (as Dummy Variables):**

| | |
|---|---|
| Naturalwaterway | 1 if natural waterway; 0 if other than natural waterway |
| Bayfront | 1 if bayfront; 0 if other than bayfront |
| Canal | 1 if canal; 0 if other than canal |

**Trafficshed-Type Locators (as Interactive Dummy Variables):**

| | |
|---|---|
| NaturalwaterwayX | Naturalwaterway*X |
| NaturalwaterwayY | Naturalwaterway*Y |
| NaturalwaterwayXY | Naturalwaterway*XY |
| NaturalwaterwayX2 | Naturalwaterway*X2 |
| NaturalwaterwayY2 | Naturalwaterway*Y2 |
| BayfrontX | Bayfront*X |
| BayfrontY | Bayfront*Y |
| BayfrontXY | Bayfront*XY |
| BayfrontX2 | Bayfront*X2 |
| BayfrontY2 | Bayfront*Y2 |
| CanalX | Canal*X |
| CanalY | Canal*Y |
| CanalXY | Canal*XY |
| CanalX2 | Canal*X2 |
| CanalY2 | Canal*Y2 |

**Selected Variables by Census Block Group:**

| | |
|---|---|
| H007002 | Occupied Housing Units (Total): Owner-Occupied |
| H007003 | Occupied Housing Units (Total): Rental |
| H008001 | Vacant Housing Units (Total) |
| H033001 | Total Population in Occupied Housing Units |
| H056001 | Median Contract Rent ($) |
| H076001 | Median Value of Housing Units ($) |
| H079001 | Aggregate Value Owner-Occupied Housing ($) |
| P001001 | Total Population |
| P008002 | Total Population Male |
| P008041 | Total Population Female |
| P043003 | Population 16 years and over in Labor Force: Male |
| P043010 | Population 16 years and over in Labor Force: Female |
| P050001 | Employed Civilian Population 16 years and over (Total) |
| P053001 | Median Household Income ($) |
| P058001 | Households: Total |
| P059002 | Households with Wage and Salary Income (Total) |
| P060002 | Households with self-employment Income (Total) |
| P061002 | Households with Income, Dividends, and Rent (Total) |
| P062002 | Households with Social Security Income |
| P067001 | Aggregate Earnings in 1999 ($) |
| P068001 | Aggregate Wage or Salary Income in 1999 ($) |
| P071001 | Aggregate Social Security Income in 1999 ($) |
| P074001 | Aggregate Retirement Income in 1999 ($) |
| P077001 | Median Family Income in 1999 ($) |
| P078001 | Aggregate Family Income in 1999 ($) |
| P082001 | Per Capita Income in 1999 ($) |

**New Variables created from Census Block Group Information:**

| | |
|---|---|
| POP62+ | Proportion of Population 62 years of age or older |
| F62+ | Proportion of Population 62 years of age or older: Female |
| M62+ | Proportion of Population 62 years of age or older: Male |
| DEPRATIO | Dependency Ratio: (Population 62 years of age or older + population less than 16 years of age)/(population between 16 and 61 years of age inclusive) |

**Variables used in the Draft Analysis**

| | |
|---|---|
| DRAFT | draft for all OWC vessels |
| DRAFTC | draft for OWC vessels congruent with a VTRS record |
| DRAFTNC | draft for OWC vessels that are not congruent with a VTRS record |
| DRAFT5 | draft for all OWC vessels with a draft 1 foot or greater |
| DRAFTNC5 | draft for OWC vessels with a draft 1 foot or greater, which are non-congruent with a VTRS record |
| DRAFTC5 | draft for OWC with a draft 1 foot or greater, which are congruent with a VTRS record |

Note: all drafts are measured in feet, and rounded to the nearest 0.5-foot.

# Appendix F. Lee County Congruency Proportions by GUA

**Table F1. Congruency Proportions for Lee County GUA**

| GUA[1] | Count (n) | Congruency Proportion | 95% Confidence Interval Lower Level | 95% Confidence Interval Upper Level | Non-overlap[2] in GUA interval vs. ALL |
|---|---|---|---|---|---|
| **10.1.1** | **228** | **0.5657** | **0.5013** | **0.6302** | **Yes** |
| 10.1.2 | 168 | 0.3571 | 0.2839 | 0.4303 | No |
| 10.3.1 | 230 | 0.4130 | 0.3489 | 0.4771 | No |
| 20.1.1 | 242 | 0.4090 | 0.3470 | 0.4711 | No |
| 20.1.2 | 450 | 0.4822 | 0.4359 | 0.5286 | No |
| 20.1.3 | 458 | 0.4716 | 0.4257 | 0.5175 | No |
| **20.1.4** | **492** | **0.3800** | **0.3371** | **0.4230** | **Yes** |
| 20.1.5 | 123 | 0.4146 | 0.3263 | 0.5029 | No |
| **20.1.6** | **69** | **0.2318+** | **0.1297** | **0.3340** | **Yes** |
| 20.1.7 | 219 | 0.4703 | 0.4040 | 0.5365 | No |
| **20.2.1** | **237** | **0.3375** | **0.2772** | **0.3978** | **Yes** |
| 20.2.2 | 114 | 0.5175 | 0.4244 | 0.6106 | No |
| 20.2.3 | 193 | 0.4818 | 0.4107 | 0.5529 | No |
| 20.2.4 | 251 | 0.4143 | 0.3532 | 0.4754 | No |
| 20.2.5 | 367 | 0.4359 | 0.3851 | 0.4867 | No |
| 20.2.6 | 452 | 0.4623 | 0.4163 | 0.5084 | No |
| 20.3.1 | 113 | 0.4159 | 0.3236 | 0.5082 | No |
| 20.3.2 | 207 | 0.3864 | 0.3199 | 0.4529 | No |
| **20.3.3** | **85** | **0.8352*** | **0.7548** | **0.9157** | **Yes** |
| **20.3.4** | **363** | **0.3636** | **0.3140** | **0.4131** | **Yes** |
| **20.3.5** | **215** | **0.3395** | **0.2760** | **0.4029** | **Yes** |
| 30.1.1 | 429 | 0.4685 | 0.4212 | 0.5158 | No |
| **30.1.2** | **398** | **0.5351** | **0.4861** | **0.5842** | **Yes** |
| **30.1.3** | **167** | **0.2994++** | **0.2292** | **0.3695** | **Yes** |
| 30.2.1 | 315 | 0.4126 | 0.3582 | 0.4671 | No |
| **30.3.1** | **202** | **0.6188**** | **0.5516** | **0.6859** | **Yes** |
| ***All*** | ***6,787*** | ***0.4420*** | ***0.4302*** | ***0.4538*** | ***n/a*** |

Note: Results are for the binary variable FLM12

[1]Composite value for retirement-wealth potential and geographic area: the 1st number refers to retirement potential, the 2nd number to wealth potential, and the 3rd number to a geographically unique clustering of parcels. See Table 1 for an explanation of the wealth-retirement values.

[2]**Yes** indicates that no overlap exists between the 95% confidence interval for the GUA congruency proportion versus the 95% confidence interval for All GUA; this suggests that the GUA proportion is significantly different than 0.4420 (two-tail test at the 95% confidence level).

Key: * Maximum observed; ** Second-Largest Proportion observed
+ Minimum observed; ++ Next-Smallest Proportion observed

**Table F2. Normality Test of Lee County GUA Congruency Proportions**

| Ho: Distribution is "Normal" | | | |
|---|---|---|---|
| Test Statistic | Test Value | Probability | Decision (5%) |
| Shapiro-Wilk (SW) | 0.99259 | 0.999386 (0.000614) | Fail to Reject Ho: |
| Anderson-Darling (AD) | 0.14543 | 0.968540 (0.031460) | Fail to Reject Ho: |
| | | Critical value (at 5%) | |
| Kolmogorov-Smirnov (KS) | 9.250882E-02 | 1.27609 | Fail to Reject Ho: |

**Figure F1. Histogram of Lee County GUA Congruency Proportions**

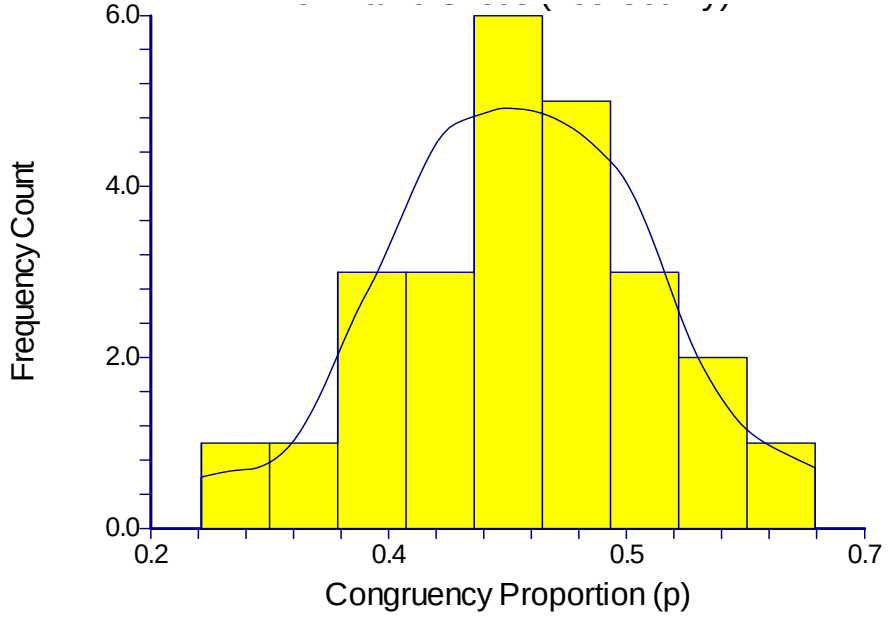
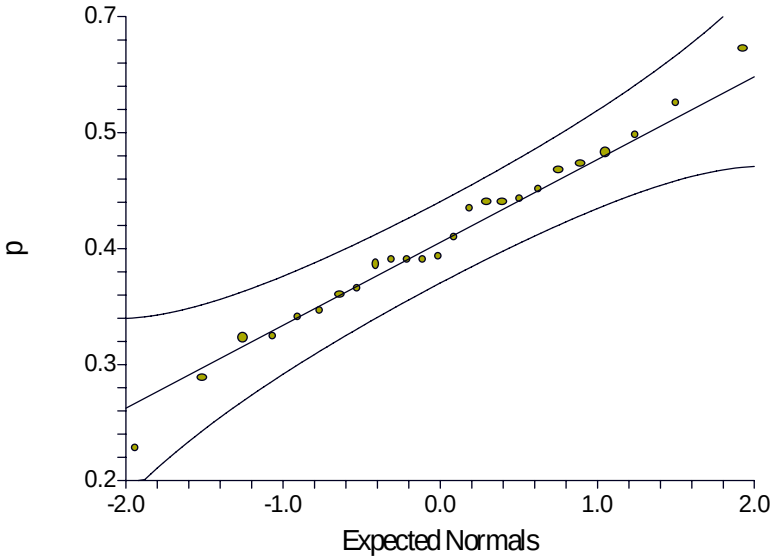


**Figure F2. Normality Plot of Lee County GUA Congruency Proportions**




Note that all values of p fall between within the 95% confidence bands (and along the 45 degree line positioned between them), indicating that the distribution of p values is not significantly different from a "normal" distribution at the 95% confidence level.

**Table F3. Descriptive Statistics of Lee County GUA Congruency Proportions**

---

Count (n) = 25 (total number of GUA)

Mean Congruency Proportion = 0.4420 (unweighted average)
Mean Congruency Proportion = 0.4317 (weighted average)

Statistical results for unweighted (p) values:

Standard deviation = 0.08669053
Standard error = 0.01733811
Minimum = 0.2318
Maximum = 0.6188
Range = 0.387

95% Lower Confidence Level = 0.395959
95% Upper Confidence Level = 0.467528

---

See Figure F3 (below) for Box Plot of Congruency Proportions (p)

**Figure F3. Box Plot of Lee County GUA Congruency Proportions**

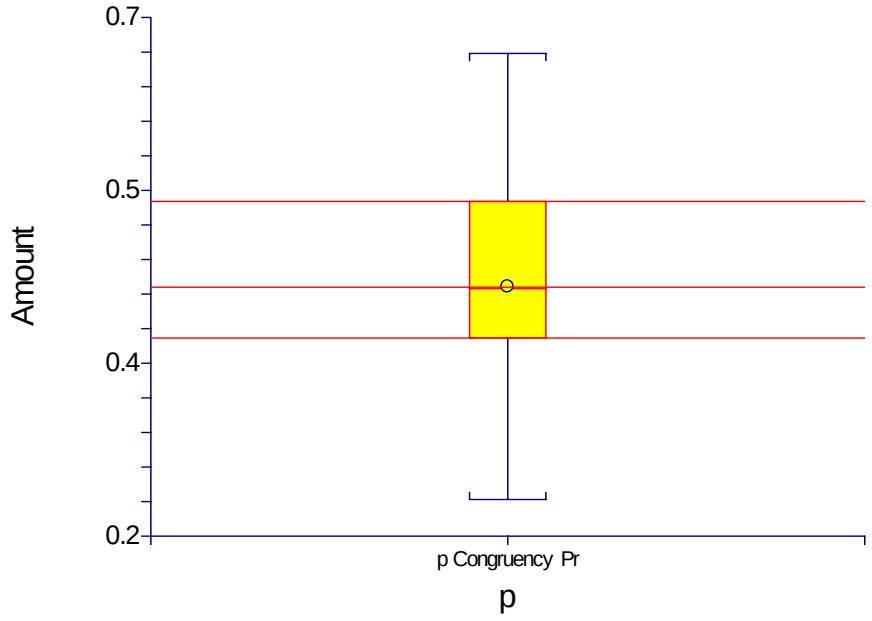



**Table F4. Equality of Proportions Tests for Largest and Smallest Lee County GUA Congruency Proportions**

| GUA | Congruency Proportion (p) | Description |
|---|---|---|
| 20.3.3 | .8352 | Maximum Congruency Proportion observed (n=85) |
| 30.3.1 | .6188 | Second-Largest Congruency Proportion observed (n=202) |
| 20.1.6 | .2318 | Minimum Congruency Proportion observed (n=69) |
| 30.1.3 | .2994 | Next-Smallest Congruency Proportion observed (n=167) |
| **All** | .4402 | Average Congruency Proportion (Lee County; n=6787) |

**Null Hypothesis**: Ho: equality of proportions p(All) = p(j) where j=30.3.1, 10.1.1, 20.1.6, 30.1.3

| Alternative Hypothesis | Fisher's Exact Test Prob. Level | Decision (5%) | Normal Approximation Z-Value | Prob. Level | Decision (5%) |
|---|---|---|---|---|---|
| p(All)-p(30.3.1)<>0 | 0.000001 | Reject Ho: | -4.9801 | 0.000001 | Reject Ho: |
| p(All)-p(30.3.1)<0 | 0.000000 | Reject Ho: | -4.9801 | 0.000000 | Reject Ho: |
| p(All)-p(10.1.1)<>0 | 0.000224 | Reject Ho: | -3.6981 | 0.000217 | Reject Ho: |
| p(All)-p(10.1.1)<0 | 0.000149 | Reject Ho: | -3.6981 | 0.000109 | Reject Ho: |
| p(All)-p(20.1.6)<>0 | 0.000365 | Reject Ho: | 3.4988 | 0.000467 | Reject Ho: |
| p(All)-p(20.1.6)>0 | 0.000000 | Reject Ho: | 3.4988 | 0.000234 | Reject Ho: |
| p(All)-p(30.1.3)<>0 | 0.000260 | Reject Ho: | 3.6694 | 0.000243 | Reject Ho: |
| p(All)-p(30.1.3)>0 | 0.000131 | Reject Ho: | 3.6694 | 0.000122 | Reject Ho: |

# Appendix G. Manatee County Congruency Proportions by GUA

**Table G1. Congruency Proportions for Manatee County GUA**

| GUA[1] | (n) | Congruency Proportion | 95% Confidence Interval Lower Level | Upper Level | Non-overlap[2] in GUA interval vs. All |
|---|---|---|---|---|---|
| **10.1.1** | **75** | **.6133*** | **.5005** | **.7261** | **Yes** |
| 10.2.2 | 86 | .4534 | .3461 | .5608 | No |
| 10.2.3 | 66 | .4393 | .3164 | .5623 | No |
| 10.2.4 | 138 | .4130 | .3298 | .4962 | No |
| **10.2.5** | **418** | **.3612** | **.3151** | **.4073** | **Yes** |
| 10.3.1 | 90 | .4333 | .3289 | .5377 | No |
| 10.3.2 | 101 | .5445 | .4457 | .6433 | No |
| **20.1.1** | **129** | **.1240+** | **.0066** | **.1816** | **Yes** |
| **20.2.1** | **289** | **.2871++** | **.2349** | **.3394** | **Yes** |
| 20.2.2 | 211 | .4928 | .4252 | .5605 | No |
| **20.2.3** | **110** | **.5818** | **.4881** | **.6754** | **Yes** |
| 20.2.4 | 64 | .4843 | .3585 | .6101 | No |
| 20.2.5 | 201 | .3930 | .3249 | .4611 | No |
| 20.3.1 | 216 | .3935 | .3282 | .4588 | No |
| 20.3.2 | 206 | .4757 | .4073 | .5440 | No |
| **30.2.1** | **242** | **.5991**** | **.5373** | **.6610** | **Yes** |
| **30.3.1** | **80** | **.5625** | **.4514** | **.6735** | **Yes** |
| ***All*** | ***2,722*** | ***.4283*** | ***.4097*** | ***.4469*** | ***n/a*** |

Note: Results are for the binary variable FLM12

[1]Composite value for retirement-wealth potential and geographic area: the 1st number refers to retirement potential, the 2nd number to wealth potential, and the 3rd number to a geographically unique clustering of parcels. See Table 1 for an explanation of the retirement-wealth values.
[2]**Yes** indicates that there is no overlap between the 95% confidence interval for the GUA congruency proportion versus the 95% confidence interval for all GUA in Manatee County. A "No" suggests that the congruency proportion for that GUA is not significantly different from 0.4283 (using a two-tail test at the 95% confidence level).

