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## An analysis of marina environmental practices on the north shore of Lake Pontchartrain

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**AN ANALYSIS OF MARINA ENVIRONMENTAL PRACTICES ON THE NORTH  
SHORE OF LAKE PONTCHARTRAIN**

A Thesis

Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
in partial fulfillment of the  
requirements for the degree of  
Master of Landscape Architecture

in

The School of Landscape Architecture

by

Arthur Hunter Marks, III  
B.S., University of Tennessee-Martin, 1984  
May 2002

To my wife, Lynn, for her constant support, help, understanding and love.

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## **ABSTRACT**

During January and February of 2002, fifteen marinas on the north shore of Lake Pontchartrain were surveyed to identify what environmental management practices they employed. The objectives of this study were to find out what was being done by these facilities in Louisiana, what these and other marina owners and operators could do to improve environmental conditions, and what recommendations could be made for future marina designers and operators. An additional objective was to suggest what role government could play in helping present and future marinas in implementing best management practices (BMPs).

A questionnaire and evaluation form was developed, and the 15 marinas were visited. In addition, three large marinas in New Orleans were also visited and evaluated. While not included in the study group, it was felt several relevant comparisons could be made from information found at these three marinas.

After the marinas were visited, the data was summarized and evaluated based on the 15 management measures covered in the questionnaire. Results ranged widely, generally depending on the size and type of marina. Based on the questions and observations made in the study, the North Shore marinas were generally found to not be as environmentally progressive as the New Orleans marinas, primarily due to differences in management ability and philosophy, and also to financing.

As the north shore of Lake Pontchartrain continues to be the fastest growing area of Louisiana, existing and proposed marinas will come under increased public scrutiny and pressure to improve management practices. Marina owners and operators need assistance and guidelines to help them adopt and implement good management practices, and government must find ways

to encourage and assist these businesses. Landscape architects and other designers can be an important part of this process and this thesis will help clarify their potential role.

## **CHAPTER 1: INTRODUCTION**

### **Background**

Water is the defining natural feature of Louisiana. It has shaped the state's history, culture, economics and environment. Perceptions of Louisiana call forth images of swamps filled with cypress trees and spanish moss, steamboats on the Mississippi, crossing Lake Pontchartrain, or the marshes along the Gulf coast. People from both urban and rural settings continue to be attracted to the water for recreation in the form of boating and fishing.

Marinas often act as gateways between land and water for what has become a growing number of individuals seeking boating recreation. At the same time, marinas have had to become more responsive to the need for good stewardship of our imperiled coastal environmental resources.

Compared to agricultural and urban sources, the amount of pollution generated by boaters and marinas is relatively minor. While environmental management practices at marinas have often left a lot to be desired, pollution in marina basins is often substantially due to upstream sources.

However sewage, sediments, fish wastes, petroleum, toxic metals and liquid and solid wastes may well be generated by marinas. Therefore it is up to marina designers, owners and operators to plan and implement effective management practices to control the generation of pollutants that occur and to limit the delivery of these pollutants into marina basin waters. An analysis of marina management practices in certain parts of Louisiana can serve as a basis for a better understanding of what is being done today in the state, and what can and should be done in the future.

## **Problem Statement**

Being “tied” to the water, marina operators depend on a healthy environment for a successful business. They want to do the “right thing” environmentally, and will do so if practices can be economically justified, are fairly easy to implement, and are effective. In order to make recommendations for both existing and proposed marinas, it is first necessary to research what environmental management practices are being used, as well as the attitudes and concerns of marina operators and owners.

This thesis proposes to conduct a survey and analysis of environmental practices of a selected group of marinas on the north shore of Lake Pontchartrain. See Appendix A for the questionnaire. It is hoped the results will assist current marina managers in environmental decision making, as well as landscape architects and other designers in the development of future marinas.

## **Scope**

The scope of this survey will be restricted to marinas on the north shore of Lake Pontchartrain. This area has a large concentration of marinas and boat slips and has a rapidly growing population. In addition, three large marinas on the south shore of Lake Pontchartrain in New Orleans will be analyzed. While not a central focus of this thesis, it may be enlightening to compare the study group with the three New Orleans marinas as a reference of what is currently being done in Louisiana by some of the larger marinas that are well managed and well financed.

## **Objectives**

The objectives of this thesis are as follows:

- To discover what a sample group of marinas in Louisiana is doing concerning environmental management measures.

- To discover what management practices are currently being used.
- To discover why (or why not) BMPs are being used (or not used).
- To discover what attitudes and awareness towards BMPs currently exist at Louisiana marinas.
- To make recommendations that will promote the adoption of BMPs by existing Louisiana marinas, and encourage the use of BMPs when new marinas are proposed, designed, and constructed.
- To educate myself and other landscape architects about management measures and BMPs as they relate not only to marinas, but also to waterfront development in general.

### **Approach or Methods**

- Review current literature on management measures and BMPs in general.
- Review current literature on management measures, BMPs and marinas. This would include what has been done both internationally and in the United States, and to see which states currently have BMP guides for marinas.
- Review current literature on management measures, BMPs and marinas in Louisiana.
- Develop a questionnaire and evaluation form with which to survey a selected group of Louisiana marinas.
- Visit the selected group of marinas, as well as three large New Orleans marinas to use as a comparison for this study.
- Compile and analyze the collected data.
- Discuss the results of the analysis and make recommendations for existing marinas, proposed marinas, and government agencies.

- Make specific suggested recommendations for landscape architects and other designers concerning marina design and environmental practices.

## CHAPTER 2: BACKGROUND AND LITERATURE REVIEW

*"If environmental deterioration is permitted to continue and increase at present rates, [man] wouldn't stand a snowball's chance in hell [of surviving]." Under Secretary of the Interior Russell E. Train speaking at the April 1969 Centennial of the American Museum of Natural History.*

### **Legislative History of Addressing Pollution and Literature Review**

Any review of the current literature on marinas and pollution needs to begin with the role government has played over the past several decades. Most, if not all, writing and research on the subject deals with implementing government policies.

The United States Environmental Protection Agency (EPA) was established in 1970 due to the growing concern about the environment in this country. In 1972 Congress passed the Clean Water Act (CWA) and the Coastal Zone Management Act (CZMA). Section 208 of the CZMA required states to identify areas within their borders that have “substantial water quality control problems”. In 1990, Congress amended the CZMA with the Coastal Zone Act Reauthorization Amendment (CZARA). Finally, in 1992, Congress passed the Clean Vessel Act (CVA), that had as one its purposes to provide funds for the construction, renovation, operation and maintenance of pumpout and dump stations. The CVA is administered through the U. S. Fish and Wildlife Service, and in Louisiana by the Louisiana Department of Wildlife and Fisheries. All of these acts deal with both point source and nonpoint source pollution, which are defined below.

Great strides have been made in curtailing point source pollution, it being more easily identified. However, less success has been achieved battling nonpoint source pollution. Section 6217 of CZARA attempted to address this problem by identifying economically achievable management measures “to control the addition of pollutants to our coastal waters, which reflect

the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives” (Ross, Marina 5-1). Under the CZARA legislation, the EPA has identified five major categories of nonpoint pollution sources that are to be addressed by the coastal states:

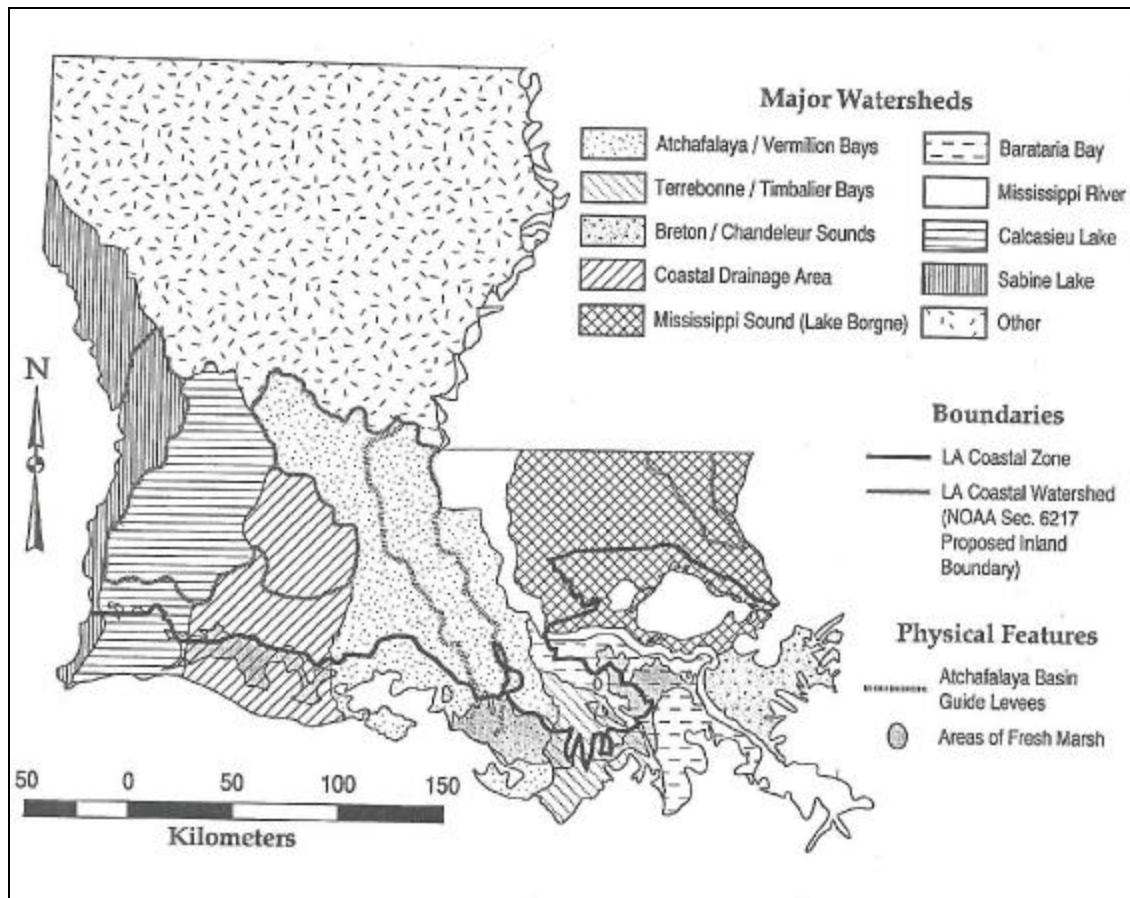
1. Agricultural runoff.
2. Urban runoff (including developing and developed areas).
3. Silvicultural (forestry) runoff.
4. Channelization and channel modification, dams, and streambank and shoreline erosion.
5. Marinas and recreational boating.

To help states comply, the EPA also “developed a publication of proposed management measures and guidance for states, setting forth objectives and potential management practices for controlling nonpoint source pollution from each of these categories of activities. That publication, Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, was issued in January 1993” (Nyman 1).

Louisiana’s Coastal Nonpoint Pollution Control Program (CNPCP) work plan was submitted to the National Oceanic and Atmospheric Administration (NOAA) and to EPA and was approved in October 1995. The ultimate goals of this program are to identify BMPs appropriate for all applicable pollutant categories and to initiate programs to further public education, technical assistance, and development of enforcement protocols to implement these BMPs (LA Coastal Nonpoint I-1).

In Louisiana, the CZARA section 6217 coastal zone management area comprises all or parts of 19 parishes (Figure 2.1).





**Figure 2.1. Map of Louisiana Coastal Zone and Major Watersheds.**

**Source: Louisiana, Louisiana Coastal... II-1**

These parishes are Assumption, Calcasieu, Cameron, Iberia, Jefferson, Lafourche, Livingston, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Mary, St. Martin, St. Tammany, Tangipahoa, Terrebonne, and Vermilion. The largest concentrations of marinas in the Louisiana coastal zone occur along the north and east shores of Lake Pontchartrain, the south shore of the same lake in the New Orleans area, and in the western

portion of St. Bernard Parish along Bayou la Loutre and Bayou Terre aux Boeufs (Louisiana Management Measures 1).

### **Types of Pollution**

There are two types of water pollution, nonpoint source (NPS) and point source. Nonpoint source pollution results when water from rainfall or snowmelt moves over or through the ground, picking up both natural pollutants and pollutants generated by human activity. Sources include agriculture, forestry, urban runoff, development and industry. These pollutants are ultimately deposited in lakes, rivers, wetlands, coastal waters and groundwater (Nonpoint Source News-Notes 32). A marina site would be an example of a potential source of nonpoint pollution.