Key: * Maximum observed; ** Second-Largest Proportion observed
+ Minimum observed; ++ Next-Smallest Proportion observed

**Table G2. Normality Test of Manatee County GUA Congruency Proportions**

Ho: Distribution is "Normal"

| Test Statistic | Test Value | Probability | Decision (5%) |
|---|---|---|---|
| Shapiro-Wilk (SW) | 0.9257 | 0.18465 | Fail to Reject Ho |
| Anderson-Darling (AD) | 0.3762 | 0.41158 | Fail to Reject Ho |
| | | Critical value (at 5%) | |
| Kolmogorov-Smirnov (KS) | 0.0915 | 1.960 | Fail to Reject Ho |

**Figure G1. Histogram of Manatee County GUA Congruency Proportions**

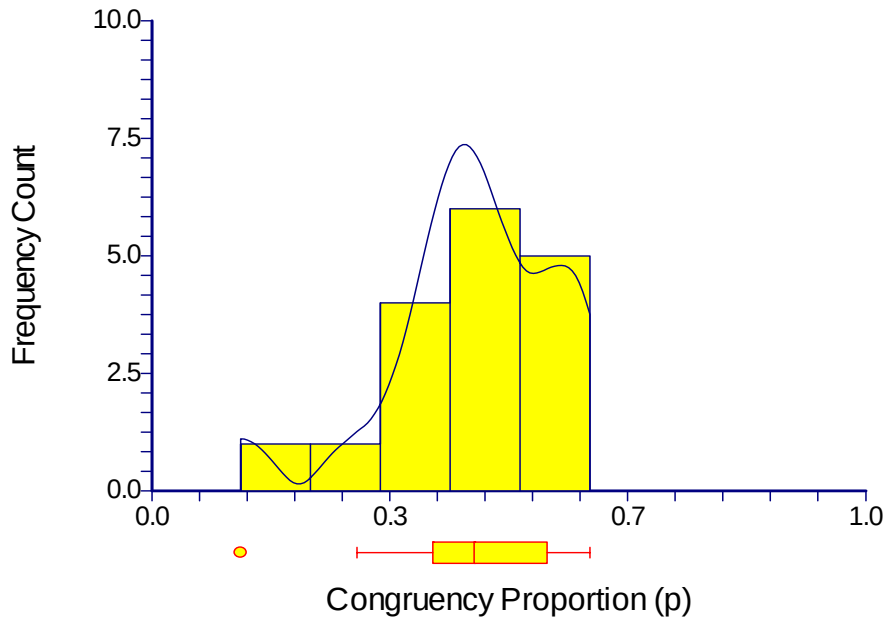
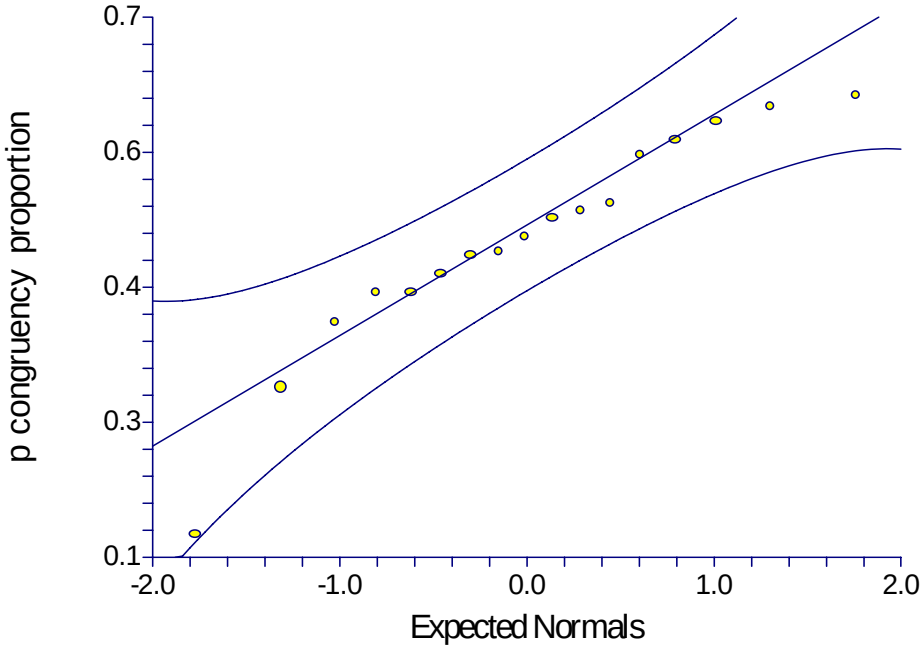


**Figure G2. Normality Plot of Manatee County GUA Congruency Proportions**




Note that all values of p fall between within the 95% confidence bands (and along the 45 degree line positioned between them), indicating that the distribution of p values is not significantly different from a "normal" distribution at the 95% confidence level.

**Table G3. Descriptive Statistics of Manatee County GUA Congruency Proportions**

Count (k) = 17 (total number of GUA)

Mean Congruency Proportion = 0.4283 (unweighted average)
Mean Congruency Proportion = 0.4501 (weighted average)

Statistical results for unweighted (p) values:
Standard deviation = 0.12258
Standard error = 0.02983
Minimum = 0.1240
Maximum = 0.6133
Median = 0.4534 (95% C.I.: lower = 0.3935; upper = 0.5445
Range = 0.4893

95% Lower Confidence Level = 0.387078
95% Upper Confidence Level = 0.513133

**Figure G3. Box Plot of Manatee County GUA Congruency Proportions**

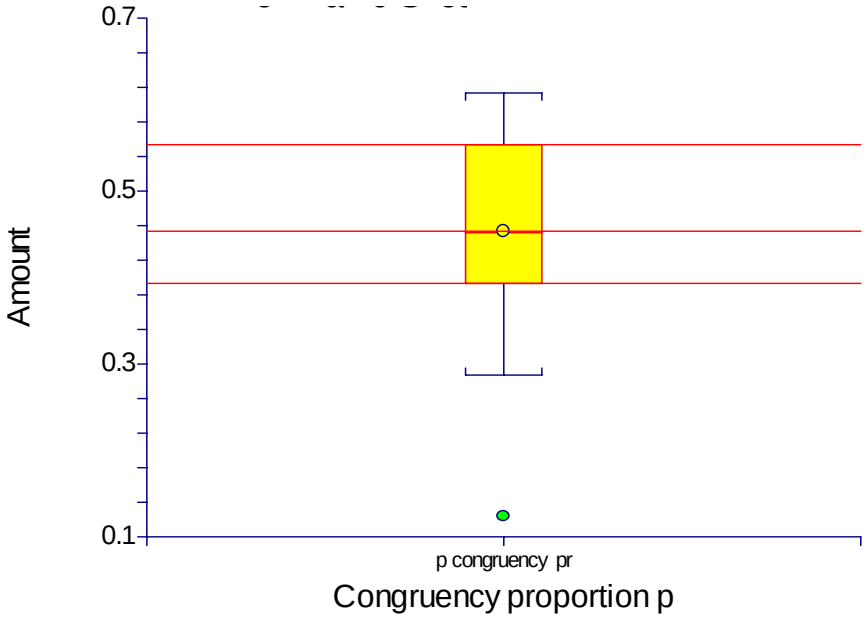



**Table G4. Equality of Proportions Tests for Largest and Smallest Manatee County GUA Congruency Proportions**

| GUA | Congruency Proportion (p) | Description |
|---|---|---|
| 10.1.1 | .6133 | Maximum Congruency Proportion observed (n=111) |
| 30.2.1 | .5991 | Second-Largest Congruency Proportion observed (n=75) |
| 20.1.1 | .1240 | Minimum Congruency Proportion observed (n=58) |
| 20.2.1 | .2871 | Next-Smallest Congruency Proportion observed (n=129) |
| **All** | .4283 | Avg. Congruency Proportion (Manatee County; n=2722) |

**Null Hypothesis**: Ho: equality of proportions p(All) = p(j) where j= 10.1.1, 30.2.1, 20.1.1, and 20.2.1

| | Fisher's Exact Test | | Normal Approximation | | |
|---|---|---|---|---|---|
| Alternative Hypothesis | Prob. Level | Decision (5%) | Z-Value | Prob. Level | Decision (5%) |
| p(All)-p(10.1.1)<>0 | 0.000000 | Reject Ho | -9.8156 | 0.000000 | Reject Ho |
| p(All)-p(10.1.1)<0 | 0.000000 | Reject Ho | -9.8156 | 0.000000 | Reject Ho |
| p(All)-p(30.2.1)<>0 | 0.001457 | Reject Ho | -3.1890 | 0.000142 | Reject Ho |
| p(All)-p(30.2.1)<0 | 0.001120 | Reject Ho | -3.1890 | 0.000007 | Reject Ho |
| p(All)-p(20.1.1)<>0 | 0.000000 | Reject Ho | 6.5417 | 0.000000 | Reject Ho |
| p(All)-p(20.1.1)>0 | 0.000000 | Reject Ho | 6.5417 | 0.000000 | Reject Ho |
| p(All)-p(20.2.1)<>0 | 0.000000 | Reject Ho | 6.8556 | 0.000000 | Reject Ho |
| p(All)-p(20.2.1)>0 | 0.000000 | Reject Ho | 6.8556 | 0.000000 | Reject Ho |

# Appendix H. Congruency Proportions by Trafficshed Type for Lee and Manatee Counties

**Table H1. Equality of Proportions Test for Congruency by Trafficshed Type for Lee County**

| # | Category | n | FLM12=1 count | Congruency proportion (p) |
|---|---|---|---|---|
| 1 | Natural waterway | 276 | 99 | .3586 |
| 2 | Bayfront | 311 | 119 | .3826 |
| 3 | Canal | 6,200 | 2782 | .4487 |

Null Hypothesis (Ho): p(i) – p(j) = 0 {for an (i,j) pair where (i<>j), and p(j) > p(i)}

Fisher's Exact Test Result

| Alternative Hypothesis | Prob Level | Decision (5%) | Normal Approximation Test Result Z-value | (prob) | Decision (5%) |
|---|---|---|---|---|---|
| p1-p2<>0 | 0.5506 | Fail to Reject | -0.5992 | 0.5490 | Fail to Reject |
| p1-p2 < 0 | 0.3039 | Fail to Reject | -0.5992 | 0.2745 | Fail to Reject |

Interpretation: There is no statistical evidence of a significant difference in the congruency proportions for natural waterways and bayfront systems (i.e., the values of 0.3586 and 0.3826 are not statistically dissimilar from one another at the 95% confidence level).

| | | | | | |
|---|---|---|---|---|---|
| p1-p3<>0 | 0.0035 | Reject Ho | -2.9444 | 0.0032 | Reject Ho |
| p1-p3 < 0 | 0.0018 | Reject Ho | -2.9444 | 0.0016 | Reject Ho |

Interpretation: There is statistical evidence of a significant difference in the congruency proportions for natural waterways and canal systems (i.e., the values of 0.3586 and 0.4487 are statistically dissimilar at the 95% confidence level). Moreover, the value of 0.4487 is found to be significantly greater than 0.3586 at the 95% confidence level.

| | | | | | |
|---|---|---|---|---|---|
| p2-p3<>0 | 0.0226 | Reject Ho | -2.2877 | 0.0221 | Reject Ho |
| p2-p3 < 0 | 0.0125 | Reject Ho | -2.2877 | 0.0110 | Reject Ho |

Interpretation: There is statistical evidence of a significant difference in the congruency proportions for bayfront and canal systems (i.e., the values of 0.3826 and 0.4487 are statistically dissimilar at the 95% confidence level). Moreover, the value of 0.3826 is shown to be significantly less than 0.4487 at the 95% confidence level.

**Table H2. Equality of Proportions Test for Congruency by Trafficshed Type for Manatee County**

| # | Category | n | FLM12=1 count | Congruency proportion (p) |
|---|---|---|---|---|
| 1 | Natural waterways | 503 | 221 | 0.4393 |
| 2 | Bayfront | 436 | 134 | 0.3073 |
| 3 | Canal | 1,783 | 811 | 0.4980 |

Null Hypothesis (Ho): p(i) – p(j) = 0 {for an (i,j) pair where (i<>j), and p(j) > p(i)}

Fisher's Exact Test Result

| Alternative Hypothesis | Prob Level | Decision (5%) | Normal Approximation Test Result Z-value | (prob) | Decision (5%) |
|---|---|---|---|---|---|
| p1-p2<>0 | 0.00003 | Reject Ho | 4.1610 | 0.000032 | Reject Null H |
| p1-p2 > 0 | 0.00002 | Reject Ho | 4.1610 | 0.000016 | Reject Null H |

Interpretation: There is hard statistical evidence of a significant difference in the congruency proportions for natural waterways and bayfront systems (i.e., the values of 0.4393 and 0.3073 are statistically dissimilar from one another at the 95% confidence level). Moreover, the congruency proportion for natural waterways (0.439) is significantly greater than that of bayfronts (0.307).

| | | | | | |
|---|---|---|---|---|---|
| p1-p3<>0 | 0.54315 | Fail to Reject Ho | -0.6164 | 0.537603 | Fail to Reject Ho |
| p1-p3 < 0 | 0.28602 | Fail to Reject Ho | -0.6164 | 0.268801 | Fail to Reject Ho |

Interpretation: There is no statistical evidence of a significant difference in the congruency proportions for natural waterways and canal systems (i.e., the values of 04393 and 0.4980 are not statistically dissimilar at the 95% confidence level). Moreover, the value of 0.439 is not found to be significantly less than 0.498 at the 95% confidence level.

| | | | | | |
|---|---|---|---|---|---|
| p2-p3<>0 | 0.00000 | Reject Ho | -5.58370 | 0.00000 | Reject Ho |
| p2-p3 < 0 | 0.00000 | Reject Ho | -5.58370 | 0.00000 | Reject Ho |

Interpretation: There is statistical evidence of a significant difference in the congruency proportions for bayfront and canal systems (i.e., the values of 0.3073 and 0.4980 are statistically dissimilar at the 95% confidence level). Moreover, the value of 0.307 is shown to be significantly less than 0.498 at the 95% confidence level, suggesting that the congruency proportion in canals is significantly greater than the congruency proportion for bayfronts.