Point source pollution emanates from a “discrete conveyance or runoff source which “can be pointed to” or easily sampled” (Ross 7). In other words, pollution that originates from a specific source such as a sewage treatment plant or a pipe from a factory.

### **Management Measures and Practices**

At this point, it is felt that some clarification needs to be made concerning the differences between the terms management measures, management practices, suggested management practices and best management practices (BMPs). In simple terms, **management measures** are categories. “Management measures are the 15 measures established by EPA for implementation within the state coastal (or CZARA section 6217) management areas. From discussions with marina operators at facilities on fresh waters nationwide, these 15 management measures and associated practices were found to be just as applicable to fresh water marinas as to coastal water marinas” (Drabkowski 4-1). These management measures are based on economic feasibility and available technology, not on achieving an ideal state of water quality (US EPA, Final Guidance

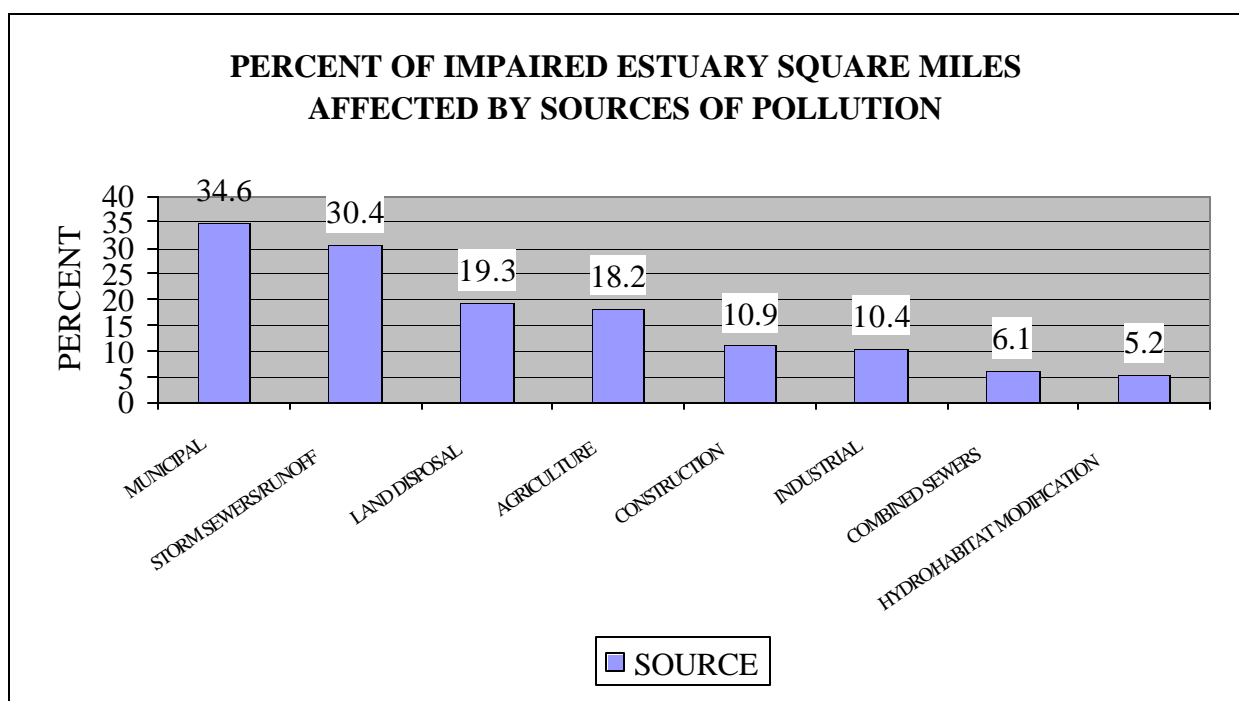
1-5). **Management practices** are what marinas are now doing in each of these categories, whether good or bad. **Suggested management practices** are broad, but would typically be applied to improve on bad or nonexistent practices. **Best management practices** are those that would be “best” for a specific facility. “Which BMPs are really “best” for a particular facility depends on the marina” (Tanski 3). “Best management practices are individual activities or structures that can be used alone or in combination to achieve the management measures” (Drabkowski 4-1). Put simply, marina BMPs are anything a manager can do to prevent or reduce the amount of pollutants coming from the particular marina.

The above terms can be confusing, and it is crucial to understand them to clearly understand the problem of pollution at marinas and to understand this thesis. To clarify, consider the following analogy of mowing your yard. Mowing the yard is the **management measure**. A **management practice** would be mowing it with a pair of scissors. This may not be a good management practice, but nevertheless is a management practice. A **suggested management practice** would be to use a lawnmower. A **best management practice** would be to mow the yard with the best possible mower available, specifically selected for your yard’s conditions. Since the author does not claim to be an expert on marinas (or yard mowing), this paper will recommend suggested management practices.

## **Marinas and Pollution**

While marinas are not often mentioned as specific sources of pollution into Lake Pontchartrain and other waters, recreational boating and marinas are highly visible and are thus subject to scrutiny. As Neil Ross of Neil Ross Marina Consultants states, however, “It is clear from comments at most permit hearings for marinas, unfortunately, that both the public and government often mistake boating activities and services as “major” waterway polluters. Let’s

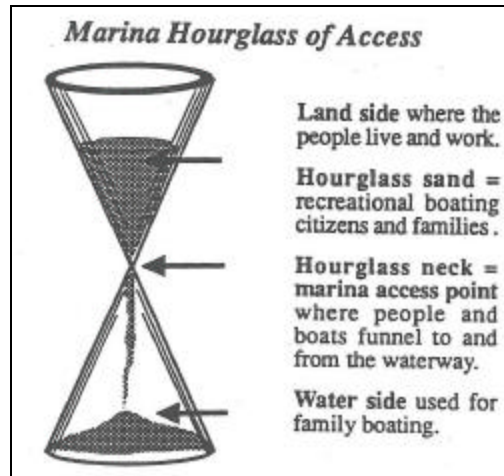
admit it, boats and people onboard do contribute some contamination such as litter, minor fuel leaks, sewage, noise, wave erosion, and antifouling paint. However, we must keep the total level of pollution in perspective as a relatively minor environmental problem which can generally be corrected” (Ross, Marina 10). As noted in Figure 2.2, marinas are not specifically shown as a major pollution source, while municipal sources account for nearly 35%.



**Figure 2.2. Percent of Impaired Estuary Square Miles Affected by Sources of Pollution.**  
Source: US EPA National Water 305B

### Marinas Defined

Definitions of marinas can vary widely. In simplest terms, Neil Ross’ concept of an hourglass defines the role of marinas clearly. (Figure 2.3)



**Figure 2.3. Marina Hourglass.**  
**Source: Ross 4**

When speaking of marinas, this thesis will use the definition found in the Clean Vessel Act. It defines a marina as “A recreational boating facility with ten or more wet slips and/or dry land storage.” (As defined by the US Department of the Interior, Fish and Wildlife Service, Clean Vessel Act) The body of water the marina is located on (usually semi-enclosed) is the marina basin.

Some definitions include boatyards as “marinas”. Boatyard activities typically include: vessel maintenance and repair, pressure washing, paint removal (sanding and bead blasting), painting, mechanical maintenance and repairs, boat process and sanitary waste, and material handling, transfer, storage and disposal (Englande 1). Boatyards, per se, are usually not recreational in nature, but do provide services to recreational vessels much like automobile repair shops do for cars.

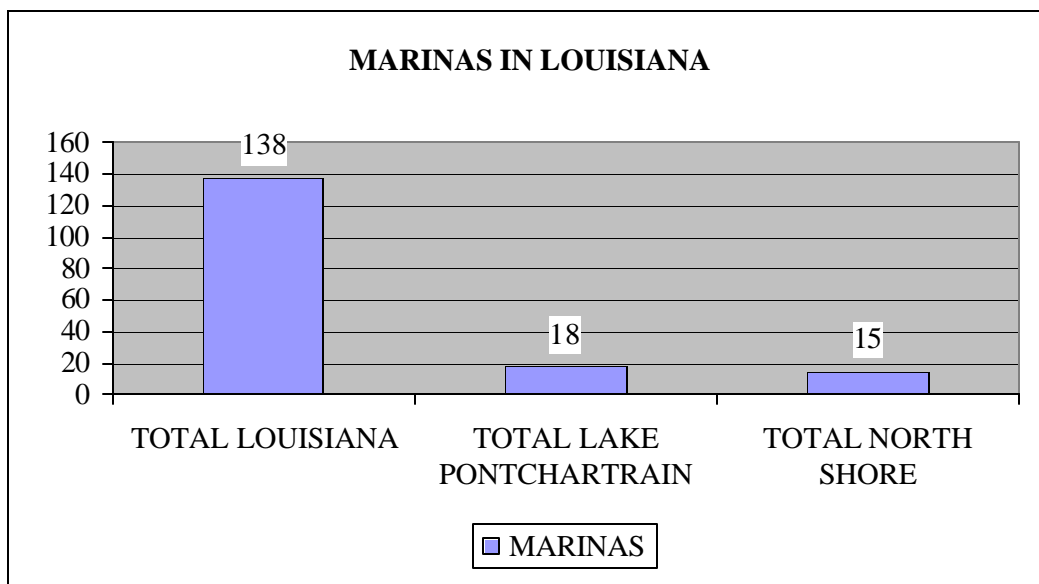
Even when boatyards are excluded, marinas vary tremendously with respect to size, services, and operating characteristics. This can be due to geographic location differences in boat use, boat size, boat type, and number of boats. Even in relatively small geographic areas, including the 15 marinas studied in this thesis, there can be a great deal of variation (Tanski 3).

This variability makes it difficult to generalize about best management practices, and the author does not claim to be an expert on BMPs. But there are a number of suggested management practices that are suitable for most facilities (Tanski 3). For these reasons this paper will propose suggested management practices rather than BMPs.

## CHAPTER 3: METHODS

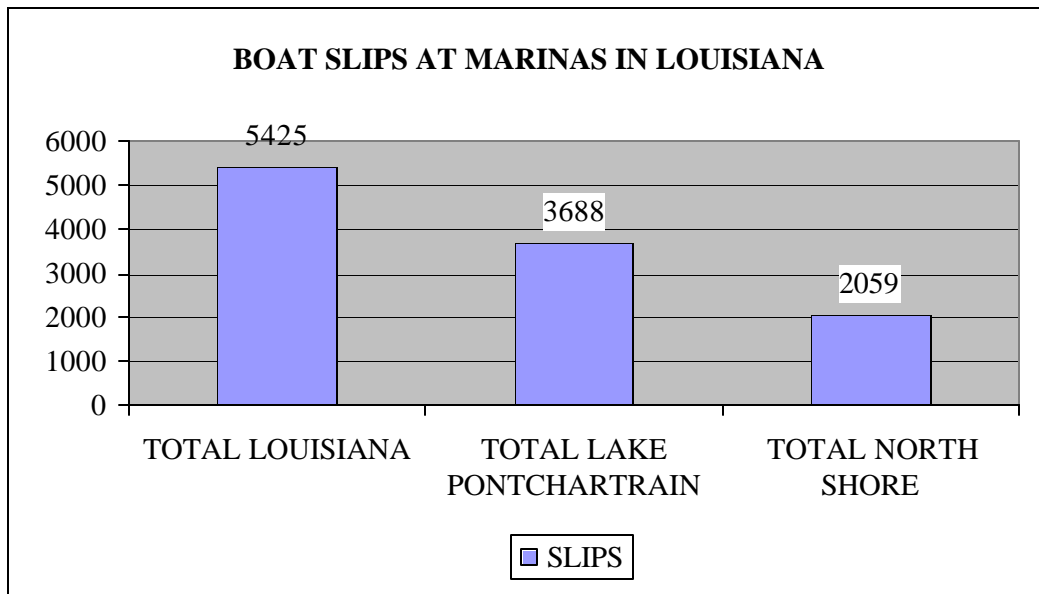
### Selection of the Study Group Marinas

Louisiana is home to 138 recreational marinas housing approximately 5425 boat slips (Marks 3). Of these, eighteen marinas containing 3688 slips exist on Lake Pontchartrain. While this figure represents only 13% of marinas in the state, it represents 68% of the total slips in Louisiana. (Figure 3.1)