**Table H3. Equality of Proportions Test for Congruency by Trafficshed Type: A Comparison of Manatee and Lee Counties**

Congruency Proportion (p) for FLM12 {where VTRS/OWC match is observed)

**Natural Waterways**

| Lee | Manatee |
|---|---|
| .3586 | .4393 |

Null Hypothesis (Ho): Equality of Proportions [ p (Lee) = p (Manatee) ]

| Alternative Hypothesis | Fisher's Probability | Z-test | (Probability) | Decision |
|---|---|---|---|---|
| p(Lee)-p(Manatee)<>0 | 0.032960 | -2.1889 | (0.028603) | Reject Ho |
| p(Lee)<p(Manatee) | 0.017062 | -2.1889 | (0.014302) | Reject Ho |

Interpretation: There is strong statistical evidence that the congruency proportions in natural waterways are not equal in Lee and Manatee counties. Moreover, there is evidence to support the contention that the congruency proportion for natural waterways in Lee County is significantly less than the congruency proportion for natural waterways in Manatee County.

Congruency Proportion (p) for FLM12 {where VTRS/OWC match is observed)

**Bayfront**

| Lee | Manatee |
|---|---|
| .3826 | .3073 |

Null Hypothesis (Ho): Equality of Proportions [ p (Lee) = p (Manatee) ]

| Alternative Hypothesis | Fisher's Probability | Z-test | (Probability) | Decision |
|---|---|---|---|---|
| p(Lee)-p(Manatee)<>0 | 0.034392 | 2.1436 | (0.032067) | Reject Ho |
| p(Lee)>p(Manatee) | 0.019616 | 2.1436 | (0.016033) | Reject Ho |

Interpretation: There is strong statistical evidence that the congruency proportions in bayfronts are not equal in Lee and Manatee counties. Moreover, there is evidence to support the contention that the congruency proportion for bayfronts in Lee County is significantly greater than the congruency proportion for bayfronts in Manatee County.

Congruency Proportion (p) for FLM12 {where VTRS/OWC match is observed)

**Canal**

| Lee | Manatee |
|---|---|
| .4487 | .4980 |

Null Hypothesis (Ho): Equality of Proportions [ p (Lee) = p (Manatee) ]

| Alternative Hypothesis | Fisher's Probability | Z-test | (Probability) | Decision |
|---|---|---|---|---|
| p(Lee)-p(Manatee)<>0 | 0.646254 | -0.4594 | (0.645954) | Fail to Reject Ho |
| p(Lee)<p(Manatee) | 0.332588 | -0.4594 | (0.322977) | Fail to Reject Ho |

Interpretation: There is strong statistical evidence that the congruency proportions in canals are not significantly different in Lee and Manatee counties. Moreover, there is evidence to support the contention that the congruency proportion for canals in Lee County is not significantly less than the congruency proportion for canals in Manatee County.

# Appendix I. Results of Logistic Regression for Bayfront-Only Congruence in Manatee County

**Table I1. Results of Logistic Regression for Bayfront-Only Congruence in Manatee County**

Dependent Variable = FLM12 (data subset: Bay; n=436)
Procedure = Logistic; Forward Selection (inclusion probability = 0.10)

| Independent Variable | Estimated Coefficient | Standard Error | Chi-Square (β=0) | Probability Level |
|---|---|---|---|---|
| Intercept | -464.6570 | 356.6255 | 1.70 | 0.192600 |
| H056001 | 6.815643E-03 | 1.801784E-03 | 14.31 | 0.000155 |
| F62 | -0.0105793 | 2.288563E-03 | 21.37 | 0.000004 |
| Pop62 | 5.611575E-02 | 1.175337E-02 | 22.80 | 0.000002 |
| H076001 | 1.528210E-05 | 6.391974E-06 | 5.70 | 0.016811 |
| Y2 | 9.097694E-03 | 2.857885E-03 | 10.13 | 0.001456 |
| Y | -2.251123 | 1.128948 | 3.98 | 0.046152 |
| XY | -8.658556E-03 | 3.060938E-03 | 8.00 | 0.004673 |
| X | 3.287031 | 1.181641 | 7.74 | 0.005407 |
| P068001 | -2.540247E-08 | 1.244018E-08 | 4.17 | 0.041155 |

Model Chi-Square = 226.21 (w/ 9 degrees of freedom); probability (0.000000) -- the overall model is significant at the 99.9% confidence level
Midpoint Classification: 0.5

| | | Predicted | | |
|---|---|---|---|---|
| Actual | | 0 | 1 | Total |
| 0 | count | 243 | 59 | **302** |
| | row % | 80.46 | 19.54 | |
| | column % | 90.33 | 35.33 | 69.27% |
| 1 | count | 26 | 108 | **134** |
| | row % | 19.40 | 80.60 | |
| | column % | 9.67 | 64.67 | 30.73% |
| total | | **269** | **167** | **436** |
| | row % | 61.70 | 38.30 | |

**Percent FLM12 Correctly Classified = 80.50%**

# Appendix J. Modeling Congruency in Lee County using Socio-Economic and Demographic Variables

**Table J1. Results of Logistic Regression for FLM12 in Lee County**

Dependent Variable = FLM12
Procedure = Logistic; Forward Selection (inclusion probability = 0.10)

| Independent Variable | Estimated Coefficient | Standard Error | Chi-Square (β=0) | Probability Level |
|---|---|---|---|---|
| Intercept | 4.313537 | 1.280676 | 11.34 | 0.000757 |
| Y | 7.078336E-03 | 1.416009E-03 | 24.99 | 0.000001 |
| Y2 | -4.633165E-06 | 1.225177E-06 | 14.30 | 0.000156 |
| Y3 | 8.306804E-10 | 3.084871E-10 | 7.25 | 0.007086 |
| PY | -2.174294E-02 | 4.260221E-03 | 26.05 | 0.000000 |
| F62+ | 3.753759E-03 | 1.051189E-03 | 12.75 | 0.000356 |
| P050001 | 1.913410E-03 | 4.791401E-04 | 15.95 | 0.000065 |
| P059002 | -4.483239E-03 | 9.729520E-04 | 21.23 | 0.000004 |
| P067001 | -4.500790E-08 | 1.705885E-08 | 6.96 | 0.008330 |
| P068001 | 7.759887E-08 | 1.968643E-08 | 15.54 | 0.000081 |
| P071001 | -2.122874E-05 | 7.804760E-08 | 7.40 | 0.006529 |
| P082001 | -1.357542E-05 | 2.921560E-06 | 21.59 | 0.000003 |
| H056001 | 2.963057E-04 | 8.917181E-05 | 11.04 | 0.001628 |

Model Chi-Square = 198.48 (w/ 12 degrees of freedom); probability (0.00000) -- the overall model is significant at the 99.9% confidence level
Midpoint Classification: 0.45

| | | Predicted | | |
|---|---|---|---|---|
| Actual | | 0 | 1 | Total |
| 0 | count | 2777 | 1010 | **3787** |
| | row % | 73.33 | 26.67 | |
| | column % | 60.23 | 46.42 | 55.80% |
| 1 | count | 1834 | 1166 | **3000** |
| | row % | 61.13 | 38.87 | |
| | column % | 39.77 | 53.58 | 44.20% |
| total | | **4611** | **2176** | **6787** |
| | row % | 67.94 | 32.06 | |

**Percent FLM12 Correctly Classified = 58.10%**

# Appendix K. Modeling Congruency in Manatee County using Socio-Economic and Demographic Variables

**Table K1. Results of Logistic Regression for FLM12 in Manatee County**

Dependent Variable = FLM12
Procedure = Logistic; Forward Selection (inclusion probability = 0.10)

| Independent Variable | Estimated Coefficient | Standard Error | Chi-Square (β=0) | Probability Level |
|---|---|---|---|---|
| Intercept | -6.4422450 | 1.785261 | 13.02 | 0.000308 |
| Bay | -0.6626955 | 0.124475 | 28.34 | 0.000000 |
| Y | 8.997785E-03 | 3.097894E-03 | 8.44 | 0.003679 |
| P068001 | -1.817974E-07 | 4.413592E-08 | 16.97 | 0.000038 |
| P067001 | 1.655214E-07 | 4.267844E-08 | 15.04 | 0.000105 |
| P071001 | 4.621196E-07 | 8.071584E-08 | 32.78 | 0.000000 |
| Pop62 | -3.873121E-03 | 7.049931E-04 | 30.18 | 0.000000 |
| XY | -5.165291E-06 | 1.395313E-06 | 13.70 | 0.000214 |
| X | 7.763655E-03 | 2.197671E-03 | 12.48 | 0.000411 |

Model Chi-Square = 124.79 (w/ 8 degrees of freedom); probability (0.000000) -- the overall model is significant at the 99.9% confidence level
Midpoint Classification: 0.5

| | | Predicted | | |
|---|---|---|---|---|
| Actual | | 0 | 1 | Total |
| 0 | count | 1311 | 245 | **1556** |
| | row % | 84.25 | 15.75 | |
| | column % | 59.95 | 45.79 | 57.16% |
| 1 | count | 876 | 290 | **1166** |
| | row % | 75.13 | 24.87 | |
| | column % | 40.05 | 19.65 | 42.84% |
| total | | **2187** | **535** | **2722** |
| | row % | 80.35 | 19.65 | |

**Percent FLM12 Correctly Classified = 58.82%**

Note: All Independent Variables (as listed in Appendix D) were included in the initial run. Only those variables that proved to add explanatory power to the model were included and/or retained in the final run (see results above).

# Appendix L. Draft Analysis Statistics for Lee County

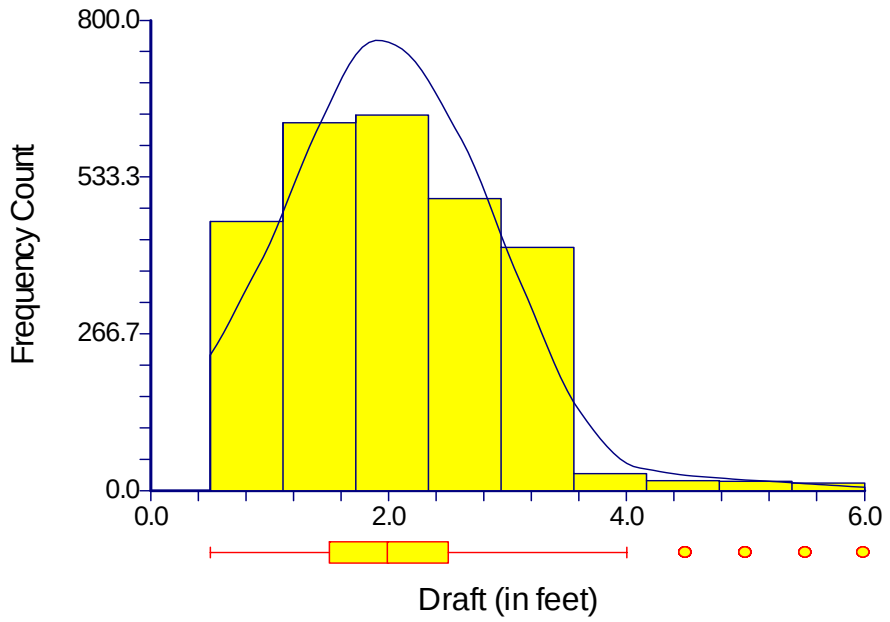
**Table L1. Summary Draft Statistics for Lee County OWC Vessels**

| | |
|---|---|
| Variable: DRAFT* | |
| N = 2709 | |
| Mean = 1.9928 | Confidence interval for mean: |
| Std. Dev. = 0.8822 | 95% lower = 1.9928 |
| Minimum = 0.5 | 95% upper = 2.0260 |
| Maximum = 6.0 | |
| Range = 5.5 | |
| **Normality test**: | |
| Shapiro-Wilk Test W = 0.9370 | (Reject normality @ 95% confidence) |
| Kolmogorov-Smirnov d = 0.1327 | (Reject normality @ 95% confidence) |
| D'Agostino Skewness = 11.4083 | (Reject normality @ 95% confidence) |
| D'Agostino Kurtosis = 9.1682 | (Reject normality @ 95% confidence) |

*measured in feet, rounded to the nearest 0.5-foot.

| Variable | Count |
|---|---|
| DRAFT | N = 2709 |
| DRAFTC (OWC/VTRS) Congruence | N = 2165 |
| DRAFTNC (OWC/VTRS) Non-congruence | N = 544 |

**Figure L1. Histogram of Draft for Lee County OWC Vessels**




Note: The distribution appears to be non-normal, uni-modal, and positively skewed.

**Table L2. Summary Draft Statistics for Congruent Lee County OWC Vessels**

Variable: DRAFTC (draft if OWC/VTRS congruence)

n = 2165
Mean = 2.0219
Std. Dev. = 0.8160
Minimum = 0.5
Maximum = 6.0
Range = 5.5

Confidence interval for mean:
95% lower = 1.9876
95% upper = 2.0563

Normality test:

| | |
|---|---|
| Shapiro-Wilk Test W = 0.94236 | (Reject normality @ 95% confidence) |
| Kolmogorov-Smirnov d = 0.1407 | (Reject normality @ 95% confidence) |
| D'Agostino Skewness = 8.3101 | (Reject normality @ 95% confidence) |
| D'Agostino Kurtosis = 7.0599 | (Reject normality @ 95% confidence) |

**Figure L2. Histogram of Draft for Congruent Lee County OWC Vessels**

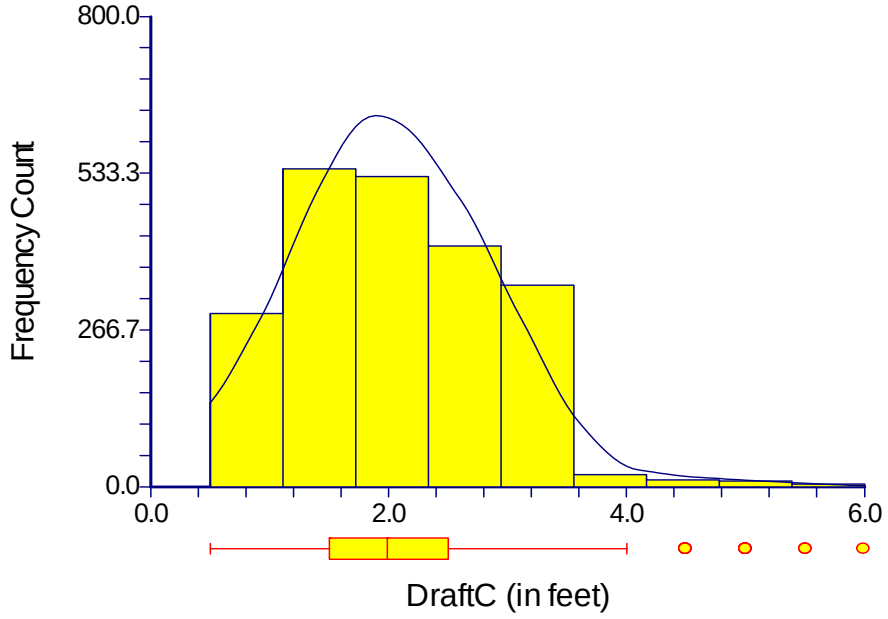


**Table L3. Summary Draft Statistics for Non-Congruent Lee County OWC Vessels**

Variable: DRAFTNC (draft if OWC/VTRS non-congruence)

n = 544
Mean = 1.8768
Std. Dev. = 1.1006
Minimum = 0.5
Maximum = 6.0
Range = 5.5

Confidence interval for mean:
95% lower = 1.7843
95% upper = 1.9693

Normality test:

| | |
|---|---|
| Shapiro-Wilk Test W = 0.9073 | (Reject normality @ 95% confidence) |
| Kolmogorov-Smirnov d = 0.1153 | (Reject normality @ 95% confidence) |
| D'Agostino Skewness = 7.3833 | (Reject normality @ 95% confidence) |
| D'Agostino Kurtosis = 4.2160 | (Reject normality @ 95% confidence) |