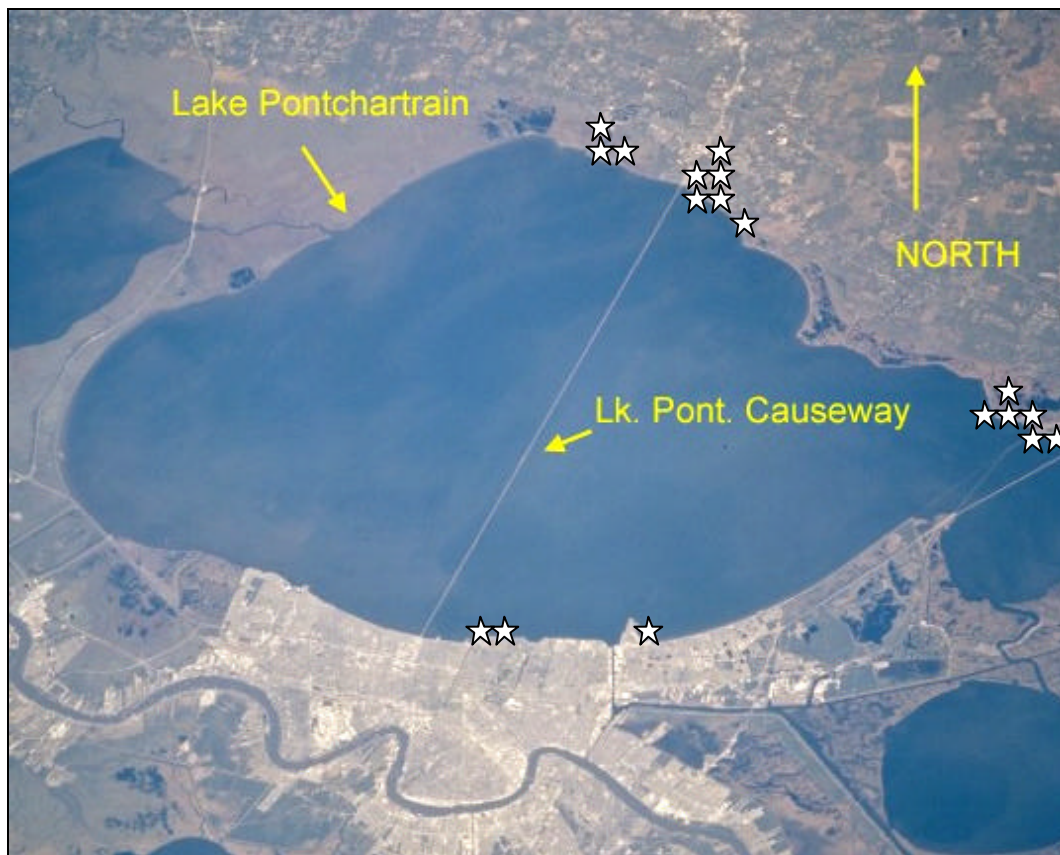


**Figure 3.1. Marinas in Louisiana.**

Of the eighteen Lake Pontchartrain marinas, 15 are located on the North Shore and collectively have 2059 slips. All are in the vicinity of the cities of Madisonville, Mandeville and Slidell. These marinas are either directly on the lake or within approximately one mile of the lakeshore. These 15 marinas represent 11% of the total number of marinas in Louisiana and 38% of the state's boat slips. (Figure 3.2)



**Figure 3.2. Boat Slips at Marinas in Louisiana.**



**Figure 3.3. Locations of Surveyed Marinas.**



A group of 15 marinas on the north shore of Lake Pontchartrain was selected for inclusion in the study group. (Figure 3.3) This group was chosen because the North Shore contains the greatest combined concentration of marinas and boat slips in Louisiana. Seven additional marinas are located in the vicinity of Lake Pontchartrain: three near Springfield on the Natalbany and Blood Rivers which drain into Lake Maurepas, one at Lee's Landing on the Tangipahoa River, and three on Chef Menteur Pass leading to Lake Borgne. These seven marinas were deemed too far from Lake Pontchartrain itself to be included in this study.

The remaining three marinas on Lake Pontchartrain are located in New Orleans. It was decided not to include the three New Orleans marinas in this study. This decision was based on several factors. First, the average Louisiana marina contains 39 boat slips. The three New Orleans facilities are much larger, averaging 543 boat slips. Second, the typical marina in Louisiana is privately owned. The New Orleans marinas are publicly owned and operated, two by the Orleans Levee Board, a state agency, and the third by the City of New Orleans. This relates to the third factor, financial backing and management. The three New Orleans marinas are well financed and supported by public monies, and are professionally managed. By contrast the typical marina in Louisiana is privately owned and very few managers are professionally trained. Last, almost all marinas in Louisiana are located in semi-urban or rural areas. The New Orleans operations are all in urban settings. For these reasons it was determined to exclude the New Orleans marinas from this study.

However, it was decided to survey the New Orleans marinas for purposes of comparison to the study group. These three facilities are well run, well maintained and especially cognizant of their environmental responsibilities. A comparison of current management practices at these

marinas versus practices in the study group could improve understanding of what the study group marinas could do in the future.

## Lake Pontchartrain

Since this thesis will concentrate on marinas located on or near Lake Pontchartrain, some background information on the lake and its watershed may be helpful. Lake Pontchartrain and its adjoining lakes together make up one of the largest estuaries in the United States. Nearly 1.5 million people (approximately one-third of the population of Louisiana) live in the 16 parishes and four Mississippi counties that comprise the Lake Pontchartrain basin ([www.epa.gov](http://www.epa.gov)). This basin covers over 4700 square miles. The lake itself is 630 square miles. It is 41 miles long, 25 miles wide, averages 11 feet in depth and empties into the Gulf of Mexico through Lake Borgne.



**Figure 3.4. Map of Lake Pontchartrain Basin.**  
Source: LPBF [www.saveourlake.org](http://www.saveourlake.org)

The geology and hydrology of Lake Pontchartrain are such that inflow is received from numerous sources, bringing with it pollution from urban, agricultural, commercial and industrial sources. On Lake Pontchartrain's south shore lies New Orleans, Louisiana's largest urban area. To the north lies St. Tammany Parish, the fastest growing parish in the state, and the cities of Slidell, Covington, Mandeville and Madisonville. Larger cities including Hammond and Baton Rouge are also located in the Lake Pontchartrain basin.

Environmental pressures on the lake are great, and the increasing population and development will only exacerbate matters in the future. The Lake Pontchartrain Basin Foundation has identified the following major environmental issues:

- Saltwater intrusion
- Loss of wetlands and habitat destruction, primarily due to development
- Commercial activities
- Sewage from fishing camps and inadequate, poor or nonexistent sewer systems
- Storm water runoff
- Nonpoint source pollutants from sewage and agricultural activities

As environmental and pollution pressures increase around Lake Pontchartrain, promoting public awareness and understanding about these pressures can aid in mitigating their effects and actually help improve water quality in this important natural resource.

### **Description of the Experimental Procedure**

To gather data for this thesis, a questionnaire (Appendix A) and evaluation form was prepared and field visits were conducted to the marinas in the survey group. The 15 selected marinas, along with the three marinas in the New Orleans area, were visited in January and February of 2002. This method was selected because: (1) the questionnaire was felt to be rather

long to be mailed; (2) non-response of a mailed questionnaire was a concern; (3) explanation and discussion of questions with the marina owners/operators would be much easier in person and would provide additional insight and understanding; and (4) as this was both a questionnaire and evaluation, it was necessary for the author to personally visit each marina in order to record impressions and make an assessment of the marinas environmental management practices.

Questions were asked informally. Some hesitation was evident on the part of a few of the marina operators until it was clear that this survey was for the purpose of researching a masters thesis and was not connected with any government agency. Almost all of the interviewees were extremely helpful and open, and often volunteered substantial additional information and insights that were very valuable to the author's understanding of the issues involved.

Dr. Brian LeBlanc, Louisiana Sea Grant Marine Extension Agent and Associate Specialist-Watershed Management with the LSU Agricultural Center, was present during the majority of marina visits and was very helpful in evaluating such areas as water quality and flushing.

It should be pointed out that several of the categories surveyed were evaluated qualitatively by the researcher, Dr. LeBlanc and the marina owner/operator. The resulting conclusions were based on the opinions of the above parties.

The following information was obtained during the interviews and observations:

General information:

- Name of marina
- Owner's name
- Manager's name
- Address

- Phone
- Email
- Location of the marina
- Number on boat slips

Management Measures:

- Marina Flushing
- Water Quality Assessment
- Habitat Assessment
- Shoreline Stabilization
- Storm Water Runoff
- Fuel Station Design
- Petroleum Control
- Liquid Material Management
- Solid Waste Management
- Fish Waste Management
- Sewage Facility Management
- Maintenance of Sewage Facilities
- Boat Cleaning
- Boat Operation
- Education and General (including design questions)

As previously mentioned the EPA established these 15 categories. Eleven of these 15 management measures or categories included specific questions as to what management practices are presently used at the individual marinas. To reiterate what was stated in Chapter II,

management practices and/or best management practices are recommended to address management measures. The questions within each category were chosen after consulting several BMP guides and discussions with Mike Liffmann in the Louisiana Sea Grant College Program at LSU. Specific questions were not used in sections I through IV of the questionnaire. These four measures: marina flushing, water quality assessment, habitat assessment and shoreline stabilization, are primarily design measures and are more suited to marinas not yet constructed or to renovations and expansions at existing marinas. Therefore, these sections were researched through open discussion with several of the marina operators, and interviews with Dr. LeBlanc and Mr. Liffmann.

### **Processing and Analysis of the Data**

After the marinas in the study group were visited, the results were put into a spreadsheet, tallied and analyzed. (Appendix B) The results are summarized and discussed in the next chapter.

## **CHAPTER 4: SURVEY RESULTS AND DISCUSSION**

### **Introduction**

This chapter describes the 15 management measures that affect marinas, what general management practices are recommended to attain compliance for these measures, what questions were asked of the 15 marinas regarding specific management practices, and finally, their responses and what practices were actually observed.

### **The Fifteen Management Measures: Introduction, Suggested Management Practices, Questions and Evaluations, and Findings**

#### **General Questions**

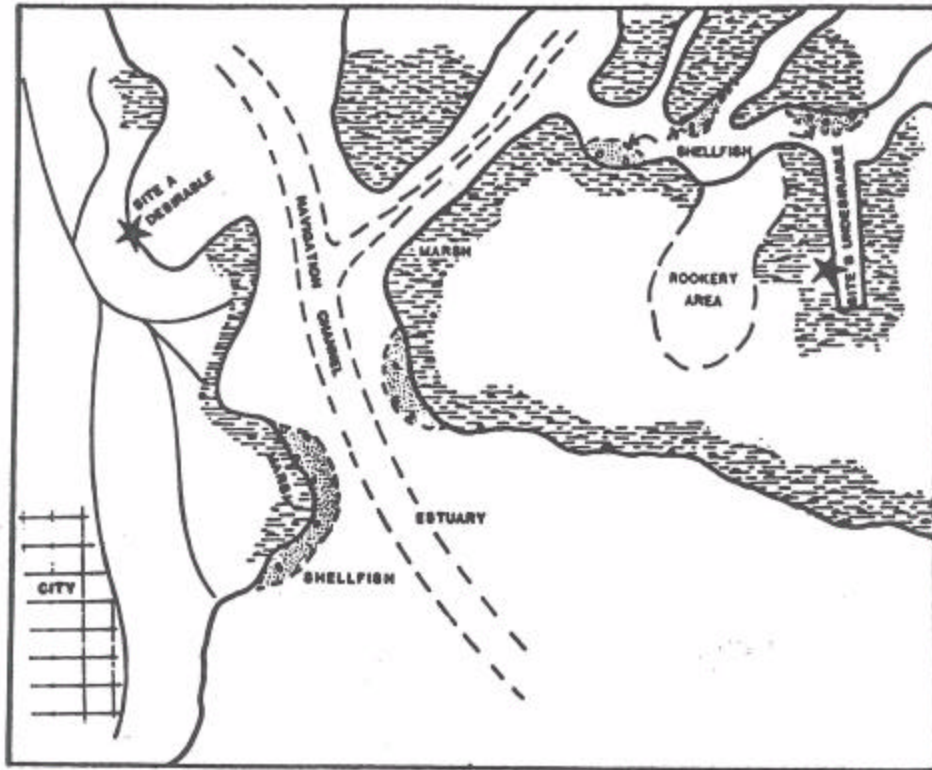
Of the fifteen marinas in the study group, six are located in or near Mandeville, three in or near Madisonville and six in or near Slidell. All are in St. Tammany Parish. Three are situated directly on Lake Pontchartrain, while the remaining 12 are on tributaries leading to the lake. The number of boat slips ranged from 18 to 386, with the mean being 137.