**Figure L3. Histogram of Draft for Non-Congruent Lee County OWC Vessels**

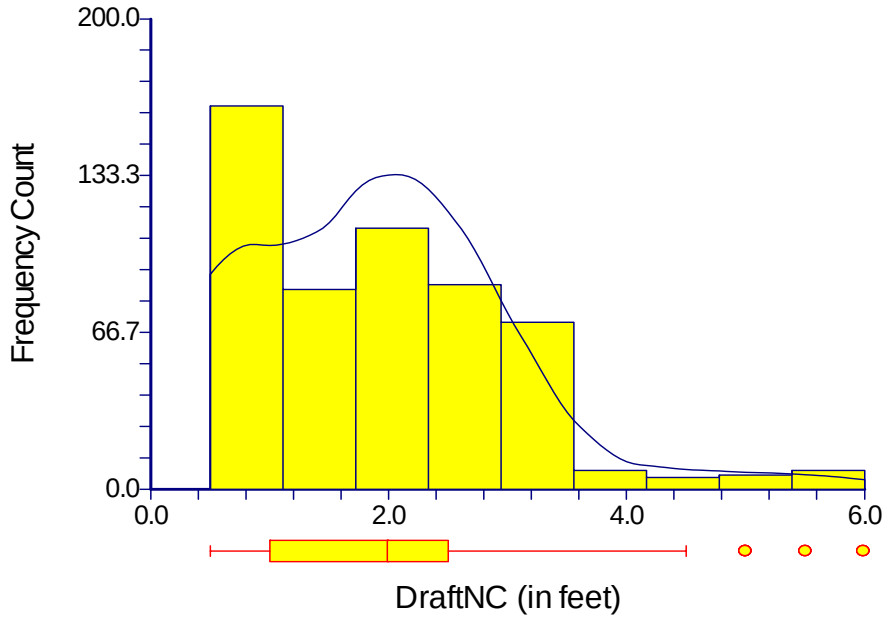


**Table L4. Comparison of Samples (DRAFTC vs. DRAFTNC) for Lee County OWC Vessels**

| | |
|---|---|
| Two-sample t-test (Ho: equality of means): Aspin-Welch unequal variance test | |
| t = 2.8833 | (p=0.00405)-- two tailed test |
| t = 2.8833 | (p=.002028)-- one-tailed test |
| | Ha: mean DRAFTC > mean DRAFTNC |
| | Result: Reject null hypothesis at 95% confidence level |
| | (Reject equality of means) |
| Variance-ratio test (Ho: equality of variance) | |
| VR = 1.8192 | (p=0.0000) |
| | Result: Reject null hypothesis at 95% confidence level |
| | (Reject equal variance assumption) |
| Mann-Whitney U / Wilcoxon Rank-Sum test (Ho: equality of medians) | |
| Z = -4.1365 | (p=0.00003) |
| | Result: Reject null hypothesis at 95% confidence level |
| | (Reject equality of medians) |
| Kolmogorov-Smirnov test for Different Distributions | |
| (Ho: distributions are not statistically dissimilar from one another) | |
| D(max) = 0.1633 | (reject if greater than 0.0652) |
| | Result: Reject null hypothesis at 95% confidence level |
| | (There is statistical evidence of different distributions) |

**Figure L4. Box Plots of DRAFTC and DRAFTNC for Lee County OWC Vessels**

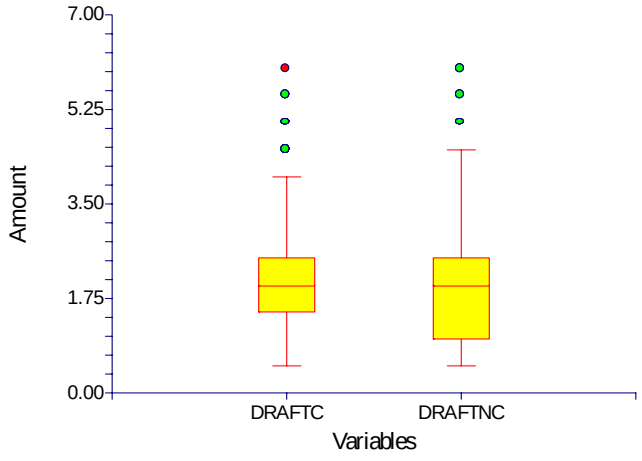


**Table L5. Comparison of DRAFT and DRAFTC for Lee County OWC Vessels**

| | | | | 95% confidence interval (of mean) | |
|---|---|---|---|---|---|
| | n | mean | std. dev | lower | upper |
| DRAFT | 2709 | 1.9928 | 0.8822 | 1.9596 | 2.0260 |
| DRAFTC | 2165 | 2.0219 | 0.8160 | 1.9876 | 2.0563 |

Two-sample t-test (Ho: equality of means)

t = -1.1847 (p=0.23619)-- two tailed test

Result: Fail to reject null hypothesis at 95% confidence level (two-tailed test)
(Cannot reject equality of means)

Variance-ratio test (Ho: equality of variance)
VR = 1.1690 (p=0.000130)

Result: Reject null hypothesis at 95% confidence level
(Reject equal variance assumption)

Aspin-Welch t-test for unequal-variance

t = -1.1950 (p=0.23212)

Result: Fail to reject null hypothesis at 95% confidence level
(Cannot reject equality of means)

Mann-Whitney U / Wilcoxon Rank-Sum test (Ho: equality of medians)
Z = 1.3835 (p=0.16651)

Result: Fail to reject null hypothesis at 95% confidence level
(Cannot reject equality of medians)

Kolmogorov-Smirnov test for Different Distributions
(Ho: distributions are not statistically dissimilar from one another)

D(max) = 0.03280 (reject if greater than 0.0392)

Result: Fail to reject null hypothesis at 95% confidence level
(There is no evidence of different distributions)

**Conclusion: There is no statistical difference in the means, medians, or distributions of DRAFT and DRAFTC for Lee County at the 95% confidence level.**

**Figure L5. Comparison of the Distributions of DRAFT vs. DRAFTC for Lee County OWC Vessels**

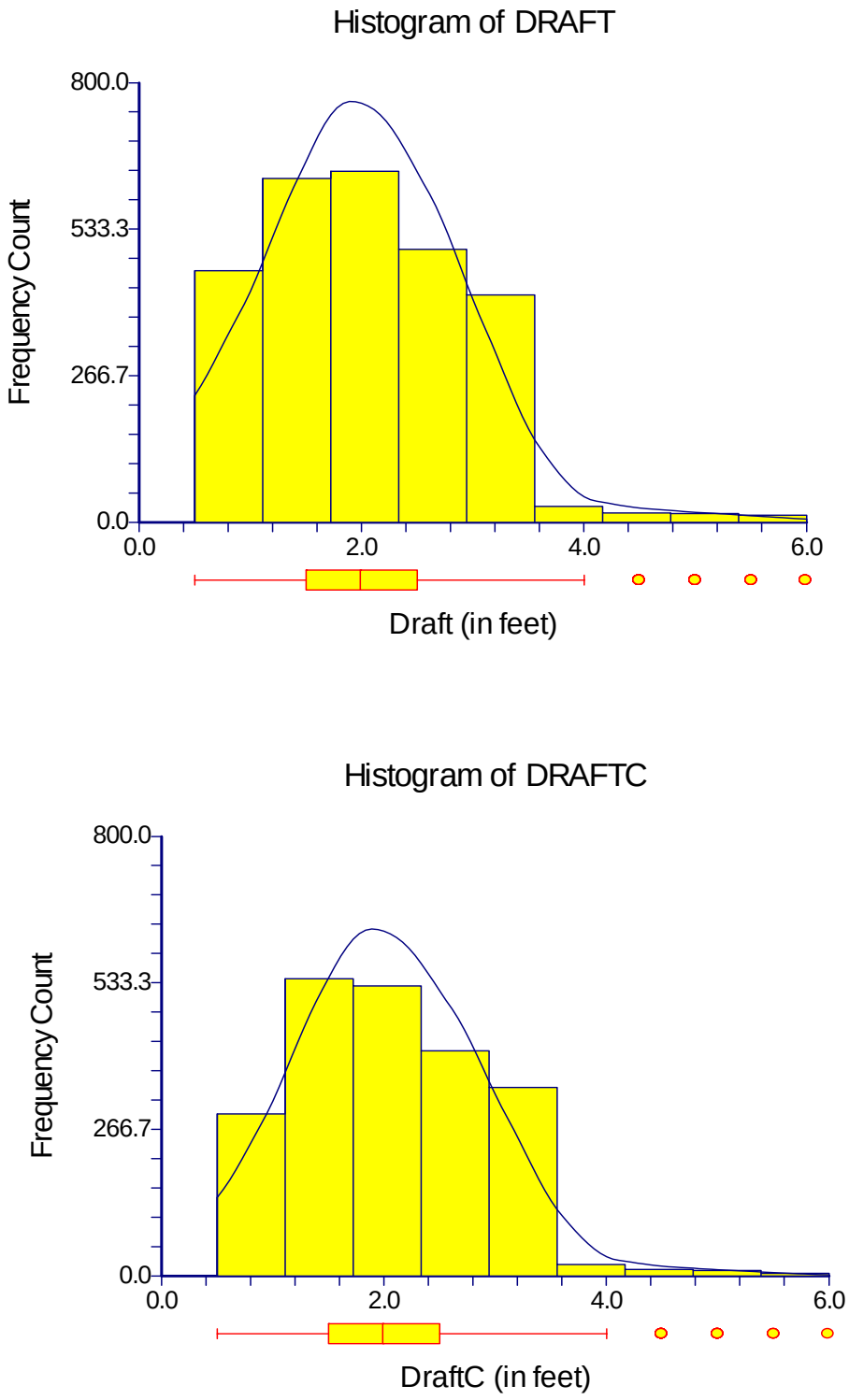


**Table L6. Summary Table of DRAFTC vs. DRAFT by Trafficshed for Lee County OWC Vessels**

Variables: DRAFTC vs. DRAFT
DRAFTC = draft for cases involving OWC/VTRS congruency
DRAFT = draft for all OWC cases (congruency or non-congruency)

| | Statistical results/evidence of… | | | |
|---|---|---|---|---|
| **Trafficshed** | **equal means?** | **equal variances?** | **equal medians?** | **similar distributions?** |
| County | Yes | Yes | Yes | Yes |
| 6022 | Yes | Yes | Yes | Yes |
| 6028* | Yes | Yes | Yes | Yes |
| 5040 | Yes | Yes | Yes | Yes |
| 6016 | Yes | Yes | Yes | Yes |
| 6053 | Yes | Yes | Yes | Yes |
| 5041 | Yes | Yes | Yes | Yes |
| 6038** | -- | -- | -- | -- |
| 6010 | Yes | Yes | Yes | Yes |
| 6055* | Yes | Yes | Yes | Yes |
| 6001 | Yes | Yes | Yes | Yes |
| 6009 | Yes | Yes | Yes | Yes |
| 6010 | Yes | Yes | Yes | Yes |
| 6008 | Yes | Yes | Yes | Yes |
| 6037 | Yes | Yes | Yes | Yes |
| 6002 | Yes | Yes | Yes | Yes |
| 6049 | Yes | Yes | Yes | Yes |
| 6050 | Yes | Yes | Yes | Yes |
| 6036 | Yes | Yes | Yes | Yes |
| 5029 | Yes | Yes | Yes | Yes |
| 5025 | Yes | Yes | Yes | Yes |
| 5022* | Yes | Yes | Yes | Yes |
| 4035 | Yes | Yes | Yes | Yes |
| 5031 | Yes | Yes | Yes | Yes |
| 4030 | Yes | Yes | Yes | Yes |
| 4033* | Yes | Yes | Yes | Yes |
| | | (% of trafficsheds) | | |
| % Yes | 100% | 100% | 100% | 100% |

- Results based on small sample(s) (when n<40 in at least one sample); ** insufficient sample size (no conclusions can be reached).
- In all cases (i.e., trafficsheds), there was sufficient statistical evidence to suggest that the means, medians, and distributions of the variables DRAFT and DRAFTC were not significantly different from one another at the 95% confidence level.

# Appendix M. Draft Analysis Statistics for Manatee County

**Table M1. Summary Draft Statistics for Manatee County OWC Vessels**

| | |
|---|---|
| Variable: DRAFT (observed)* | |
| N = 1395 | |
| Mean = 1.843 | Confidence Interval for mean: |
| Std. Dev. = 0.7266 | 95% lower = 1.80523 |
| Minimum = 0.5 | 95% upper = 1.88150 |
| Maximum = 5.0 | |
| Range = 4.5 | |
| **Normality test**: | |
| Shapiro-Wilk Test W = 0.94267 | (Reject normality @ 95% confidence) |
| Kolmogorov-Smirnov d = 0.1365 | (Reject normality @ 95% confidence) |
| D'Agostino Skewness = 4.896 | (Reject normality @ 95% confidence) |
| D'Agostino Kurtosis = 4.3927 | (Reject normality @ 95% confidence) |

*measured in feet, rounded to the nearest 0.5-foot.

| Variable | Count |
|---|---|
| DRAFT | N = 1395 |
| DRAFTC (OWC/VTRS) Congruence | N = 859 |
| DRAFTNC (OWC/VTRS) Non-congruence | N = 536 |

**Figure M1. Histogram of Draft for Manatee County OWC Vessels**

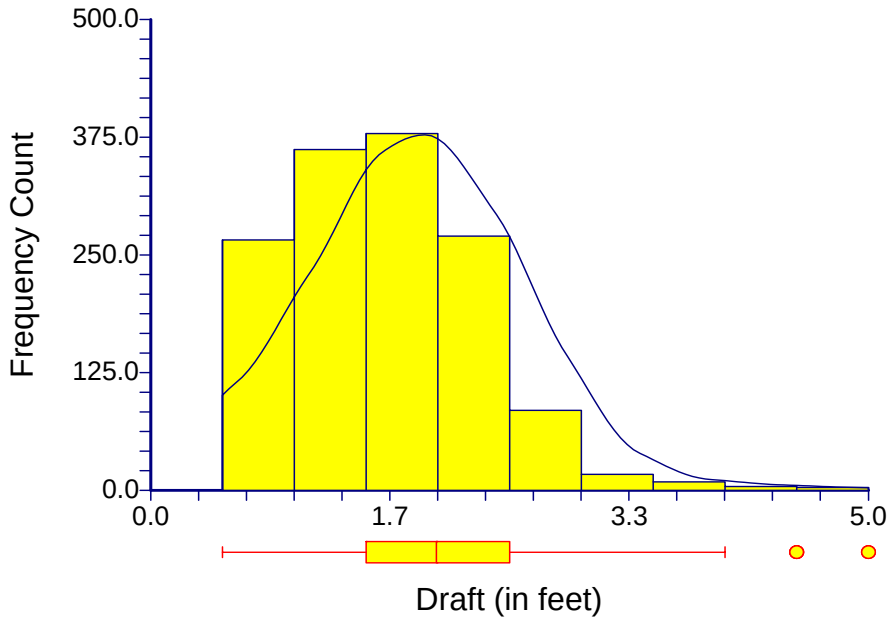


**Table M2. Summary Draft Statistics for Congruent Manatee County OWC Vessels**

Variable: DRAFTC (draft if OWC/VTRS congruence)

n = 859
Mean = 1.8690
Std. Dev. = 0.7132
Minimum = 0.5
Maximum = 5.0
Range = 4.5

Confidence interval for mean:
95% lower = 1.8213
95% upper = 1.9167

Normality test:

| | |
|---|---|
| Shapiro-Wilk Test W = 0.94376 | (Reject normality @ 95% confidence) |
| Kolmogorov-Smirnov d = 0.1352 | (Reject normality @ 95% confidence) |
| D'Agostino Skewness = 3.1123 | (Reject normality @ 95% confidence) |
| D'Agostino Kurtosis = 3.2952 | (Reject normality @ 95% confidence) |

---

**Figure M2. Histogram of Draft for Congruent Manatee County OWC Vessels**

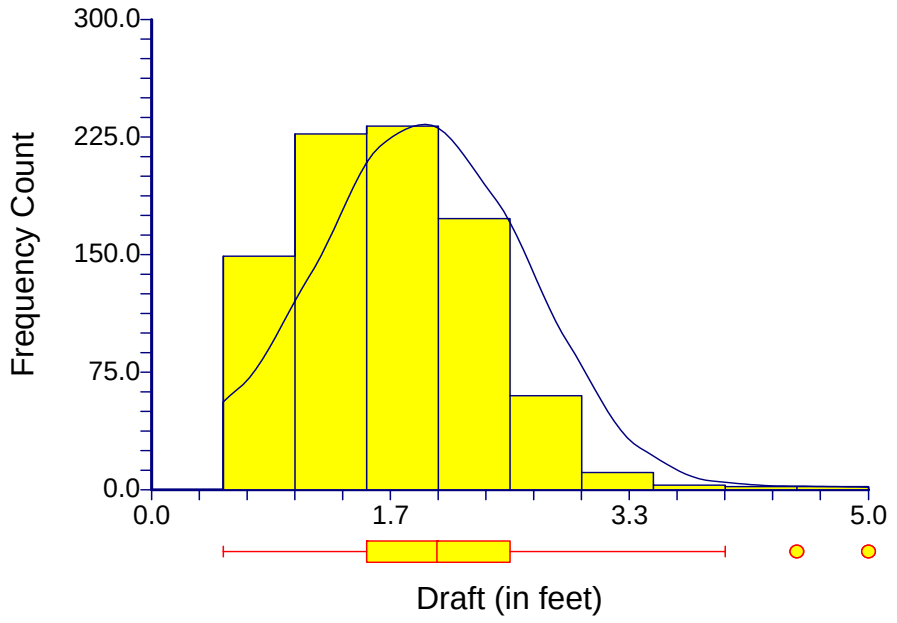



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**Table M3. Summary Draft Statistics for Non-Congruent Manatee County OWC Vessels**

Variable: DRAFTNC (draft if OWC/VTRS non-congruence)

n = 536
Mean = 1.8022
Std. Dev. = 0.7463
Minimum = 0.5
Maximum = 5.0
Range = 4.5

Confidence interval for mean:
95% lower = 1.7390
95% upper = 1.8654

Normality test:

| | |
|---|---|
| Shapiro-Wilk Test W = 0.9386 | (Reject normality @ 95% confidence) |
| Kolmogorov-Smirnov d = 0.1399 | (Reject normality @ 95% confidence) |
| D'Agostino Skewness = 3.9996 | (Reject normality @ 95% confidence) |
| D'Agostino Kurtosis = 3.1787 | (Reject normality @ 95% confidence) |

**Figure M3. Histogram of Draft for Non-Congruent Manatee County OWC Vessels**

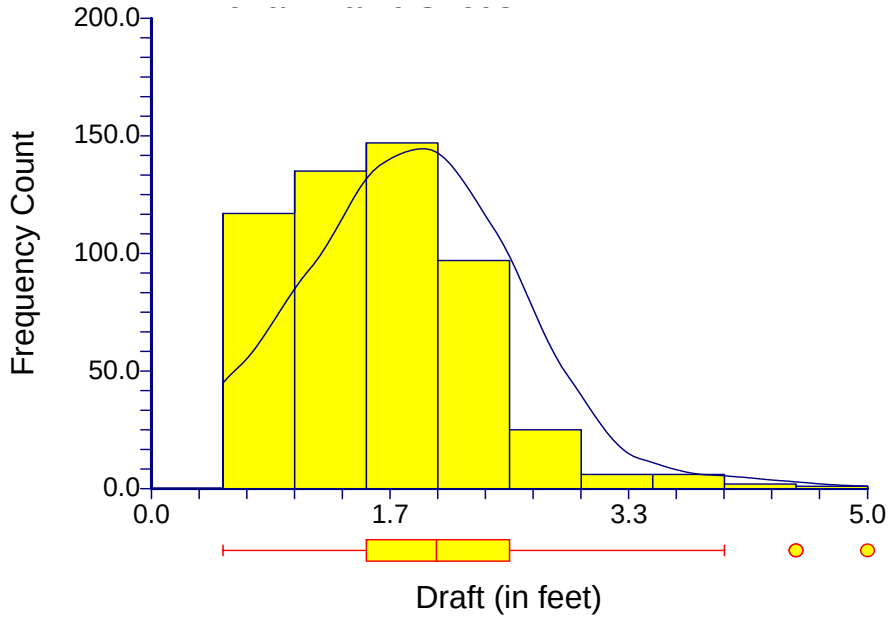


**Table M4. Comparison of Samples (DRAFTC vs. DRAFTNC) for Manatee County OWC Vessels**

| | |
|---|---|
| Two-sample t-test (Ho: equality of means): Equal variance test | |
| t = 1.6711 | (p=0.09492)-- two tailed test |
| t = 1.6711 | (p=.04746)-- one-tailed test |
| | Ha: mean DRAFTC > mean DRAFTNC |
| | Result: Fail to Reject Ho at 95% confidence level (two-tailed test) |
| | Reject Ho at 95% confidence level (one-tailed test) |
| Variance-ratio test (Ho: equality of variance) | |
| VR = 1.2682 | (p=0.2603) |
| | Result: Fail to Reject null hypothesis (Ho) at 95% confidence level |
| | (Cannot reject equal variance assumption) |
| Mann-Whitney U / Wilcoxon Rank-Sum test (Ho: equality of medians) | |
| Z = -1.8739 | (p=0.06095) |
| | Result: Fail to reject null hypothesis at 95% confidence level |
| | (Cannot reject equality of medians) |
| Kolmogorov-Smirnov test for Different Distributions | |
| (Ho: distributions are not statistically dissimilar from one another) | |
| D(max) = 0.04482 | (reject if greater than 0.0749) |
| | Result: Fail to reject null hypothesis at 95% confidence level |

**Figure M4. Box plots of DRAFTC and DRAFTNC for Manatee County OWC Vessels**

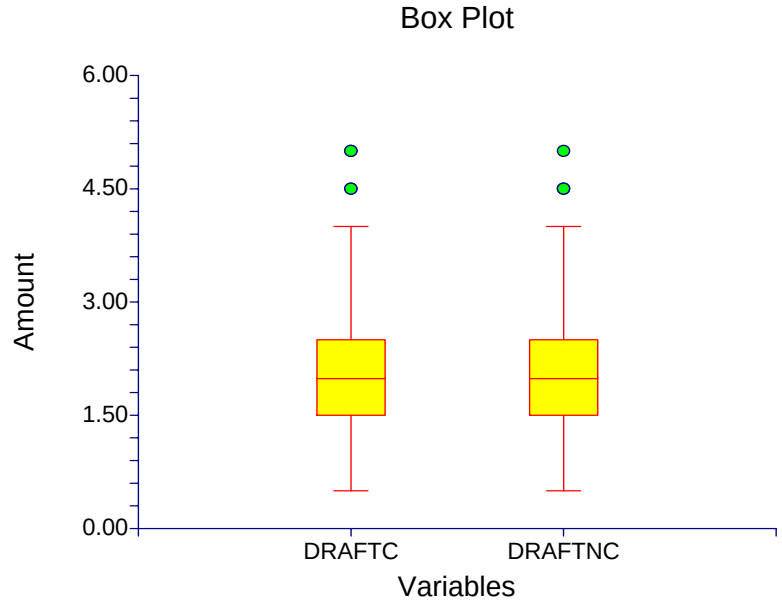


**Table M5. Comparison of DRAFT and DRAFTC for Manatee County OWC Vessels**

| | | | | 95% confidence interval (of mean) | |
|---|---|---|---|---|---|
| | n | mean | std. dev | lower | upper |
| DRAFT | 1395 | 1.8433 | 0.7266 | 1.8052 | 1.8815 |
| DRAFTC | 859 | 1.8690 | 0.7132 | 1.8213 | 1.9167 |

Two-sample t-test (Ho: equality of means): Equal variance test

t = -0.8201 (p=0.412252)-- two tailed test

Result: Fail to Reject null hypothesis at 95% confidence level (two-tailed test)
(Cannot reject equality of means)

Variance-ratio test (Ho: equality of variance)
VR = 1.0378 (p=0.545446)

Result: Fail to reject null hypothesis at 95% confidence level
(Cannot reject equal variance assumption)

Mann-Whitney U / Wilcoxon Rank-Sum test (Ho: equality of medians)
Z = 0.9141 (p=0.36065)

Result: Fail to Reject null hypothesis at 95% confidence level
(Cannot reject equality of medians)

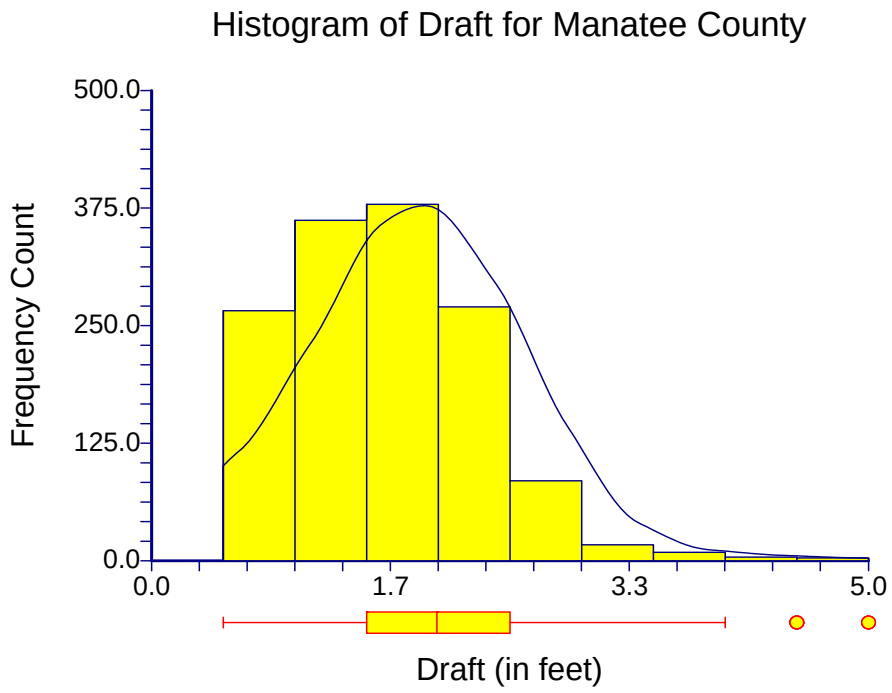
Kolmogorov-Smirnov test for Different Distributions
(Ho: distributions are not statistically dissimilar from one another)

D(max) = 0.017223 (reject if greater than 0.0590)

Result: Fail to Reject null hypothesis at 95% confidence level
(There is no statistical evidence of dissimilar distributions)

**Conclusion: There is no discernible statistical difference in the means, medians, or distributions of DRAFT and DRAFTC for Manatee County at the 95% confidence level.**

**Figure M5. Comparison of the Distributions of DRAFT vs. DRAFTC for Manatee County OWC Vessels**



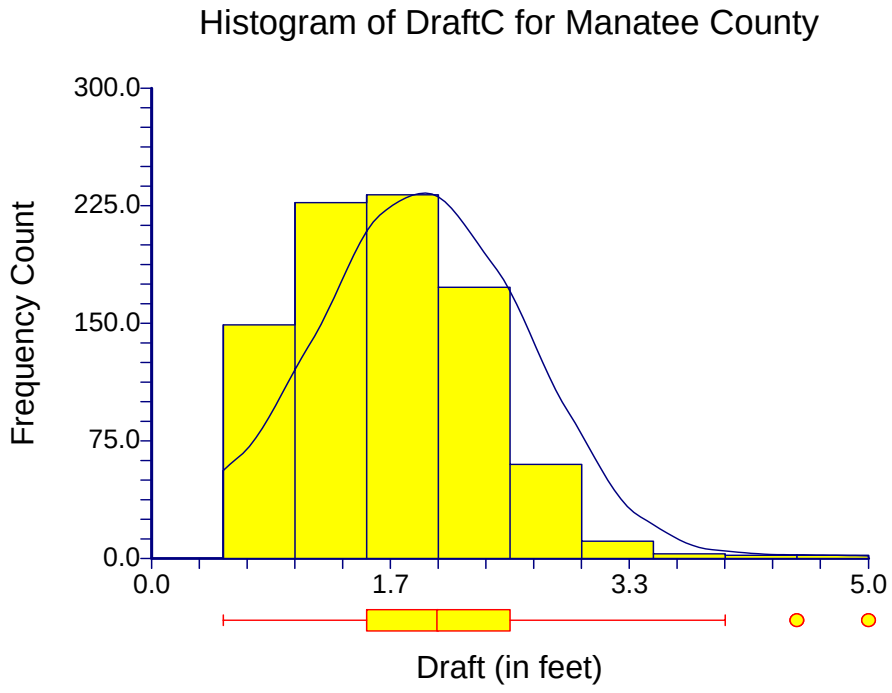



**Table M6. Summary Table of Statistical Results by Trafficshed for Manatee County OWC Vessels**

Variables: DRAFTC vs. DRAFT
DRAFTC = draft for cases involving OWC/VTRS congruency
DRAFT = draft for all OWC cases (congruency or non-congruency)

| | Statistical evidence of… | | | |
|---|---|---|---|---|
| **Traffic Shed (ID)** | **equal means?** | **equal variances?** | **equal medians?** | **similar distributions?** |
| All | Yes | Yes | Yes | Yes |
| 3006 | Yes | Yes | Yes | Yes |
| 3241 | Yes | Yes | Yes | Yes |
| 3070 | Yes | Yes | Yes | Yes |
| 3004 | Yes | Yes | Yes | Yes |
| 3239 | Yes | Yes | Yes | Yes |
| 1004 | Yes | Yes | Yes | Yes |
| 3048 | Yes | Yes | Yes | Yes |
| 3071 | Yes | Yes | Yes | Yes |
| 3238 | Yes | Yes | Yes | Yes |
| 3067 | Yes | Yes | Yes | Yes |
| 1044 | Yes | Yes | Yes | Yes |
| 1046 | Yes | Yes | Yes | Yes |
| 1010 | Yes | Yes | Yes | Yes |
| 3237 | Yes | Yes | Yes | Yes |
| 1045 | Yes | Yes | Yes | Yes |
| 8002 | Yes | Yes | Yes | Yes |
| 1005 | Yes | Yes | Yes | Yes |
| 3097 | Yes | Yes | Yes | Yes |
| 3190 | Yes | Yes | Yes | Yes |
| 8001 | Yes | Yes | Yes | Yes |
| 1047 | Yes | Yes | Yes | Yes |
| 3002 | Yes | Yes | Yes | Yes |
| 3113 | Yes | Yes | Yes | Yes |
| | | (% of trafficsheds) | | |
| % Yes | 100% | 100% | 100% | 100% |

Note: Some results are based on small sample(s) (when n<40 in at least one sample).
* Insufficient sample size (no conclusions can be reached).
In all cases (trafficsheds), there was sufficient statistical evidence to suggest that the means, medians, and distributions of the variables DRAFT and DRAFTC were not significantly different from one another at the 95% confidence level. This result also holds at the county level.