#### **I. Marina Flushing and**

#### **II. Water Quality Assessment**

##### **Introduction**

Marinas should ideally be sited so that tides and/or currents will assist in flushing of the water in the marina basin and regularly renew its water (Ross 5-11). Water quality within a basin is largely dependent on how well water circulates within it (Drabkowski 4-8). The marina operators in this study were asked their general impressions of water quality, and if they experienced any problems related to flushing within their marina basins. In addition a visual assessment was made by either Dr. LeBlanc or the author as to impressions of water quality and flushing. No water quality samples were taken or analyzed.



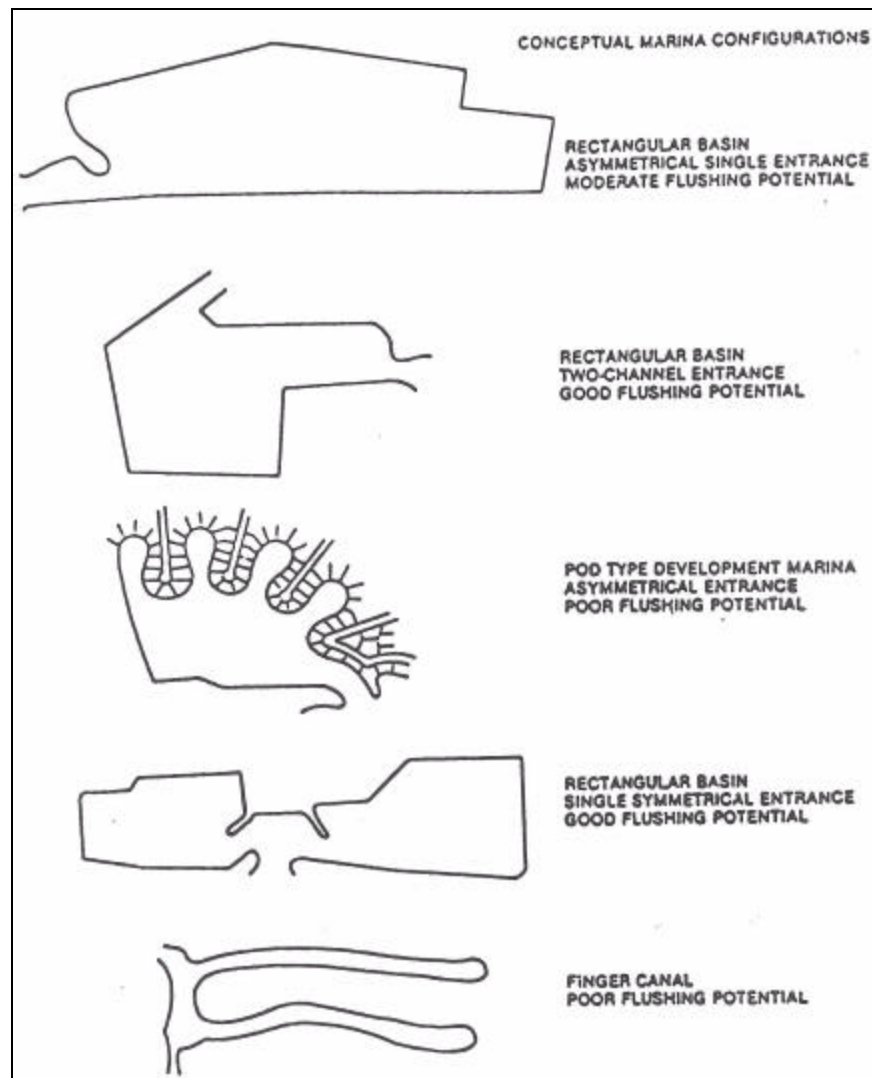
**Figure 4.1. Desirable and Undesirable Marina Locations.**  
**Source: Hollin, BMPs for Texas Marinas 4-4.**



**Figure 4.2. Stagnant Water in Marina Basin. Photo by author.**



It should be understood that water quality and especially marina flushing is heavily dependent on the initial design of the marina. Management measures may only have limited effects in facilities that are too enclosed, have establish fixed breakwaters, are highly segmented and have single entrances. It should also be noted that this survey was conducted during the winter months, and results could vary due to seasonal variations.



**Figure 4.3. Conceptual Marina Configurations and Flushing Potential.**  
**Source: Hollin, BMPs for Texas Marinas 4-7.**

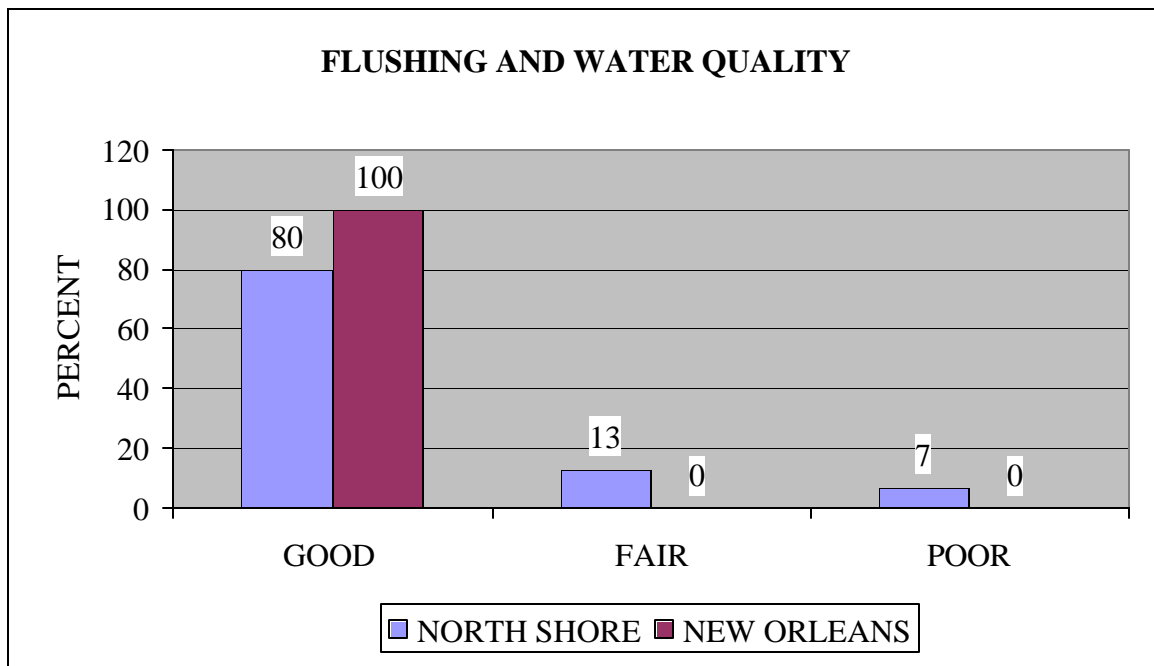
## Suggested Management Practices

Marina experts and regulators have suggested that management practices to ensure adequate flushing and water quality at existing marinas should at a minimum include:

- Ensuring that the marina basin is no deeper than adjacent navigable channels.
- When possible using wave attenuators rather than fixed breakwaters.
- Periodic monitoring of water quality.
- Unobstructed entrances to marinas to allow for maximum water circulation.

## Findings

Based on the comments of the marina operators and the assessments of Dr. LeBlanc and the author, 12 of the 15 marinas surveyed were judged to have good flushing and water quality, two were judged fair and one poor. (Figure 4.4)



**Figure 4.4. Flushing and Water Quality.**

Many of the marinas are located either directly on Lake Pontchartrain or on tributaries flowing into the lake. Flushing at these facilities was good due to tidal and wave action and currents in the rivers and bayous. Flushing and water quality was also judged to be good at the three New Orleans marinas.

### **III. Habitat Assessment**

#### **Introduction**

“Well designed and cared for, marinas can be a valuable habitat for plants and animals that prefer quiet, sheltered waters” (Drabkowski 4-20). As this study was made of operating marinas, characterization of the existing marina sites was the primary method of evaluating habitat.

#### **Suggested Management Practices**

Like marina flushing and water quality, habitat preservation is best addressed during the design and construction phases. Again, existing marinas may have limited options in habitat conservation and protection. Suggested management practices for habitat assessment should include:

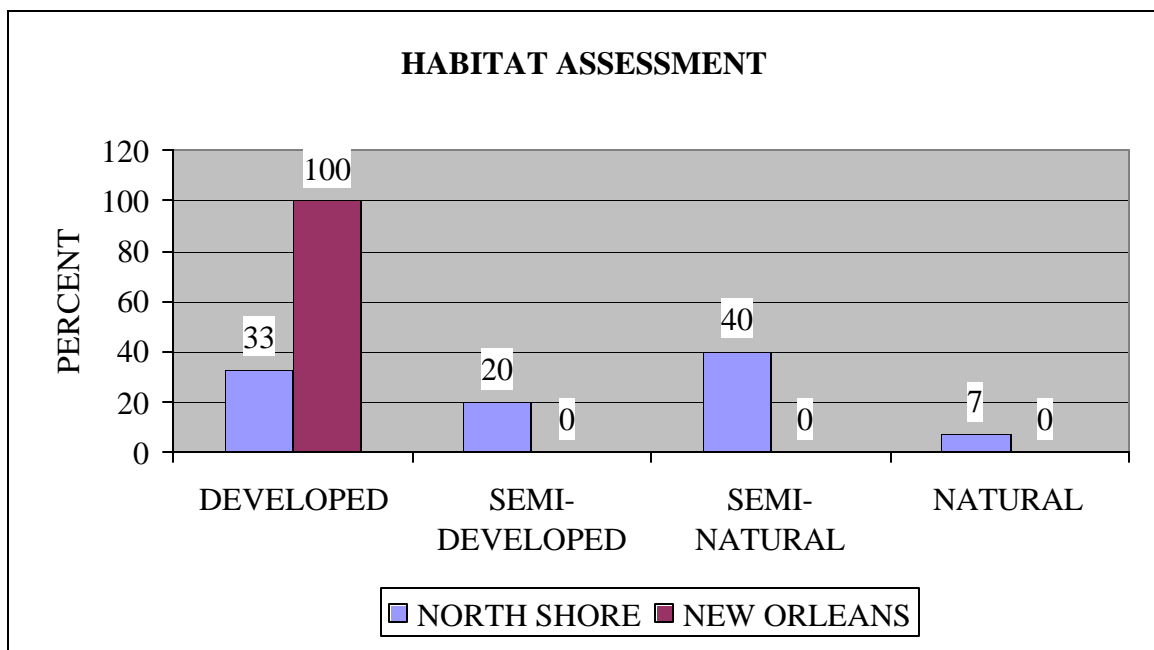
- Habitat surveys to characterize present marina conditions.
- Assessment of habitat functions to minimize disturbances.
- Redevelopment of previously disturbed areas of the marina.
- Consideration of habitat when planning marina expansions.
- Minimizing disturbance to existing shorelines.

Many of these practices may require assistance from trained environmental professionals such as government agencies or private consultants.

## Findings

Five of the 15 marinas are surrounded by either commercial or residential development, with little native habitat evident. (Figure 4.5) These were characterized as developed. Three were characterized as semi-developed, as some of the surroundings appeared to remain in a native state. Six were judged to be in a semi-natural environment, where some adjacent development was present, but most of the marinas surroundings were natural. Only one of the 15 marinas was judged to be surrounded entirely by native habitat. Native or natural refers to areas that are undeveloped and appear to have been undisturbed, at least for enough years so that they appear to be in a natural state. This is not to imply that they are natural as in pristine or “untouched by man”.

Habitat around the New Orleans marinas is urban in nature and heavily developed.