# Appendix N. Draft Comparisons: Lee County versus Manatee County

**Table N1. Lee County and Manatee County Draft: Equality of Means and Variance**

Variance-Ratio Test – Ho: Equality of Variance

| | |
|---|---|
| VR = 1.4572 | (0.0000) Reject Ho at 95% confidence level |
| Levene's = 30.6745 | (0.0000) Reject Ho at 95% confidence level |

Equality of Means Test – Ho: Equal Means
Aspin-Welch Unequal-Variance Equality of Means Test:

| Alternative Hypothesis | t-stat | probability | decision |
|---|---|---|---|
| Mean Draft(Lee) <> Mean Draft(Manatee) | 5.792 | (0.0000) | Reject Ho |
| Mean Draft(Lee) > Mean Draft(Manatee) | 5.792 | (0.0000) | Reject Ho |

**Figure N1. Box plots of DRAFT for Lee and Manatee Counties**

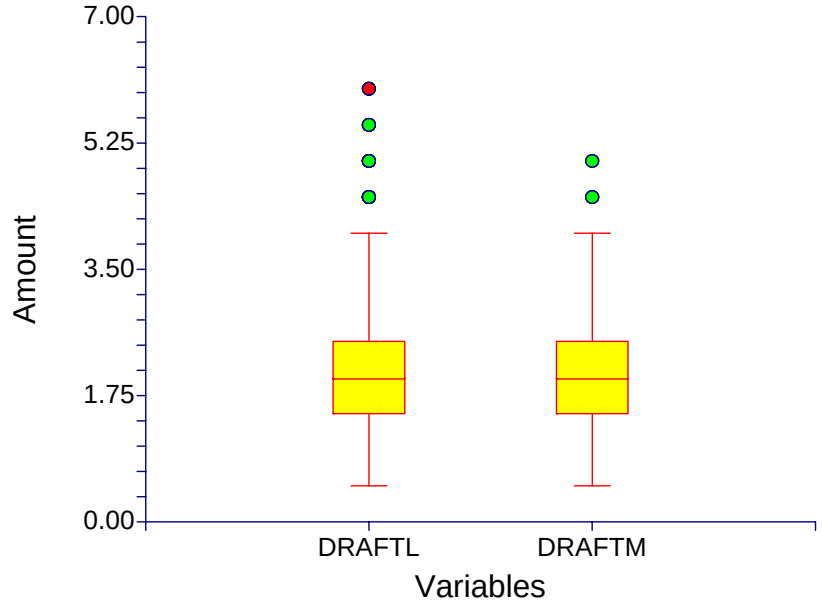


**Table N2. Lee County and Manatee County Draft: Equality of Means and Variance with Extreme Outliers Removed**

Variance-Ratio Test – Ho: Equality of Variance

| | |
|---|---|
| VR = 1.3551 | (0.0000) Reject Ho at 95% confidence level |
| Levene's = 24.700 | (0.0000) Reject Ho at 95% confidence level |

Equality of Means Test – Ho: Equal Means
Aspin-Welch Unequal-Variance Equality of Means Test:

| Alternative Hypothesis | t-stat | probability | decision |
|---|---|---|---|
| Mean Draft(Lee) <> Mean Draft(Manatee) | 4.944 | (0.0000) | Reject Ho |
| Mean Draft(Lee) > Mean Draft(Manatee) | 4.944 | (0.0000) | Reject Ho |

# Appendix O. Draft Analysis of OWC Vessels with Drafts 1 Foot or Greater

**Table O1. Draft Comparison Statistics and ANOVA Results for OWC Vessels with Drafts 1 foot Draft and Greater**

DRAFT5 draft for all OWC vessels with a draft 1 foot or greater
DRAFTNC5 draft for OWC vessels with a draft 1 foot or greater, which are non-congruent with a VTRS record
DRAFTC5 draft for OWC with a draft 1 foot or greater, which are congruent with a VTRS record

| | | | | 95% confidence interval | |
|---|---|---|---|---|---|
| Variable | n (count) | mean | std. dev. | Lower | Upper |
| DRAFT51 | 4489 | 2.08632 | 0.7239 | 2.0651 | 2.1075 |
| DRAFTNC5 | 916 | 2.07969 | 0.8166 | 2.0268 | 2.1325 |
| DRAFTC5 | 3573 | 2.08802 | 0.6983 | 2.0651 | 2.1109 |
| All | 8978 | 2.086 | | | |

**ANOVA Table**

| Source | d.f. | Sum of Squares | Mean square | F | prob. |
|---|---|---|---|---|---|
| Between Group | 2 | 5.055342E-02 | 2.527671E-02 | 0.05 | (.9529) |
| Within Group | 8975 | 4704.55 | 0.52418 | | |
| Total (adjusted) | 8977 | 4704.60 | | | |
| Total | 8978 | | | | |

**Test Result**: "Fail to Reject" null hypothesis (Ho): Equality of Means at the 95% confidence level. There is no statistical evidence to indicate a difference in the mean draft for the three cases examined.

Note that the Equal Variance assumption is rejected at the 95% confidence level as based on the modified Levene's Equal-Variance Test, where L=3.604 (probability of 0.0272).

**Table O2. Kruskal-Wallis One-Way ANOVA Results for OWC Vessels with Drafts 1 Foot and Greater**

**Kruskal-Wallis One-Way ANOVA on Ranks**
**Hypotheses:** Ho: Equality of Medians
Ha: At least two medians are different

K-W Test Statistics:

| Method | d.f. | Chi-Square | probability | Decision |
|---|---|---|---|---|
| Not corrected for ties | 2 | 2.26309 | 0.32254 | Fail to Reject Ho |
| Corrected for ties (number of ties =11) | 2 | 2.38586 | 0.30333 | Fail to Reject Ho |

| Group/Case | count | Mean Rank | Z-value | median |
|---|---|---|---|---|
| DRAFT5 | 4489 | 4489.5 | 0.00000 | 2.0 |
| DRAFTNC5 | 916 | 4374.5 | -1.4163 | 2.0 |
| DRAFTC5 | 3573 | 4518.9 | 0.8758 | 2.0 |

Test results: "Fail to Reject" the null hypothesis at the 95% confidence level. There is no statistical evidence to indicate that median draft is different for the three cases examined.

**Figure O1. Box Plot of Draft for OWC Vessels with Drafts 1 Foot and Greater**

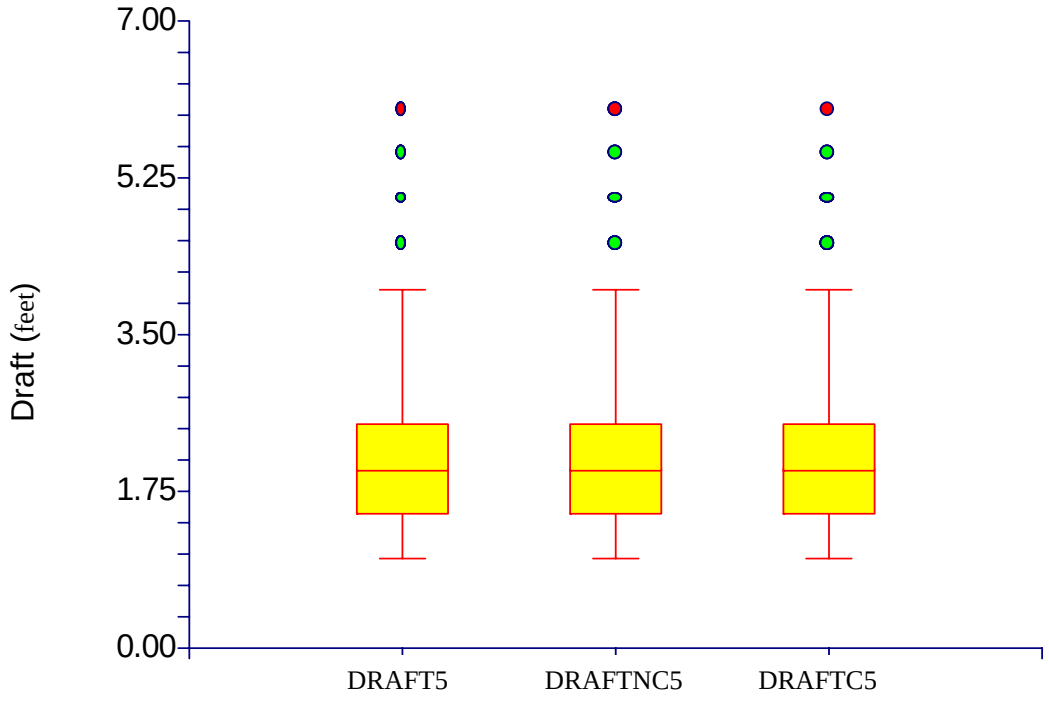


**Table O3. Comparison of Distribution Test Results for OWC Vessels with Drafts 1 Foot or Greater**

Comparisons

DRAFT5 vs. DRAFTNC5: comparing distribution of draft for all OWC draft values to distribution of draft for OWC vessels that are non-congruent with VTRS record

DRAFTNC5 vs. DRAFTC5: comparing distribution of draft for OWC vessels that are non-congruent with VTRS record to distribution of draft for vessels where there is OWC/VTRS congruence.

DRAFT5 vs. DRAFTC5: comparing distribution of draft for all OWC draft values to distribution of draft for vessels where there is OWC/VTRS congruence.

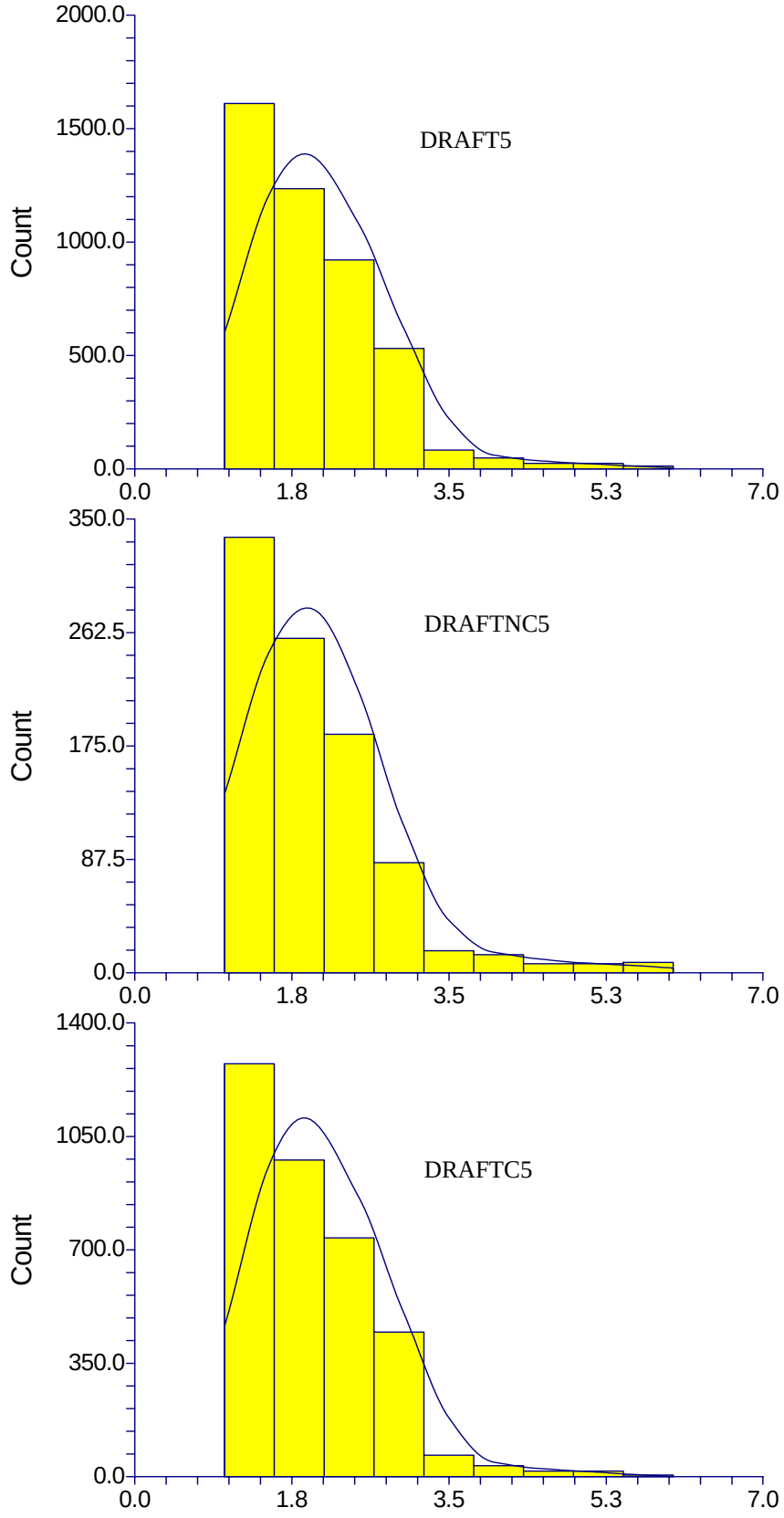
**Kolmogorov-Smirnov Test Results (two-tailed)**

Ho: Distributions are similar (i.e., distributions are not statistically dissimilar)
Ha: Distributions are not similar (i.e., distributions are statistically dissimilar)

| | D-statistic | Critical D | Decision (.05) | probability |
|---|---|---|---|---|
| DRAFT5 vs. DRAFTNC5 | 0.03775 | 0.0493 | Fail to Reject Ho | 0.2218 |
| DRAFTNC4 vs. DRAFTC5 | 0.04743 | 0.0504 | Fail to Reject Ho | 0.0724 |
| DRAFT5 vs. DRAFTC5 | 0.00967 | 0.0305 | Fail to Reject Ho | 0.9999 |

Test results: There is no statistical evidence that the distributions are dissimilar at the 95% confidence level for the three cases (and three pairs of cases) examined. In other words, there exists no significant difference in the distributions of draft across the cases examined.

**Figure O2. Histograms showing the Distributions of OWC Vessels with Drafts 1 Foot and Greater**



# Appendix P: Telephone Survey Questionnaires

**Introduction:**
Hello, I am calling from the Florida Survey Research Center at the University of Florida to speak with <OWNER NAME>.

**If <OWNER NAME> is not available then ask**:
Can some else answer questions about boats that may have been owned by him/her or registered in his/her name during [2002;2003]?

**Wait for OWNER to come to phone and repeat introduction and read following:**
We are conducting a survey to help better prioritize maintenance dredging of waterways in [Lee, Manatee] County. This requires address information on boats located along waterways and within canals. The purpose of this call is to determine whether address information that you provide on your vessel registration renewal form can be used for this effort. May I ask you a few questions; the survey should only take about 3 minutes and your answers will be completely confidential.

---

Yes ____; if case type = 1; go to **CASE 1 (VTRS Site; no OWC)**
if case type = 2; go to **CASE 2 (OWC; no VTRS)**
if case type = 3; go to **CASE 3 (FL MATCH)**
if case type = 4; go to **CASE 4 (Mail Match)**
if case type = 5; go to **CASE 5 (Parcel—no Boat)**

No ____; *If nobody is available, then get name, date, time, and telephone number to call back.*

Name: _____

Date: _____

Time: _____

Telephone number: _____

Stop ____; *If Stop, then state reason and end survey*

Reason: _____

***GO TO FINAL SECTION AFTER CASES 1-4 EXHAUSTED FOR A CALL***

# CASE 1

**Question 1a.** In [July 2002; February 2003], did you or someone at this residence own a model year <MODEL YEAR> <LENGTH> boat manufactured by <MAKE MODEL>?

Yes ____; *proceed to **Question 1b***
No ____; *proceed to **NEXT CASE or FINAL SECTION***
Not Recognized ____; *proceed to **NEXT CASE or FINAL SECTION***
Don't know ____; p*roceed to **NEXT CASE or FINAL SECTION***
Refuse ____; *proceed to **NEXT CASE or FINAL SECTION***

*NOTE: if respondent offers additional boat make model information, enter below:*

| Characteristic | Boat |
|---|---|
| **ID Number** | (write ID number from Spreadsheet) |
| Model Year | |
| Length | |
| Corrected Make Model | |

**Question 1b.** What is the depth of the shallowest water which the boat can safely navigate without running aground? (*NOTE: write out measurement units when recording the answer*.)

| Characteristic | Boat | |
|---|---|---|
| Depth (feet and inches) | (feet) | (inches) |

Don't know _____; *proceed to **Question 1c***

**Question 1c**. Is <ADDRESS> in <CITY> <STATE> the location where the boat was ***normally*** kept in [2002; 2003]?

Yes _____; *proceed to **Question 1i***
No _____; *proceed to **Question 1d***
Don't know _____; p*roceed to **NEXT CASE or FINAL SECTION***
Refuse _____; *proceed to **NEXT CASE or FINAL SECTION***

**Question 1d.** Was the boat normally kept at a residence, or was it kept at a public or private facility, such as a marina, in [2002; 2003]?