**Figure 4.5. Habitat Assessment.**

## **IV. Shoreline Stabilization**

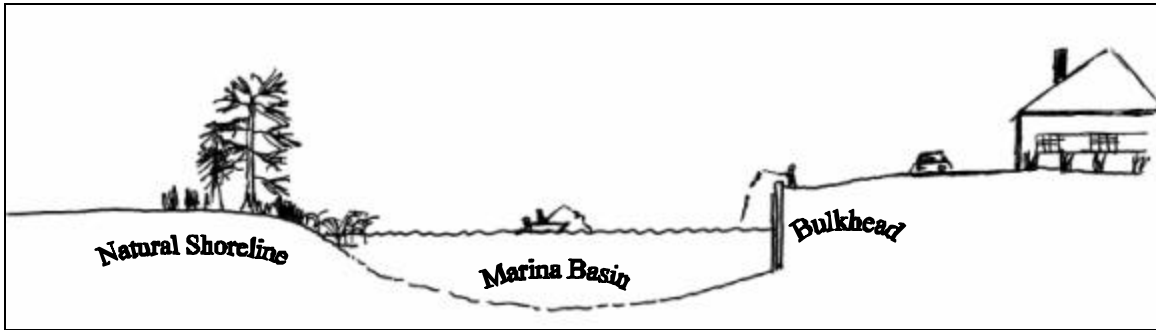
### **Introduction**

“Erosion is a natural process that results from water acting on stream banks and shorelines. In a marina, structural elements are often necessary to protect boats and the marina perimeter from waves or water current energy. Hence, the marina basin is often a fairly calm, nonerosive environment” (Drabkowski 4-27). Erosion can still occur, however, due to wave energy deflected off structures and boats, boat wakes within the basin and new construction in the marina or nearby. The lack of adequate shoreline stabilization leading to erosion can adversely affect marinas in several ways. First, it can threaten the stability of marina structures such as docks, boat launching ramps and boat storage facilities. Second, increased amounts of sediments entering the marina basin can lead to increased need for dredging to maintain adequate water depths in the marina. Last, these sediments decrease water quality, not only within the marina basin but downstream as well, sometimes far from the location of the erosion (Drabkowski 4-27).

### **Suggested Management Practices**

Suggested management practices to stabilize shorelines should at a minimum include:

- Where space permits, employing vegetative plantings, wetlands, beaches and natural shorelines in the marina basin.
- Use of bulkheads or riprap along shorelines that must be steeply graded.
- Retaining natural shorelines where possible.
- Limit development near steep shorelines.



**Figure 4.6. Shoreline Stabilization Treatments.**

### **Findings**

Of the 15 marinas surveyed, none feel they have a problem with erosion or shoreline stabilization, and very little erosion was observed.

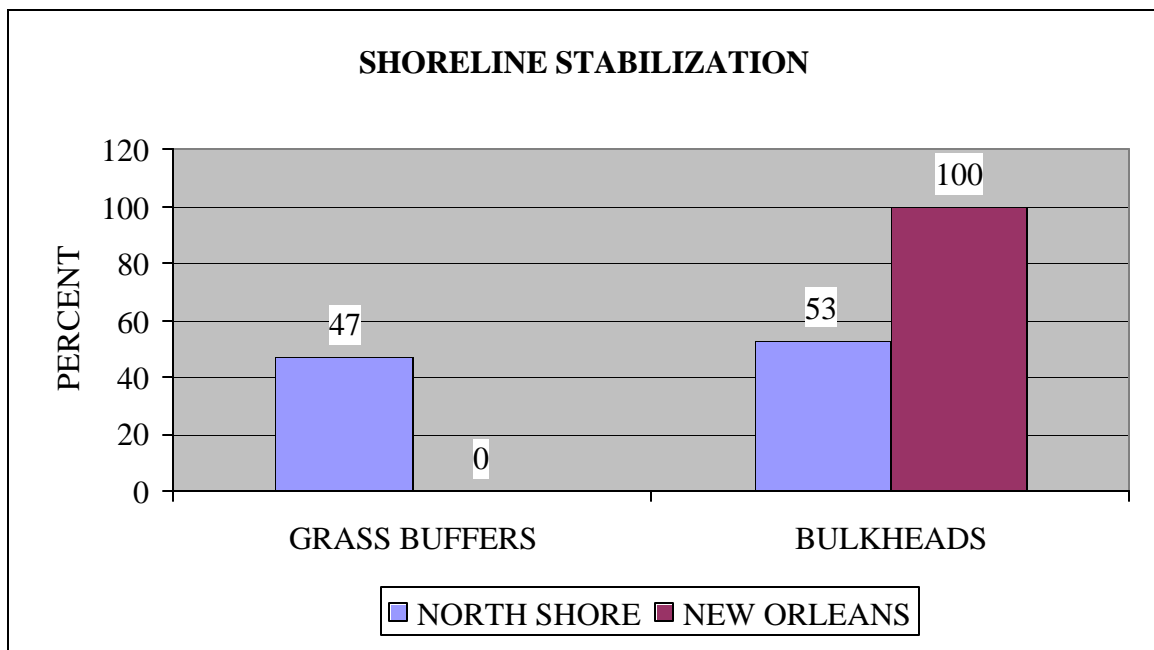


**Figure 4.7. Bulkhead with Riprap. Photo by Author.**



**Figure 4.8. Grass Buffer Sloping to Water. (Typical shoreline treatment of most of the marinas in this study). Photo by Author.**

Seven of the marinas employ grass buffers for stabilizing shorelines, while the remaining eight use bulkheads alone or bulkheads with grass buffers next to them. Grass buffers were typically simple banks where the soil had been graded to slope gradually to the water. (Figure 4.8) Since most of the marina basins were calm, this method seemed to be adequate.



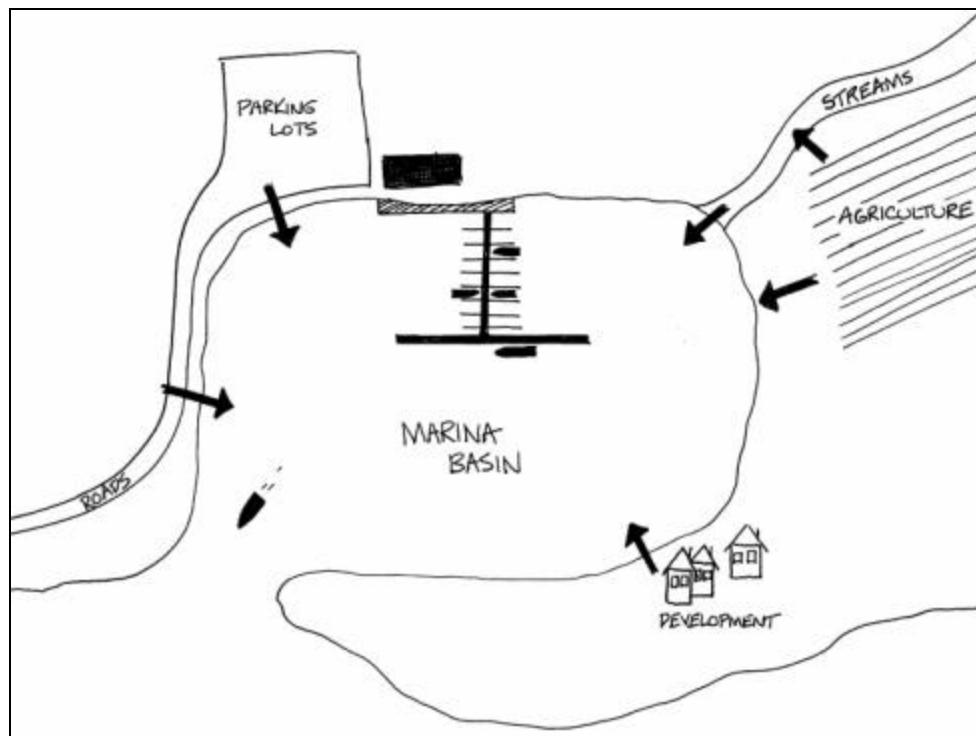
**Figure 4.9. Shoreline Stabilization.**

Grass buffers used for shoreline stabilization were seen predominantly at the smaller marinas in the study group, which also tended to be more sailboat oriented. It should be noted that all three of the north shore marinas located directly on Lake Pontchartrain used bulkheads, as they were subject to direct wave and wind action from the lake. The only instance of moderate erosion found during the visits was observed at one of these marinas near the entrance channel to the lake, where water had penetrated behind some of the bulkheads. The New Orleans marinas, also being located directly on the lake, employed bulkheads as well.

## **V. Storm Water Runoff**

### **Introduction**

Storm water runoff from parking lots and other developed surfaces is a significant source of pollutants for coastal waters, and a serious concern for marinas.



**Figure 4.10. Sources of Storm Water Runoff Pollutants**



Storm water runoff in marinas is generated from parking lots, buildings, boat maintenance areas, and access roads leading to and within the marina (Hollin 38). Ideally, marinas should be designed and operated to minimize storm water from contacting pollutants, and contaminated water should be treated prior to discharge.



**Figure 4.11. Parking Lot Drain and Grass Buffer. Photo by Author.**

### **Suggested Management Practices**

Suggested management practices to control storm water runoff should at a minimum include:

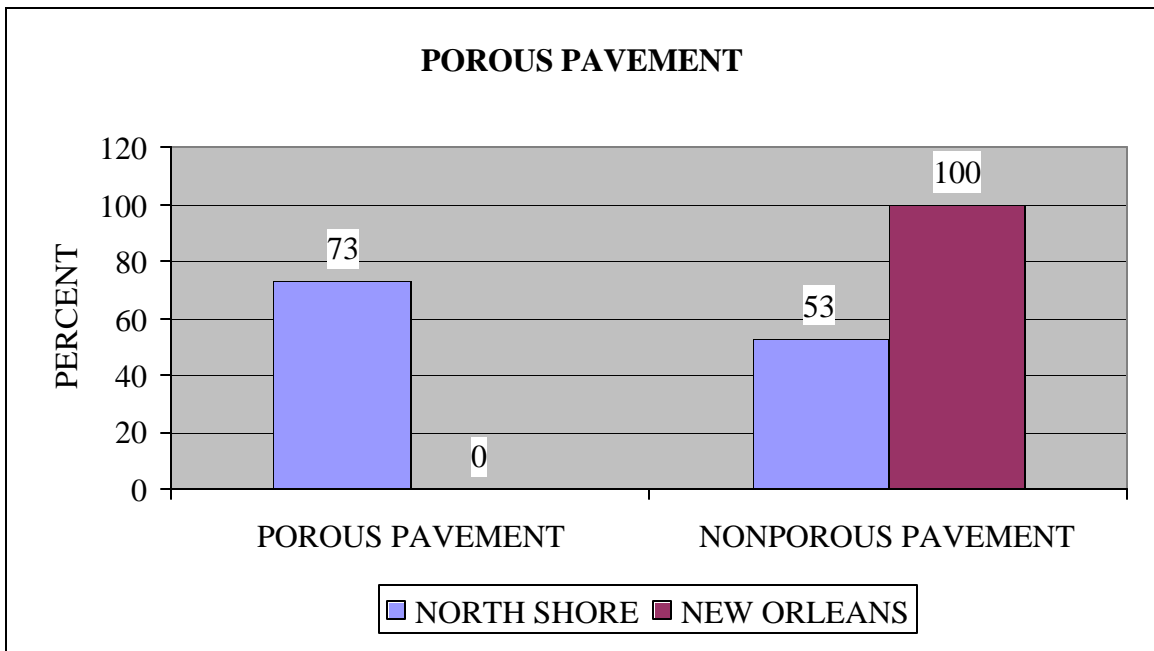
- Restriction of the types and amount of boat repair and maintenance work performed at the marina. Require heavier work to be done offsite, preferably boatyards.
- Sweeping or cleaning parking lots, access roads and paved areas regularly.
- Planting and maintaining grass or vegetation in buffers along the edges of the marina basin, especially next to paved areas.
- Use of porous pavement where possible.

- Use of catch basins to capture pollutants before runoff enters the marina basin.
- Placement of absorbents in catch basins to capture oil and grease in runoff.

### Questions and Evaluations

The 15 marinas were assessed based on three questions:

- Are buffers present between the facility and the water?
- Are parking lots constructed of porous materials?
- Are retention/detention basins used to control runoff?



**Figure 4.12. Porous Pavement.**

### Findings

Of the 15 surveyed marinas, 12 had grass buffer zones situated between roads and parking areas and the water. However, the majority of these buffer zones did not appear to be designed as such, but rather for aesthetic and/or maintenance purposes. The remaining three marinas had paved areas that extended to the water's edge, allowing for no diversion or filtration

of runoff before reaching the water. It is recommended that these three marinas either install grassy areas along the water's edge, or construct a curbed gutter to divert runoff into holding basins.

Eleven of the 15 marinas had gravel roads and parking areas that allow for some filtration of runoff before entering the marina basin. Again, this appeared to be the result of cost (versus paving) rather than as a designed management practice.

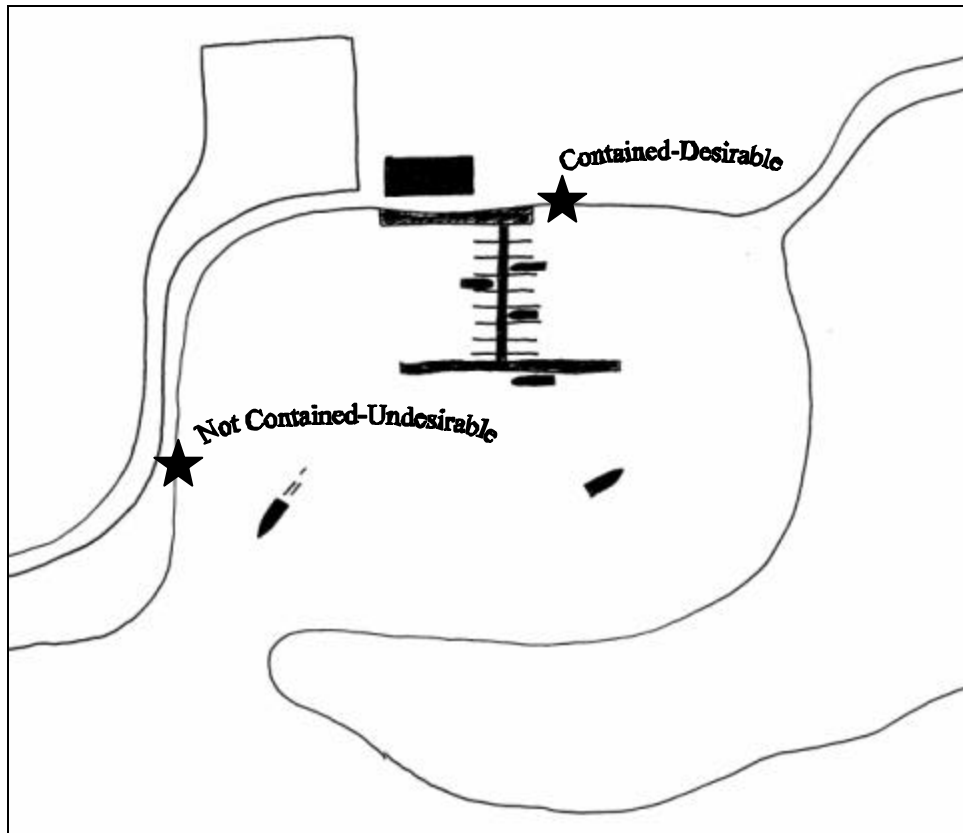
None of the surveyed marinas, including the three New Orleans marinas, used retention/detention basins in controlling storm water runoff. This finding may be primarily due to cost. The management of South Shore Harbor marina in New Orleans, which operates as part of the Orleans Levee District, stated that a recently constructed maintenance facility at its adjacent airport did have a retention basin for the purpose of settling out pollutants. If the marina were built today, it would undoubtedly be constructed with such basins. It is interesting to note that none of the marinas surveyed considered storm water runoff as a major problem, and all felt that water quality in their basins was good.

## **VI. Fuel Station Design And**

## **VII. Petroleum Control**

### **Introduction**

Marinas frequently sell gasoline and diesel fuel as a service to boat owners. The design of these fueling stations must provide for the delivery of fuel to the site, storage of fuel, and the dispensing of fuel to vessels. Each of these steps is a potential source of spillage, and preventing uncontrolled releases must be considered when designing fueling stations (Connecticut Department of Environmental Protection 1992).



**Figure 4.13. Fueling Station Locations.**

### **Suggested Management Practices**

Management practices that have been suggested to handle fueling station and petroleum control concerns should at a minimum include:

- Prohibiting the pumping of bilge water that is oily or has a sheen.
- Ensuring that fueling station instructions are clear and explain proper fueling, spill prevention, and spill reporting procedures.
- Preparing a fuel spill recovery plan, and ensuring that employees are trained in its implementation.
- Having fuel response equipment readily available.
- Locating fueling stations so that a spill can be readily contained.

- Equipping pumps with automatic shutoffs.



**Figure 4.14. Marina fuel pumps. Photo by author.**

### **Questions and Evaluations**

Four questions were asked concerning fuel station design and petroleum control:

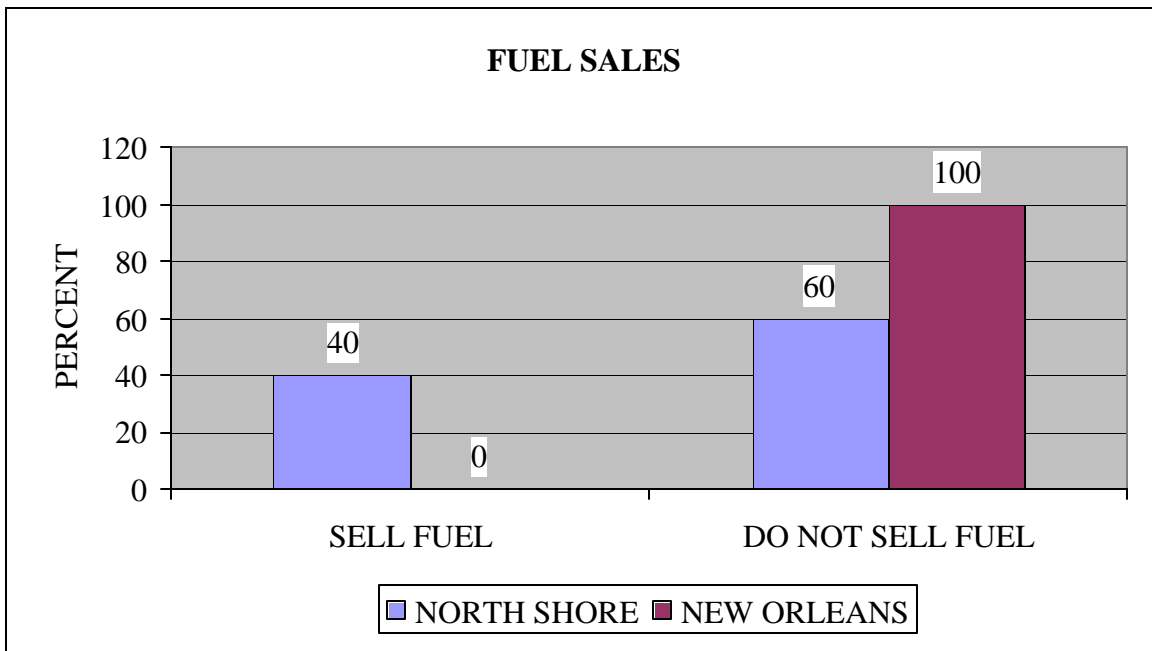
- Does this marina have a fueling station?

If the reply was yes, then:

- Is spill response equipment readily available?
- Is the fueling station located so that a spill can be contained in a limited area?
- Are fuel pumps equipped with automatic shut-off nozzles?
- Are berms or curbs present around liquid material storage areas to contain spills?

### **Findings**

Six of the 15 marinas in the study group had fueling stations at their marina. Most of the remaining noted neighboring marinas or boatyards sold fuel to their boaters, and were content not to have fueling facilities.



**Figure 4.15. Fuel Sales.**



**Figure 4.16. Fuel Tanks with Concrete Berm to Contain Spills. Photo by Author.**

Of the six that sold fuel, four had spill response equipment near the fueling station (usually in a locker or box) for quick access in case of a spill. The remaining two had equipment

at another location in the marina. This equipment typically consisted of absorbent pads, booms for containing spills in the water, and liquid dispersal agents. Only one of the six marinas that sold fuel had a fueling station located in a protected area that could be easily isolated in case of contamination.

Of the six marinas with fueling stations, all had pumps equipped with automatic shut-off nozzles. Three of the six had constructed berms around the fuel tank area to contain spills. None of the New Orleans marinas sold fuel. Fuel was readily available at nearby boatyards.

## **VIII. Liquid Material Management**

### **Introduction**

A wide variety of liquid (often toxic) materials are commonly used and stored around marinas. Facilities that provide for adequate and safe handling and storage of these materials are important for preventing contamination of the marine environment.

### **Suggested Management Practices**

Liquid materials are major concerns at marinas, particularly at those where patrons are likely to perform boat maintenance. For this reason, management practices to properly handle liquid materials should at a minimum include:

- Construction of berms around liquid material storage areas.
- Minimizing the quantities of liquid materials stored on site.
- Providing separate, labeled containers for disposal of liquid wastes.
- Having a spill response and recovery plan in place.
- Keeping spill response equipment readily available.
- Posting signs instructing patrons as to the correct handling and disposal of liquid materials.



**Figure 4.17. Contained Disposal Site for Liquid Wastes. Photo by Author.**

### **Questions and Evaluations**

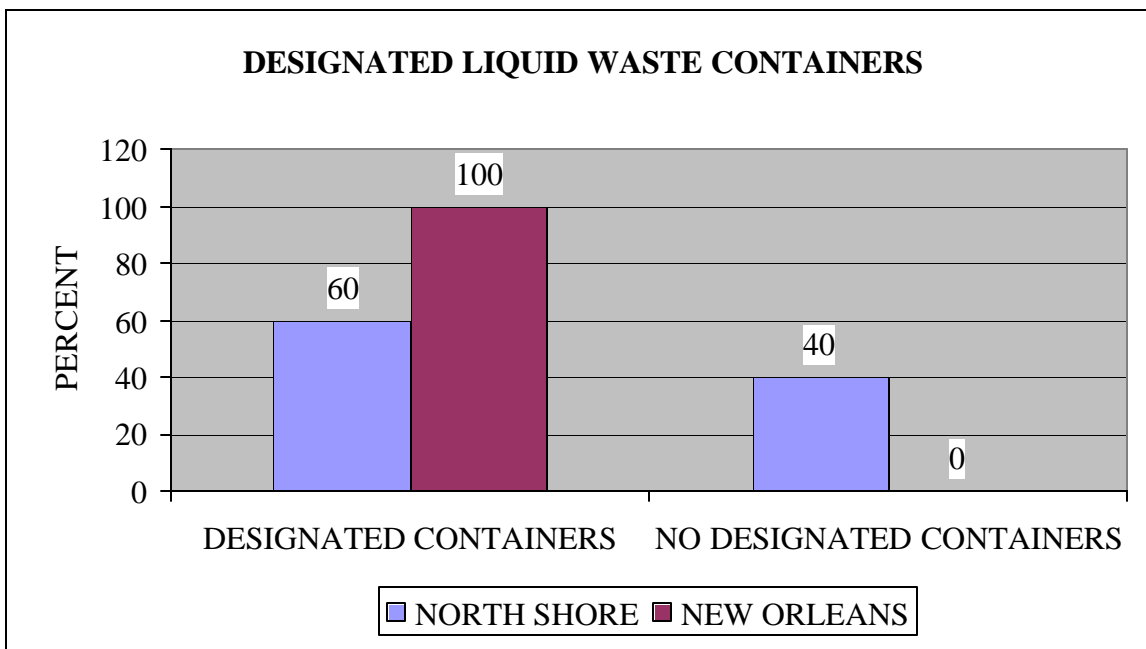
The following questions and evaluations were conducted concerning liquid material management:

- Are separate containers for the disposal of liquid materials provided?  
If the reply was yes, then: Waste oil/filters? Waste gasoline? Used antifreeze?  
Waste diesel? Other?
- Are berms or curbs present around liquid material storage areas to contain spills?
- Is a spill response and recovery plan in place?
- Is spill response equipment readily available?
- Are signs posted directing patrons as to the proper disposal of waste liquid materials?

### **Findings**

Six of the fifteen marinas provided designated containers for disposing of at least some liquid material wastes. These typically were barrels or containers located near dumpsters or supply storage area.