Residence _____; *proceed to **Question 1e***
Facility _____; *proceed to **Question 1f***
Don't know _____; *proceed to **NEXT CASE or FINAL SECTION***
Refuse _____; *proceed to **NEXT CASE or FINAL SECTION***

**Question 1e**. What was the address of the residence where the boat was normally kept in [2002; 2003]?

(*NOTE: Obtain as much address detail as respondent willing to provide.*)

| Characteristic | Answer |
|---|---|
| Street number | |
| Street name | |
| City | |
| State | |
| ZIP code | |
| Don't know | |

*Proceed to **Question 1h***

**Question 1f.** What was the name of the facility (for example, marina name) and in what city and state was the facility located?

| Characteristic | Answer |
|---|---|
| Facility name | |
| City | |
| State | |

Don't know _____; *proceed to **Question 1g***
Refuse _____; *proceed to **Question 1g***

**Question 1g.** Why was the boat normally kept at a facility and not at your home in [2002; 2003]?

| Statements |
|---|
| Reason: |
| Reason: |
| Reason: |

*Proceed to **NEXT CASE or FINAL SECTION***

**Question 1h.** Please answer yes or no to the following questions with regard to the address where the boat was normally kept in [2002; 2003].

| QUESTIONS | Answer |
|---|---|
| Is the boat owner's home located at the address? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Is the location property that belongs to the boat owner? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does an acquaintance allow the owner to keep the boat at the location? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does the boat owner rent a slip or berth at location? | Yes No |
| **IF NO, THEN ASK:** Why is the boat kept at the location? | |
| | |

| NEXT SET OF QUESTIONS | Answer |
|---|---|
| Was the boat normally trailered from the address and launched at a facility or ramp? | Yes No |
| Does the property provide direct access to the water for boating, such as a slip or hoist? | Yes No |
| **IF YES, READ FOLLOWING QUESTIONS; ELSE LAST QUESTION** | |
| Are water depths leading from the location adequate at high tide? (deep enough) | Yes No |
| Are water depths leading from the location adequate at low tide? (deep enough) | Yes No |
| Does the location provide quick access to favorite boating destinations? | Yes No |

| LAST QUESTION |
|---|
| Are there other reasons why the boat is kept at this address? |
| Reason: |
| Reason: |
| Reason: |

*Proceed to **NEXT CASE or FINAL SECTION***

**Question 1j.** Did you normally trailer the boat from that address to another location where you launched the boat?

Yes _____; *proceed to **NEXT CASE or FINAL SECTION***
No _____; *proceed to **NEXT CASE or FINAL SECTION***
Don't know _____; p*roceed to **NEXT CASE or FINAL SECTION***
Refuse _____; *proceed to **NEXT CASE or FINAL SECTION***

***PROCEED TO NEXT CASE or FINAL SECTION***

# CASE 2

**Question 2a**. During a [July 2002; February 2003] county-wide boat census, a <MAKE MODEL> was located at <ADDRESS> in <CITY> <STATE>. Do you recognize that boat?

Yes ____; *proceed to **Question 2b***
No ____; *proceed to **NEXT CASE or FINAL SECTION***
Refuse ____; *proceed to **NEXT CASE or FINAL SECTION***

*NOTE: if respondent offers additional boat make model information, enter below:*

| Characteristic | Boat |
|---|---|
| **ID Number** | (write ID number from Spreadsheet) |
| Model Year | |
| Length | |
| Corrected Make Model | |

**Question 2b**. At the time of the [July 2002; February 2003] census were you or someone else at this residence the owner of the boat?

Yes ____; *proceed to **Question 2c***
No ____; *proceed to **Question 2n***
No knowledge of boat____; *proceed to **NEXT CASE or FINAL SECTION***
Previous home owner ____; p*roceed to **NEXT CASE or FINAL SECTION***
Refuse ____; *proceed to **NEXT CASE or FINAL SECTION***

**Question 2c.** What is the depth of the shallowest water which the boat can safely navigate without running aground? (Alternate question: What is the draft of the vessel)?

(*NOTE: write out measurement units when recording the answer.*)

| Characteristic | Boat | |
|---|---|---|
| Depth (feet and inches) | (feet) | (inches) |

Don't know _____; *proceed to **Question 2d***

**Question 2d**. Was the boat registered in [2002; 2003] and, if so, in what state?

Yes _____;
If Yes, what state? _____; *If FLORIDA, proceed to **Question 2e***
*Else, proceed to **Question 2g***
No _____; *proceed to **Question 2g***
Don't know _____; *proceed to **Question 2g***
Refuse _____; *proceed to **Question 2g***

**Question 2e**. Is <ADDRESS> in <CITY> <STATE> the mailing address that would have been listed on the vessel registration renewal form in [2002; 2003]?

| | |
|---|---|
| Yes | ____; *proceed to* ***Question 2h*** |
| No | ____; *proceed to* ***Question 2f*** |
| Don't know | ____; *proceed to* ***Question 2h*** |
| Refuse | ____; *proceed to* ***Question 2h*** |

**Question 2f**. What is the mailing address that would have been listed on the vessel registration renewal form in [2002; 2003]?

(*NOTE: Obtain as much address detail as respondent willing to provide.*)

| Characteristic | Answer |
|---|---|
| Street Number | |
| Street Name | |
| City | |
| State | |
| ZIP code | |
| Don't Know | |

*Proceed to* ***Question 2h***

**Question 2g**. Was the boat documented by the Coast Guard in [2002; 2003]?

| | |
|---|---|
| Yes | ____; *proceed to* ***Question 2h*** |
| No | ____; *proceed to* ***Question 2h*** |
| Don't know | ____; *proceed to* ***Question 2h*** |
| Refuse | ____; *proceed to* ***Question 2h*** |

**Question 2h**. Is <ADDRESS> in <CITY> <STATE> the location where the boat was ***normally*** kept in [2002; 2003]?

| | |
|---|---|
| Yes | ____; *proceed to* ***Question 2m*** |
| No | ____; *proceed to* ***Question 2i*** |
| Don't know | ____; *proceed to* ***NEXT CASE or FINAL SECTION*** |
| Refuse | ____; *proceed to* ***Question 2i*** |

**Question 2i**. Was the boat normally kept at a residence, or was it kept at a public or private facility, such as a marina, in [2002; 2003]?

| | |
|---|---|
| Residence | _____; *proceed to* ***Question 2j*** |
| Facility | _____; *proceed to* ***Question 2k*** |
| Don't know | _____; *proceed to* ***NEXT CASE or FINAL SECTION*** |
| Refuse | _____; *proceed to* ***NEXT CASE or FINAL SECTION*** |

**Question 2j**. What was the address of the residence where the boat was normally kept in [2002; 2003]?

(*NOTE: Obtain as much address detail as respondent willing to provide.*)

| Characteristic | Answer |
|---|---|
| Street number | |
| Street name | |
| City | |
| State | |
| ZIP code | |
| Don't Know | |

*Proceed to **Question 2m***

**Question 2k**. What was the name of the facility (for example, marina name) and in what city and state was the facility located?

| Characteristic | Answer |
|---|---|
| Facility name | |
| City | |
| State | |

Don't know _____; *proceed to **Question 2l***
Refuse _____; *proceed to **Question 2l***

**Question 2l.** Why was the boat normally kept at a facility and not at your home in [2002; 2003]?

| Statements |
|---|
| Reason: |
| Reason: |
| Reason: |

*Proceed to **NEXT CASE or FINAL SECTION***

**Question 2m**. Please answer yes or no to the following questions with regard to the address where the boat was normally kept in [2002; 2003]?

| QUESTIONS | Answer |
|---|---|
| Is the boat owner's home located at the address? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Is the location property that belongs to the boat owner? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does an acquaintance allow the owner to keep the boat at the location? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does the boat owner rent a slip or berth at location? | Yes No |
| **IF NO, THEN ASK:** Why is the boat kept at the location? | |
| | |

| NEXT SET OF QUESTIONS | Answer |
|---|---|
| Was the boat normally trailered from the address and launched at a facility or ramp? | Yes No |
| Does the property provide direct access to the water for boating, such as a slip or hoist? | Yes No |
| **IF YES, READ FOLLOWING QUESTIONS; ELSE LAST QUESTION** | |
| Are water depths leading from the location adequate at high tide? (deep enough) | Yes No |
| Are water depths leading from the location adequate at low tide? (deep enough) | Yes No |
| Does the location provide quick access to favorite boating destinations? | Yes No |

| LAST QUESTION |
|---|
| Are there other reasons why the boat is kept at this address? |
| Reason: |
| Reason: |
| Reason: |

*Proceed to **NEXT CASE or FINAL SECTION***

**Question 2n**. Does the boat belong to a neighbor?

| | |
|---|---|
| Yes | ____; *proceed to **NEXT CASE or FINAL SECTION*** |
| No | ____; *proceed to **Question 2o*** |
| Don't know | ____; p*roceed to **NEXT CASE or FINAL SECTION*** |
| Refuse | ____; *proceed to **NEXT CASE or FINAL SECTION*** |

**Question 2o**. Is the boat normally kept at this address?

| | |
|---|---|
| Yes | ____; *proceed to **NEXT CASE or FINAL SECTION*** |
| No | ____; *proceed to **NEXT CASE or FINAL SECTION*** |
| Don't know | ____; p*roceed to **NEXT CASE or FINAL SECTION*** |
| Refuse | ____; *proceed to **NEXT CASE or FINAL SECTION*** |

***PROCEED TO NEXT CASE or FINAL SECTION***

# CASE 3

**Question 3a**. During a [July 2002; February 2003] county-wide boat census, a model year <MODEL YEAR> <LENGTH> <MAKE MODEL> was located at <ADDRESS> in <CITY> <STATE>. Do you recognize that boat?

Yes ____; *proceed to **Question 3b***
No ____; *proceed to **NEXT CASE or FINAL SECTION***
Refuse ____; *proceed to **NEXT CASE or FINAL SECTION***

*NOTE: if respondent offers additional boat make model information, enter below:*

| Characteristic | Boat |
|---|---|
| **ID Number** | (write ID number from Spreadsheet) |
| Model Year | |
| Length | |
| Corrected Make Model | |

**Question 3b**. What is the depth of the shallowest water which the boat can safely navigate without running aground? (Alternate question: What is the draft of the vessel?)

(*NOTE: write out measurement units when recording the answer*.)

| Characteristic | Boat | |
|---|---|---|
| Depth (feet and inches) | (feet) | (inches) |

Don't know _____; *proceed to **Question 3c***

**Question 3c**. Is <ADDRESS> in <CITY> <STATE> the location where the boat was ***normally*** kept in [2002; 2003]?

Yes ____; *proceed to **Question 3h***
No ____; *proceed to **Question 3d***
Don't know ____; *proceed to **NEXT CASE or FINAL SECTION***
Refuse ____; *proceed to **NEXT CASE or FINAL SECTION***

**Question 3d.** Was the boat normally kept at a residence, or was it kept at a public or private facility, such as a marina, in [2002; 2003]?

Residence _____; *proceed to **Question 3e***
Facility _____; *proceed to **Question 3f***
Don't know _____; *proceed to **NEXT CASE or FINAL SECTION***
Refuse _____; *proceed to **NEXT CASE or FINAL SECTION***

**Question 3e**. What was the address of the residence where the boat was normally kept in (2002; 2003)?

*(NOTE: Obtain as much address detail as respondent willing to provide.)*

| Characteristic | Answer |
|---|---|
| Street number | |
| Street name | |
| City | |
| State | |
| ZIP code | |
| Don't know | |

*Proceed to **Question 3h***

**Question 3f.** What was the name of the facility (for example: marina name) and in what city and state was the facility located?

| Characteristic | Answer |
|---|---|
| Facility name | |
| City | |
| State | |

Don't know _____; *proceed to **Question 3g***
Refuse _____; *proceed to **Question 3g***

**Question 3g.** Why was the boat normally kept at a facility and not at your home in [2002; 2003]?

| Statements |
|---|
| Reason: |
| Reason: |
| Reason: |

*Proceed to **NEXT CASE or FINAL SECTION***

**Question 3h**. Please answer yes or no to the following questions with regard to the address where the boat was normally kept in [2002; 2003]?

| QUESTIONS | Answer |
|---|---|
| Is the boat owner's home located at the address? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Is the location property that belongs to the boat owner? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does an acquaintance allow the owner to keep the boat at the location? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does the boat owner rent a slip or berth at location? | Yes No |
| **IF NO, THEN ASK:** Why is the boat kept at the location? | |
| | |

| NEXT SET OF QUESTIONS | Answer |
|---|---|
| Was the boat normally trailered from the address and launched at a facility or ramp? | Yes No |
| Does the property provide direct access to the water for boating, such as a slip or hoist? | Yes No |
| **IF YES, READ FOLLOWING QUESTIONS; ELSE LAST QUESTION** | |
| Are water depths leading from the location adequate at high tide? (deep enough) | Yes No |
| Are water depths leading from the location adequate at low tide? (deep enough) | Yes No |
| Does the location provide quick access to favorite boating destinations? | Yes No |

| LAST QUESTION |
|---|
| Are there other reasons why the boat is kept at this address? |
| Reason: |
| Reason: |
| Reason: |

***PROCEED TO NEXT CASE or FINAL SECTION***

# CASE 4

**Question 4a**. In [July 2002; February 2003], did you or someone at this address own a model year <MODEL YEAR> <LENGTH> boat manufactured by <MAKE MODEL>?

Yes ____; *proceed to **Question 4b***
No ____; *proceed to **NEXT CASE or FINAL SECTION***
Not Recognized ____; *proceed to **NEXT CASE or FINAL SECTION***
Don't know ____; p*roceed to **NEXT CASE or FINAL SECTION***
Refuse ____; *proceed to **NEXT CASE or FINAL SECTION***

*NOTE: if respondent offers additional boat make model information, enter below:*

| Characteristic | Boat |
|---|---|
| **ID Number** | (write ID number from Spreadsheet) |
| Model Year | |
| Length | |
| Corrected Make Model | |

**Question 4b**. What is the depth of the shallowest water which the boat can safely navigate without running aground? (Alternate question: What is the draft of the vessel?)

(*NOTE: write out measurement units when recording the answer*.)

| Characteristic | Boat | |
|---|---|---|
| Depth (feet and inches) | (feet) | (inches) |

Don't know ____; *proceed to **Question 4c***

**Question 4c**. Is <ADDRESS> in <CITY> <STATE> the location where the boat was ***normally*** kept in (2002; 2003)?

Yes ____; *proceed to **Question 4h***
No ____; *proceed to **Question 4d***
Don't know ____; *proceed to **NEXT CASE or FINAL SECTION***

**Question 4d**. Was the boat normally kept at a residence, or was it kept at a public or private facility, such as a marina, in (2002; 2003)?

Residence _____; *proceed to **Question 4e***
Facility _____; *proceed to **Question 4f***
Don't know _____; *proceed to **NEXT CASE or FINAL SECTION***

**Question 4e**. What was the address of the residence where the boat was normally kept in (2002; 2003)?

(*NOTE: Obtain as much address detail as respondent willing to provide.*)

| Characteristic | Answer |
|---|---|
| Street number | |
| Street name | |
| City | |
| State | |
| ZIP code | |
| Don't know | |

*Proceed to **Question 4h***

**Question 4f.** What was the name of the facility (for example: marina name) and in what city and state was the facility located?

| Characteristic | Answer |
|---|---|
| Facility name | |
| City | |
| State | |

Don't know _____; *proceed to **Question 4g***
Refuse _____; *proceed to **Question 4g***

**Question 4g.** Why was the boat normally kept at a facility and not at your home in [2002; 2003]?

| Statements |
|---|
| Reason: |
| Reason: |
| Reason: |

*Proceed to **NEXT CASE or FINAL SECTION***

**Question 4h**. Please answer yes or no to the following questions with regard to the address where the boat was normally kept in [2002; 2003]?

| QUESTIONS | Answer |
|---|---|
| Is the boat owner's home located at the address? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Is the location property that belongs to the boat owner? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does an acquaintance allow the owner to keep the boat at the location? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does the boat owner rent a slip or berth at location? | Yes No |
| **IF NO, THEN ASK:** Why is the boat kept at the location? | |
| | |

| NEXT SET OF QUESTIONS | Answer |
|---|---|
| Was the boat normally trailered from the address and launched at a facility or ramp? | Yes No |
| Does the property provide direct access to the water for boating, such as a slip or hoist? | Yes No |
| **IF YES, READ FOLLOWING QUESTIONS; ELSE LAST QUESTION** | |
| Are water depths leading from the location adequate at high tide? (deep enough) | Yes No |
| Are water depths leading from the location adequate at low tide? (deep enough) | Yes No |
| Does the location provide quick access to favorite boating destinations? | Yes No |

| LAST QUESTION |
|---|
| Are there other reasons why the boat is kept at this address? |
| Reason: |
| Reason: |
| Reason: |

***PROCEED TO NEXT CASE or FINAL SECTION***

# CASE 5

(Cycle through questions for each boat; maximum of three boats)

**Question 5a**. Did you or anyone else in your household own any boats in [July 2002; February 2003] that would have been kept at <ADDRESS> in <CITY>, <STATE> OR that would have listed that mailing address on the state vessel registration renewal form? *(Don't include canoes, kayaks or personal water craft; maximum of three vessels)*

| | |
|---|---|
| Yes | ____; *proceed to* ***Question 5b*** |
| Didn't live here | ____; **STOP SURVEY, THANK PARTICIPANT** |
| No | ____; **STOP SURVEY, THANK PARTICIPANT** |
| Don't know | ____; **STOP SURVEY, THANK PARTICIPANT** |
| Refuse | ____; **STOP SURVEY, THANK PARTICIPANT** |

**Question 5b**. How many boats?

**If one boat, then say:** I am going to ask you a few questions.

**If two or three boats, then say:** I am going to ask you a few questions about each boat.

**If more than three boats, then say:** I am going to ask a few questions about three of the boats, starting with the deepest draft boat.