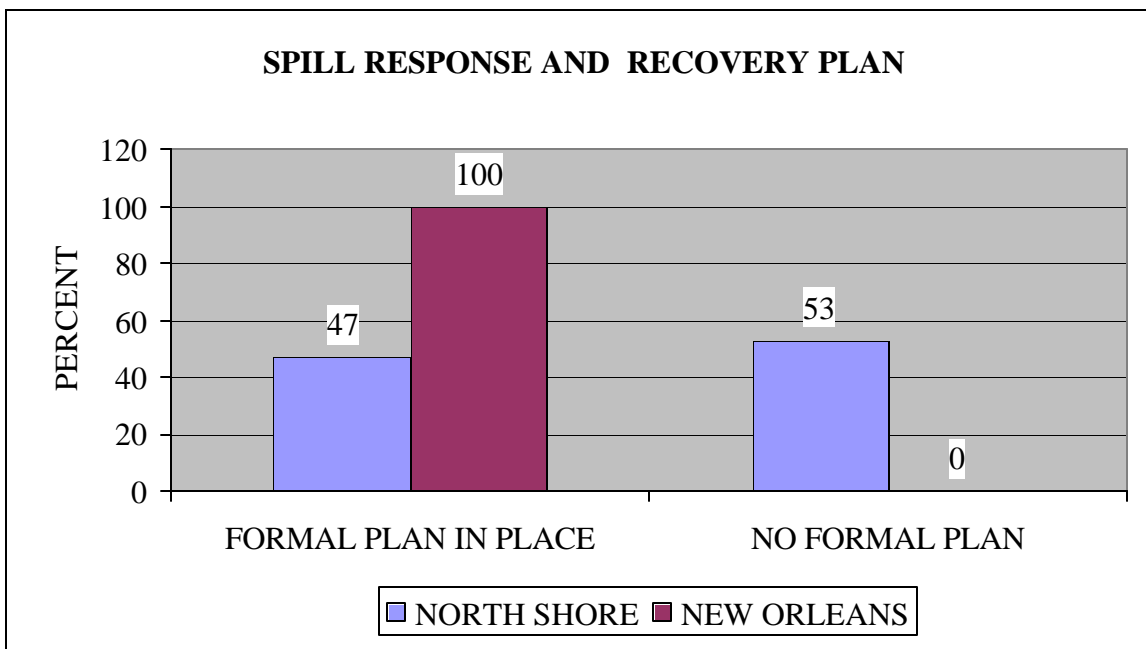


**Figure 4.18. Designated Liquid Waste Containers.**

Of the six marinas that did have designated containers, all had containers for used oil and filters, two had containers for waste gasoline and antifreeze, and one accepted waste diesel. The nine marinas that did not have designated containers believed that their patrons were either removing these materials from the marina or not performing the types of maintenance activities on their boats that would generate waste liquids.

None of the marinas had berms constructed solely for the purpose of protecting liquid materials other than fuel; however, the three marinas that did have berms around their fuel tanks did also store some liquids within the berm.

Seven of the fifteen marinas stated they had a formal spill response and recovery plan. These tended to be the larger facilities catering more to recreational powerboats as opposed to sailboats.



**Figure 4.19. Spill Response and Recovery Plan.**

Again, the same seven of the fifteen marinas had spill response equipment available in a location providing for quick response in case of a liquid material spill.

Only three of the fifteen had signs posted in conspicuous places directing patrons as to the proper disposal of waste liquid materials. As noted above, nine indicated that they felt patrons either removed these materials from the marina or did not generate them so they did not see a particular need for posting signs.

Each of the three New Orleans marinas evaluated very well concerning liquid material management. All had containers for waste liquids, berms around liquid storage areas, spill response plans in place and signs posted prominently alerting patrons to the importance of properly disposing of liquids.

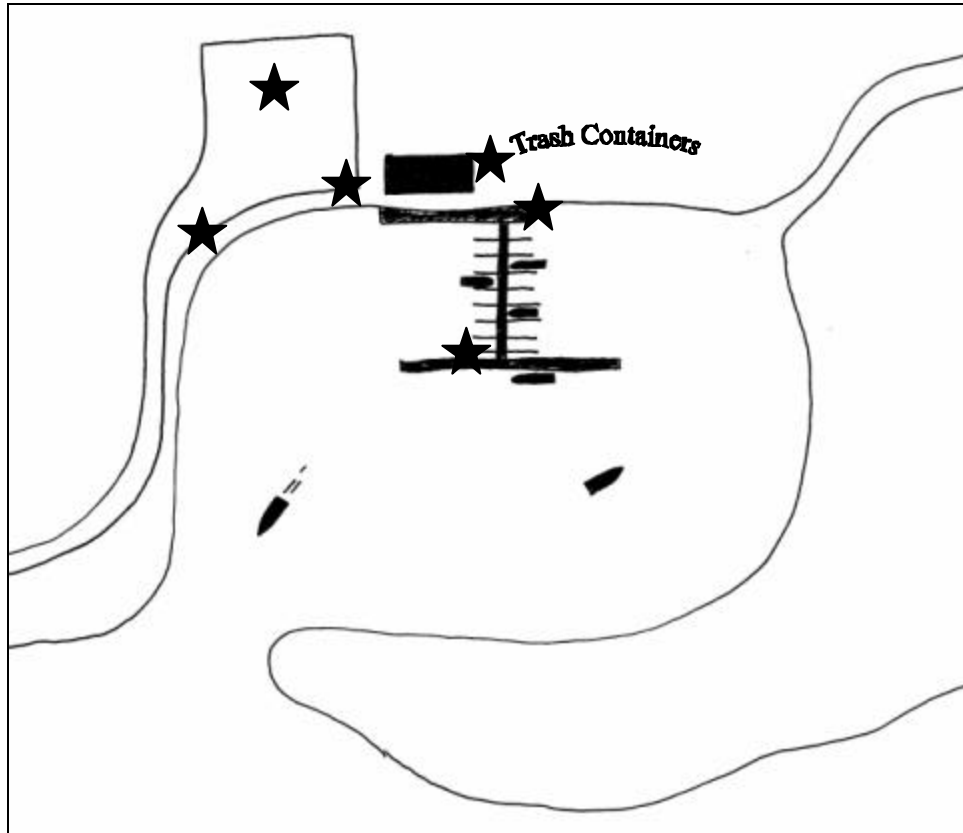
## **IX. Solid Waste Management**

### **Introduction**

Solid waste generated at recreational marinas, or aboard the boats they serve, generally falls into three categories: galley, vessel operation and maintenance, and recreational (International Maritime Organization 36). Unkempt grounds and generally poor housekeeping can result in more waste being generated than is necessary. Maintaining neat facilities is an important first step in an effective pollution control program, as well as helping to attract and keep customers.



**Figure 4.20. Covered Trash Container. Photo by Author.**



**Figure 4.21. Locating Trash and Recycling Containers in High Traffic Areas.**  
**Suggested Management Practices**

Several management practices are recommended for marinas to properly handle solid waste, they include:

- Encouraging marina patrons to avoid doing any waste producing boat maintenance.
- Placing covered trash receptacles in convenient locations near high traffic areas such as docks, parking lots and boat ramps. Boaters could also be provided with trash bags to take onboard.
- Providing recycling containers at designated locations, or making patrons aware of recycling facilities nearby.
- Designating pet walking areas and requiring pet wastes to be cleaned up and properly disposed of.

## **Questions and Evaluations**

The following questions were asked and observations made concerning solid waste management:

- Are docks and grounds well maintained and free of clutter?
- Are covered containers provided for solid waste and trash?
- Are recycling containers provided? If the reply was yes, then: Batteries? Used oil? Aluminum? Plastic? Other?
- Are signs, billboards, flyers, etc. posted conveying the importance of environmental precautions?

## **Findings**

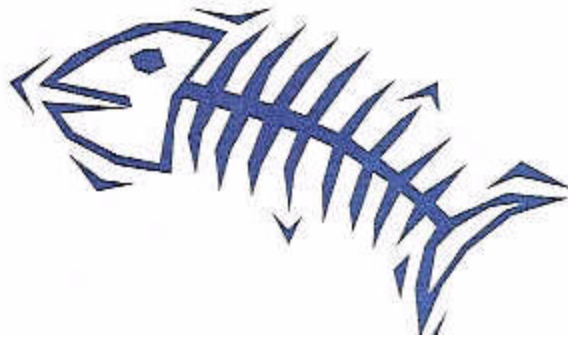
Twelve of the fifteen marinas in the survey group had generally well maintained docks and grounds. Several were excellent. These tended to be the larger facilities, although one of the smaller ones was virtually spotless, with very clean grounds and docks and substantial landscaping. Covered trash containers were present at all of the marinas. These were either dumpsters at one or more locations in the marina, or trashcans placed at the dock entrances or on the docks. While all fifteen had trash containers, three of the marinas did not have adequate containers or placed them in an area far removed from boat and pedestrian traffic.

Only four marinas provided recycling facilities or services. Of these four, all accepted used batteries and oil for recycling, while one also recycled aluminum and plastic. Three marinas of the 15 displayed signs stressing the importance of environmental awareness concerning solid waste and recycling.

All of the New Orleans marinas had very well maintained docks and grounds, provided numerous covered trash containers and posted environmental signs. Interestingly, one area

where the New Orleans marinas did not outpace their north shore counterparts was in recycling. Used oil was the only material accepted for recycling by these three marinas. Again, as with fuel sales, they depended on nearby boatyards to provide some of these services.

## **X. Fish Waste Management**



### **Introduction**

At marinas where large quantities of fish are landed, the cleaning of sport fish and resulting waste can create water quality problems. Significant amounts of fish waste can overwhelm the natural ability of the marina basin to assimilate and decompose it. In addition, resulting odors and floating fish parts are not attractive to marina patrons (Drabkowski 4-76).



**Figure 4.22. Sign Denoting Fish Cleaning Laws and Procedures.**  
**Source: Florida Sea Grant.**

Ideally, fish cleaning and the disposal of waste are best done offshore, if the laws of the state allow such practices. Louisiana does not allow this for several species of game fish.

When fish are brought back to the marina to be cleaned, boaters are glad to have a facility for cleaning their catch, avoiding creating a mess on their boats or the marinas docks.

### **Suggested Management Practices**

Suggested management practices to properly handle fish wastes should at a minimum include:

- Cleaning of fish offshore and discarding of wastes at sea, if allowable by state law.

While cleaning and disposing of fish wastes in lakes and inshore areas is not recommended. Louisiana does allow fish to be gutted. However, the Louisiana Department of Wildlife and Fisheries website states “all saltwater finfish except tuna, garfish, and swordfish, and sharks possessed by a recreational fisherman shall have the head and caudal fin intact until set or put on shore. Tuna, garfish, swordfish, Swordfish and sharks possessed by a recreational fisherman shall not be skinned or scaled until set or put on shore. Tuna shall retain the caudal fin intact until set or put on shore and those species of tuna, which have minimum size restrictions, may have the head removed as long as the carcass length without the head exceeds the minimum size requirement.” This restriction aids LDWF agents in monitoring catch and size limits.

- Installing fish cleaning facilities at marinas, ideally with tables, fresh water and containers for waste.



**Figure 4.23. Fish Cleaning Table. Source: Florida Sea Grant.**

### **Questions and Evaluations**

Four questions were asked concerning management of fish wastes:

- Is fishing a significant component of patron's activities?

If yes, then:

- Are fish cleaning areas and/or facilities provided?
- Are containers and/or a grinder available for the disposal of fish waste?

### **Findings**

Of the fifteen surveyed marinas, only one indicated fishing was a significant activity at their marina. This marina had a designated fish cleaning facility and containers for the disposal of waste. The fourteen marinas that did not have much fishing activity indicated they were



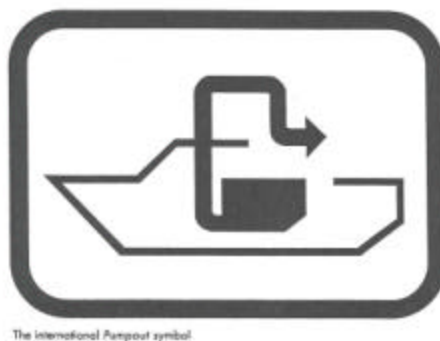
primarily used for docking of powerboats and sailboats, with a few live-aboards, i.e., boat owners using the boats as semi-permanent or permanent residences. Recreational boating, not fishing, was the activity pursued by the large majority of their customers. The three New Orleans marinas also stated they had little fishing activity at their operations.

## **XI. Sewage Facility Management And**

## **XII. Maintenance of Sewage Facilities**

### **Introduction**

While marinas and boaters are not usually considered to be primary sources of pathogen contamination in surface waters, properly installed and maintained public restrooms, pumpouts and/or dump stations can lead to the reduction of sewage entering these waters. “Boaters and marinas, in particular, have a vested interest in clean waters, since the livelihood of marinas and the recreational benefits boaters derive from use of the waters are clearly linked to clean water” (Drabkowski 4-80). Most states, including Louisiana, encourage the construction and use of boat pumpouts through the Clean Vessel Act Pumpout Grant Program (Drabkowski 4-80). This program is administered in Louisiana through the Department of Wildlife and Fisheries. It provides for a cost-share of 75% by the program and 25% by the marina. Typical total installation cost for a moderate size marina is about \$8,000 to \$10,000.