**Question 5c.** What is the depth of the shallowest water which the boat can safely navigate without running aground? (Alternate question: What is the draft of the vessel?)

(*NOTE: write out measurement units when recording the answer*.)

| Characteristic | Boat | |
|---|---|---|
| Depth (feet and inches) | (feet) | (inches) |

Don't know _____; *proceed to* ***Question 5d***

**Question 5d**. Was the boat registered in [2002; 2003] and, if so, in what state?

| | |
|---|---|
| Yes | _____; |
| If Yes, what state? | _____; *If FLORIDA, proceed to* ***Question 5e*** *Else, proceed to* ***Question 5g*** |
| No | _____; *proceed to* ***Question 5g*** |
| Don't know | _____; *proceed to* ***Question 5g*** |
| Refuse | _____; *proceed to* ***Question 5g*** |

**Question 5e**. Is <ADDRESS> in <CITY> <STATE> the mailing address that would have been listed on the vessel registration renewal form in [2002; 2003]?

Yes ____; *proceed to* ***Question 5h***
No ____; *proceed to* ***Question 5f***
Don't know ____; *proceed to* ***Question 5h***
Refuse ____; *proceed to* ***Question 5h***

**Question 5f**. What is the mailing address that would have been listed on the vessel registration renewal form in [2002; 2003]?

(*NOTE: Obtain as much address detail as respondent willing to provide.*)

| Characteristic | Answer |
|---|---|
| Street Number | |
| Street Name | |
| City | |
| State | |
| ZIP code | |
| Don't Know | |

*Proceed to* ***Question 5h***

**Question 5g**. Was the boat documented by the Coast Guard in [2002; 2003]?

Yes ____; *proceed to* ***Question 5h***
No ____; *proceed to* ***Question 5h***
Don't know ____; *proceed to* ***Question 5h***
Refuse ____; *proceed to* ***Question 5h***

**Question 5h**. Is <ADDRESS> in <CITY> <STATE> the location where the boat was ***normally*** kept in [2002; 2003]?

Yes ____; *proceed to* ***Question 5m***
No ____; *proceed to* ***Question 5i***
Don't know ____; *proceed to* ***NEXT BOAT or END SURVEY***
Refuse ____; *proceed to* ***Question 5i***

**Question 5i**. Was the boat normally kept at a residence, or was it kept at a public or private facility, such as a marina, in [2002; 2003]?

Residence _____; *proceed to* ***Question 5j***
Facility _____; *proceed to* ***Question 5k***
Don't know _____; *proceed to* ***NEXT BOAT or END SURVEY***
Refuse _____; *proceed to* ***NEXT CASE or END SURVEY***

**Question 5j**. What was the address of the residence where the boat was normally kept in [2002; 2003]?

(*NOTE: Obtain as much address detail as respondent willing to provide.*)

| Characteristic | Answer |
|---|---|
| Street number | |
| Street name | |
| City | |
| State | |
| ZIP code | |
| Don't Know | |

*Proceed to **Question 5m***

**Question 5k.** What was the name of the facility (for example, marina name) and in what city and state was the facility located?

| Characteristic | Answer |
|---|---|
| Facility name | |
| City | |
| State | |

Don't know _____; *proceed to **Question 5l***
Refuse _____; *proceed to **Question 5l***

**Question 5l.** Why was the boat normally kept at a facility and not at your home in [2002; 2003]?

| Statements |
|---|
| Reason: |
| Reason: |
| Reason: |

*Proceed to **NEXT BOAT or END SURVEY***

**Question 5m**. Please answer yes or no to the following questions with regard to the address where the boat was normally kept in [2002; 2003]?

| QUESTIONS | Answer |
|---|---|
| Is the boat owner's home located at the address? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Is the location property that belongs to the boat owner? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does an acquaintance allow the owner to keep the boat at the location? | Yes No |
| **IF NO, READ FOLLOWING QUESTION; ELSE NEXT SET OF QUESTIONS** | |
| Does the boat owner rent a slip or berth at location? | Yes No |
| **IF NO, THEN ASK:** Why is the boat kept at the location? | |
| | |

| NEXT SET OF QUESTIONS | Answer |
|---|---|
| Was the boat normally trailered from the address and launched at a facility or ramp? | Yes No |
| Does the property provide direct access to the water for boating, such as a slip or hoist? | Yes No |
| **IF YES, READ FOLLOWING QUESTIONS; ELSE LAST QUESTION** | |
| Are water depths leading from the location adequate at high tide? (deep enough) | Yes No |
| Are water depths leading from the location adequate at low tide? (deep enough) | Yes No |
| Does the location provide quick access to favorite boating destinations? | Yes No |

| LAST QUESTION |
|---|
| Are there other reasons why the boat is kept at this address? |
| Reason: |
| Reason: |
| Reason: |

***PROCEED TO NEXT BOAT or END SURVEY***

# FINAL

**Question 6a**. Not including canoes, kayaks, or personal watercraft, did you or anyone else in your household own any other boats in [July 2002; February 2003] that would have been kept at <ADDRESS> in <CITY>, <STATE> ***OR*** that would have listed that mailing address on Florida's vessel registration renewal form? (*Maximum of three vessels)*

| | |
|---|---|
| Yes | ____; *proceed to* ***Question 6b*** |
| No | ____; **STOP SURVEY, THANK PARTICIPANT** |
| Don't know | ____; **STOP SURVEY, THANK PARTICIPANT** |
| Refuse | ____; **STOP SURVEY, THANK PARTICIPANT** |

**Question 6b**. How many boats?

**If one boat, then say:** I am going to ask you a few questions.

**If two or three boats, then say:** I am going to ask you a few questions about each boat.

**If more than three boats, then say:** I am going to ask a few questions about three of the boats, starting with the deepest draft boat.

***NOTE: Cycle through the following questions for each boat; up to a maximum of three***

**Question 6c**. Was the boat registered in [2002; 2003] and, if so, in what state?

| | |
|---|---|
| Yes | _____; |
| If Yes, what state? | _____; *If FLORIDA, proceed to* ***Question 6d*** *Else, proceed to* ***Question 6e*** |
| No | _____; *proceed to* ***Question 6e*** |
| Don't know | _____; *proceed to* ***Question 6e*** |
| Refuse | _____; *proceed to* ***Question 6e*** |

**Question 6d**. Is <ADDRESS> in <CITY> <STATE> the mailing address that would have been listed on the vessel registration renewal form in [2002; 2003]?

| | |
|---|---|
| Yes | ____; *proceed to* ***Question 6f*** |
| No | ____; *proceed to* ***Question 6f*** |
| Don't know | ____; *proceed to* ***Question 6f*** |
| Refuse | ____; *proceed to* ***Question 6f*** |

**Question 6e**. Was the boat documented by the Coast Guard in [2002; 2003]?

Yes ____; *proceed to* ***Question 6f***
No ____; *proceed to* ***Question 6f***
Don't know ____; *proceed to* ***Question 6f***

**Question 6f**. Is <ADDRESS> in <CITY> <STATE> the location where the boat was ***normally*** kept in [2002; 2003]?

Yes ____; *proceed to* ***Question 6j***
No ____; *proceed to* ***Question 6g***
Don't know ____; *proceed to* ***Question 6j***

**Question 6g**. Was the boat normally kept at a residence, or was it kept at a public or private facility, such as a marina, in [2002; 2003]?

Residence _____; *proceed to* ***Question 6h***
Facility _____; *proceed to* ***Question 6i***
Don't know _____; *proceed to* ***Question 6j***
Refuse _____; *proceed to* ***Question 6j***

**Question 6h**. What was the address where the boat was normally kept in [2002; 2003]?

(*NOTE: Obtain as much address detail as respondent willing to provide.*)

| Characteristic | Answer |
|---|---|
| Street number | |
| Street name | |
| City | |
| State | |
| ZIP code | |
| Don't Know | |

*Proceed to* ***Question 6j***

**Question 6i.** What was the name of the facility (for example, marina name) and in what city and state was the facility located?

| Characteristic | Answer |
|---|---|
| Facility name | |
| City | |
| State | |

Don't know _____; *proceed to* ***Question 6j***
Refuse _____; *proceed to* ***Question 6j***

**Question 6j.** Was the boat normally trailered to a facility or boat ramp when used?

Yes ____; *proceed to* ***Question 6k***
No ____; *proceed to* ***Question 6k***
Don't know ____; *proceed to* ***Question 6k***

**Question 6k.** Please describe the following characteristics of the boat?

| Characteristic | Boat |
|---|---|
| Make and model | |
| Model year (YYYY) | |
| Length (feet) | |

**Question 6l**. What is the depth of the shallowest water which the boat can safely navigate without running aground? (Alternate question: What is the draft of the vessel?)

(*NOTE: write out measurement units when recording the answer*.)

| Characteristic | Boat | |
|---|---|---|
| Depth (feet and inches) | (feet) | (inches) |

***PROCEED TO NEXT BOAT OR END SURVEY***
***THANK PARTICIPANT!***

# Appendix Q. A Synopsis of the Vessel Title Registration System Workshops

At the start of the workshop, participants briefly stated their reasons for attending and their current and potential uses for boat- and boater-related information. The list below provides insight into the broad range of uses and applications that were mentioned.

- Assess vessel speed and boater compliance
- Enhance current methods of manatee protection
- Prioritize waterway management and permitting
- Address funding inequity due to vessel registrations outside county of use
- Address security issues
- Law enforcement—vessel conflict and management
- Comprehensive planning
- Determine vessel usage and boating patterns
- Facility planning—siting of ramps and marinas
- Evaluate boater education efforts
- Analyze and model boat traffic
- Prioritize maintenance dredging
- Predict pressures on marine environment
- Incorporate geo-coded information into county geographic information systems
- Market enhanced VTRS information
- Prioritize vessel removal after natural disasters
- Analyze new and used boating markets

There were two interactive group sessions during the workshop. The first session involved a discussion of boat- and boater-related information that participants require, and applications for this information. The discussion also addressed issues and limitations related to current data sources. During the second session, participants outlined strategies that could be implemented in order to provide the information needs listed during the first session. The results from each session are described below.

***Group Session 1—Information needs and applications***

During this session participants generated a list of their boat- and boater-related information needs. Participants each chose no more than three items from the list and ranked them first, second, or third in order of importance to their needs. The individual rankings were summarized into an aggregate score for each major category on the list. To determine the aggregate scores, individual ranks were assigned the following values: first—3 points; second—2 points; third—1 point. When summed, the individual ranks totaled 120 points. Each information category listed by the participants is discussed below in descending order of points received.

*Spatial/Location Information (49 of 120 points)*—Participants assigned this item 41 percent of the total number of points awarded to all items, which underscores the importance of knowing vessel location. The locations where vessels are stored (e.g., marina, private dock, dry stack) and

used (e.g., waterways, bays, area, region, county) were determined to be the most important kinds of information needed. Currently, information distributed by the Department of Highway Safety and Motor Vehicles (DHSMV) contains a vessel registrant's mailing address, which can be used to contact a vessel owner for surveys and educational programs, but does not necessarily indicate where the vessel is stored or used. In addition to vessel location, there is a need to obtain an estimate of how often a vessel is used (e.g., number of days per year, times used).

A sample of potential applications that would benefit from a knowledge of vessel location include addressing revenue inequities that result when vessels are not registered in the county of primary or exclusive use; allocation of tourism development dollars based on where vessels are used; a comprehensive regional assessment of maintenance dredging needs within canals and waterways (requires vessel draft); evaluation of vessel speed generation capabilities in relation to manatee populations.

*Standardization and Consistency of Meanings and Definitions (37 of 120 points)*—Participants assigned this item 31 percent of the total number of points awarded to all items. The discussion centered on a number of themes related to standardizing information contained in the VTRS. 1) There is a need for a standardized typology/hierarchy of vessel types based on usage (e.g., sport fishing, day sail, utility) or other criteria. No standard typology currently exists, which makes comparison between databases or research studies difficult. 2) There is lack of ancillary information with which to interpret coded fields contained in the VTRS, such as vessel make. In addition, if vessel model were included in the VTRS, linkages could be established with other databases that provide more detailed vessel characteristics. 3) Vessel draft is vital for a number of applications, such as security, disaster preparedness, and waterway planning and management. 4) An operational definition of vessel draft is needed (i.e., hull versus engine draft; engine up or down). 5) There is a need to include information on vessel horsepower and whether the vessel has a planing or displacement hull.

*Access to VTRS Data (21 of 120 points)*—Participants assigned this item 18 percent of the total number of points awarded. There are a number of issues that are related to accessibility: 1) The DHSMV distributes VTRS data on storage media that requires special equipment unavailable to the majority of potential users of the information. 2) Certain information fields contained on the vessel registration form (HSMV 82040) are not included in the database that is distributed by the DHSMV; vessel draft and the registrant's Florida residence address are two such fields. Vessel draft is not a required field on the registration form; however, when available, the information could be used to infer draft for similar vessels with incomplete records. 3) Versions of VTRS data for prior years are not available through the DHSMV. Such information would prove useful for trend analyses and planning. 4) Due to various reasons, some fields contain errors, such as the make, Hull ID, or propulsion type. For instance, sailboats may have two propulsion types—sail and engine; registrants may enter engine instead of the primary propulsion type—sail. 6) The VTRS contains records for vessels and trailers; linkages should be established between a vessel and its trailer.

*Vessel Ownership History (10 of 120 points)*—Participants assigned this item 8 percent of the total number of points awarded. Marine industry representatives expressed interest in the size of the used boat market. Desired information includes: 1) A record of vessel transactions, including

those that occur between individuals and those for which a dealer acts as an intermediary. 2) Vessel usage history, an application of which is to determine vessel lifespan, gaps in usage, length of service, or how long a vessel is owned by its first owner. Gaps in vessel usage also are an important consideration for waterway management and planning efforts.

*Remaining items*—Two percent of awarded points indicated a need for the location and characteristics of derelict vessels. Also mentioned was a need to account for vessels that are rented, leased, or borrowed; the height of the vessel above the water; vessel power plant; and information on vessel activity characteristics.

***Group Session 2—Strategies for obtaining boat- and boater-related information***

Participants suggested a number of strategies to obtain boat- and boater-related information. Most strategies mentioned below will not succeed alone, but need to be implemented in concert with other approaches.

1) Approach the DHSMV to assess what strategies can be implemented through the agency. Questions to be answered include:
    a. What VTRS information fields does the DHSMV collect but exclude from distributed data (e.g., draft, Florida residence address)? Can excluded information be released?
    b. Can the VTRS structure, including data collection forms, be altered to provide for additional or modified information fields?
2) Explore linkages to other databases to provide information not contained within the VTRS, or to enhance VTRS information.
    a. Insurance companies may require vessel location information from policy owners.
    b. Commercial databases (e.g., BUC, ABOS, Boats.com) often have detailed vessel information that may be accessed by linking key fields (e.g., make and model).
3) Develop alternative methods to collect information at the county or state level. These efforts can be implemented as pilot studies.
    a. Include supplemental information forms with registration mail-outs.
    b. Implement a Web-based registration form that includes voluntary input of information.
4) There is a diversity of groups whose support will be necessary to implement changes in current data collection techniques. Resistance is to be expected and, thus, a marketing effort will be necessary. The need for proposed changes, and their benefits, will need to be demonstrated.
    a. Measure economic costs and benefits associated with implementing changes.
    b. Develop a statewide coalition to ‘champion’ the cause. Include participants from various sectors, such as law enforcement, marine industry, homeland security, resource management, tourism, tax collectors, real estate, and insurance.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