**Figure 4.24. International Pumpout Symbol.**

A pumpout station is “A facility that pumps or receives human body wastes (sewage) from a Type III marine sanitation device (holding tank) installed on board vessels.” A Type III marine sanitation device (holding tank) is defined as “Any equipment for installation on board a vessel which is specifically designed to receive, retain, and discharge sewage.” (As defined by the US Department of the Interior, Fish and Wildlife Service, Clean Vessel Act) These facilities, typically vacuum operated, are located in the marina where a boat can empty its onboard sewage into a holding tank for later pickup by a septic truck or for direct disposal into the public sanitary sewer. The pumpout can be fixed in one spot where the boat can dock, or portable units that can be rolled on the dock to the boat and then taken to a holding tank or connection to a sanitary sewer system.



**Figure 4.25. Pumpout Located Near Fuel and With Clear Instructions.**  
**Photo by author.**

### **Suggested Management Practices**

Suggested management practices for proper management and maintenance of sewage facilities should at a minimum include:

- Installing a pumpout if needed.

- Providing pumpout service at convenient times and at no cost to boaters.
- Ensuring that pumpouts are clean, well maintained and accessible.
- If possible, having marina personnel operate pumpouts.
- Providing clean public restrooms.
- Considering designating marina waters as a “No Discharge Zone”.
- Establishing practices to control pet wastes, and discouraging feeding of birds in the marina.
- Regularly inspecting and maintaining pumpouts and restrooms.

### **Questions and Evaluations**

Pumpouts and sewage disposal is perhaps the single biggest concern for all marinas. The following questions were asked regarding sewage disposal facilities:

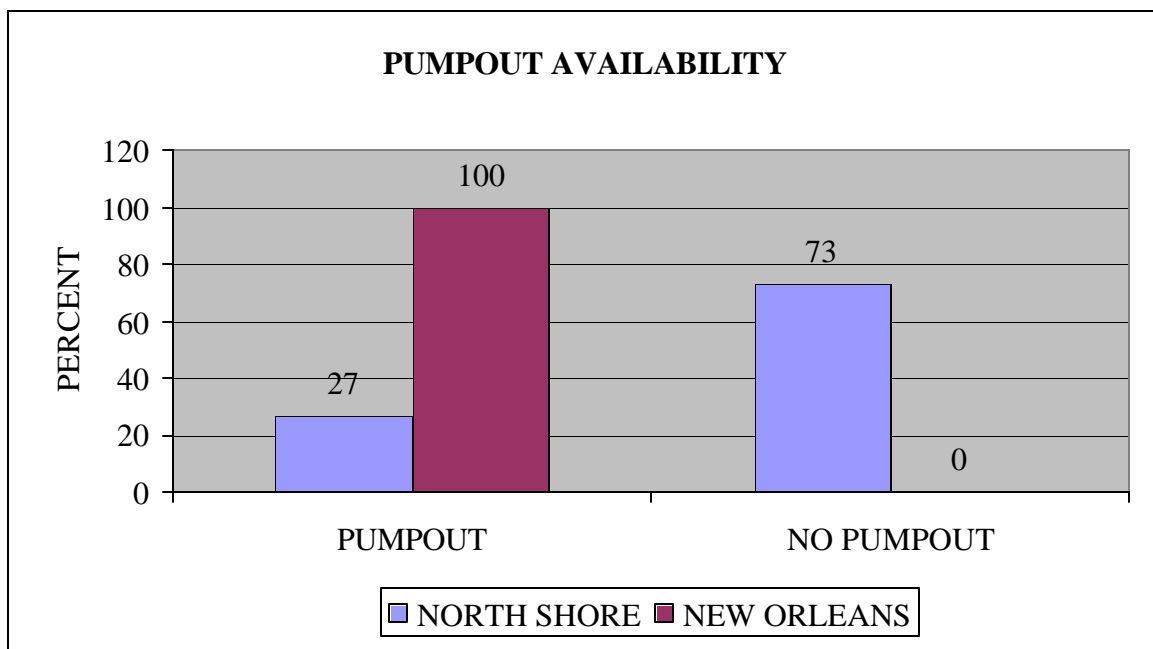
- Are clean public restrooms provided for boaters?
- Are sewage pumpout facilities or dump stations provided?
- If yes, then:
- Is the pumpout facility self-serve?
- Are signs posted making boaters aware of the facility, identifying it and explaining its proper use?
- If no sewage pumpout or dump station is present, is the marina interested in obtaining one?
- Is the marina management aware of the cost-share program available through the Louisiana Department of Wildlife and Fisheries?
- If a sewage pumpout or dump station is present, is it well maintained and clean?

## Findings

Eleven of the fifteen marinas provided relatively clean restrooms. These were either public or in a location available to the public, usually the office.

Four of the fifteen marinas provided pumpouts for their patrons. Three of these marinas stated that their pumpouts were self serve, while marina personnel operated the fourth. All four pumpouts were well marked with signs locating the facility and explaining its proper operation, and all appeared clean and well maintained.

Of the 11 marinas without pumpouts, three indicated they were interested in obtaining a facility. The remaining eight noted that either pumpout facilities were located nearby, or that not enough demand was present at their marina to warrant one.



**Figure 4.26. Pumpout Availability.**

Several of the marinas, both with and without pumpouts, complained the process to obtain a pumpout was difficult, bureaucratic and required significant paperwork. Several indicated they would be more disposed to installing a pumpout if the process was simplified and

they received more assistance from state agencies, specifically the LDWF and the Louisiana Department of Health and Hospitals. It should be said, however, that several of the marinas with pumpouts indicated they had no significant problems installing them and were satisfied with the assistance received from these state agencies. All 15 marinas were aware of the cost-sharing program.

The three New Orleans marinas all had clean, well-maintained pumpouts and public restrooms.

### **XIII. Boat Cleaning**

#### **Introduction**

One of the “joys” of boat ownership is the seemingly constant task of cleaning. While more intensive tasks such as sanding, scraping, painting and engine repair are performed at boatyards, smaller chores such as the cleaning of boat decks and hulls above the waterline are commonly done at recreational marinas like the ones in this study. Soaps, detergents, cleaning solvents and paints are often used in light boat maintenance, and preventing their entry into marina waters is essential.

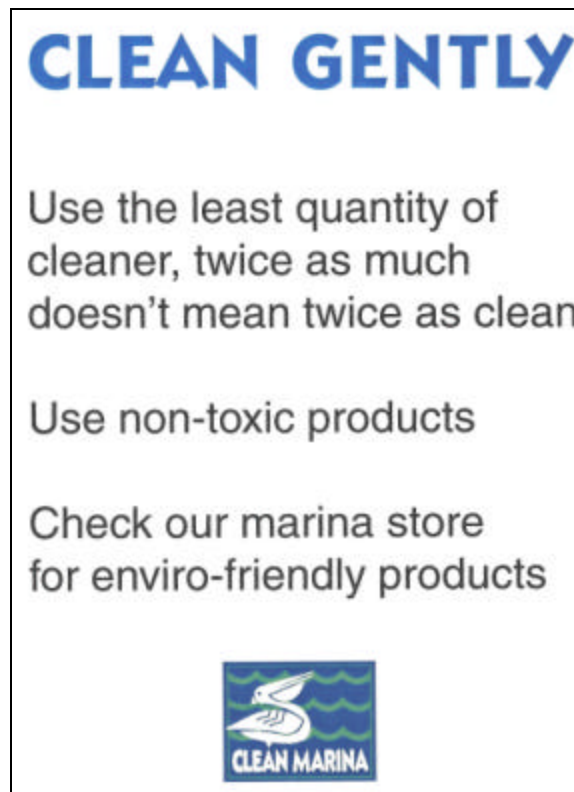


**Figure 4.27. Hand Cleaning of Boat Hull. Source: Florida Sea Grant.**

## Suggested Management Practices

Suggested minimum management practices for boat cleaning should include:

- Encouraging hand washing of decks and hulls above the waterline, and the removal of smaller boats from the water where practicable. Discourage pressure washing.
- Encouraging use of phosphate-free and biodegradable cleaners.
- Prohibiting in-water sanding and scraping.



**Figure 4.28. Clean Gently Poster. Source: Florida Sea Grant.**

## Questions and Evaluations

The following questions concerning boat maintenance were asked:

- Does the cleaning of boat topsides and hull scrubbing occur on site?

If the reply was yes, then:

- Are boat owners encouraged to remove the boat from the water (where feasible) and perform cleaning where debris can be captured and properly disposed of?
- Is the use of phosphate-free and biodegradable detergents and cleaning compounds encouraged?
- Is boat maintenance and repair permitted?

If the reply was yes, then:

- Are designated work areas provided and clearly marked?
- Do tenant contracts clearly require designated areas and techniques be used when performing boat maintenance?
- Are vacuum sanders used?
- Are tarps used to catch debris?
- Is maintenance performed inside buildings where possible?

## **Findings**

Cleaning of decks and hulls above the waterline is a common practice at marinas, and 14 of the 15 in the study group allowed it. None of these 14 actively encouraged boaters to remove boats from the water when cleaning, as most of the boats at the study marinas were larger boats not normally trailered. The use of phosphate-free and biodegradable detergents was universally encouraged, and is very common in the marina industry nationwide. Only one of the fifteen marinas stated or was observed allowing heavier boat maintenance and repair, and this appeared to be a casual and not necessarily approved practice. No practices such as use of tarps, vacuum sanders or designated maintenance areas were observed.

The New Orleans marinas all allowed deck and hull washing above the waterline. Several nearby boatyards performed all other maintenance activities for boaters.

## **XIV. Boat Operation**

### **Introduction and Question**

“No wake zones, motorized craft restrictions, and sign and buoy placement are proven, widely used practices for protecting shallow water habitats” (Drabkowski 4-100). Boat traffic at high speeds at marina entrances and within the marina basin can not only be a safety hazard, but can cause bank erosion, disturbance of native plants and wildlife, turbid waters, and damage to other boats and marina facilities.

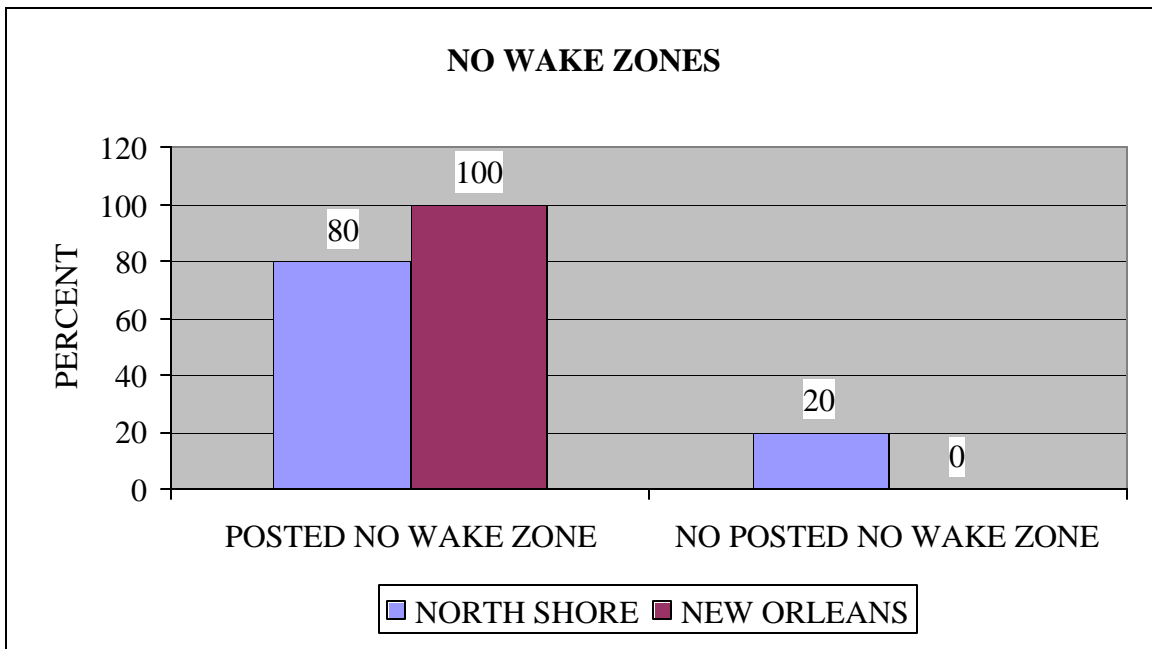


**Figure 4.29. Clearly Marked NO WAKE Zone. Photo by author.**

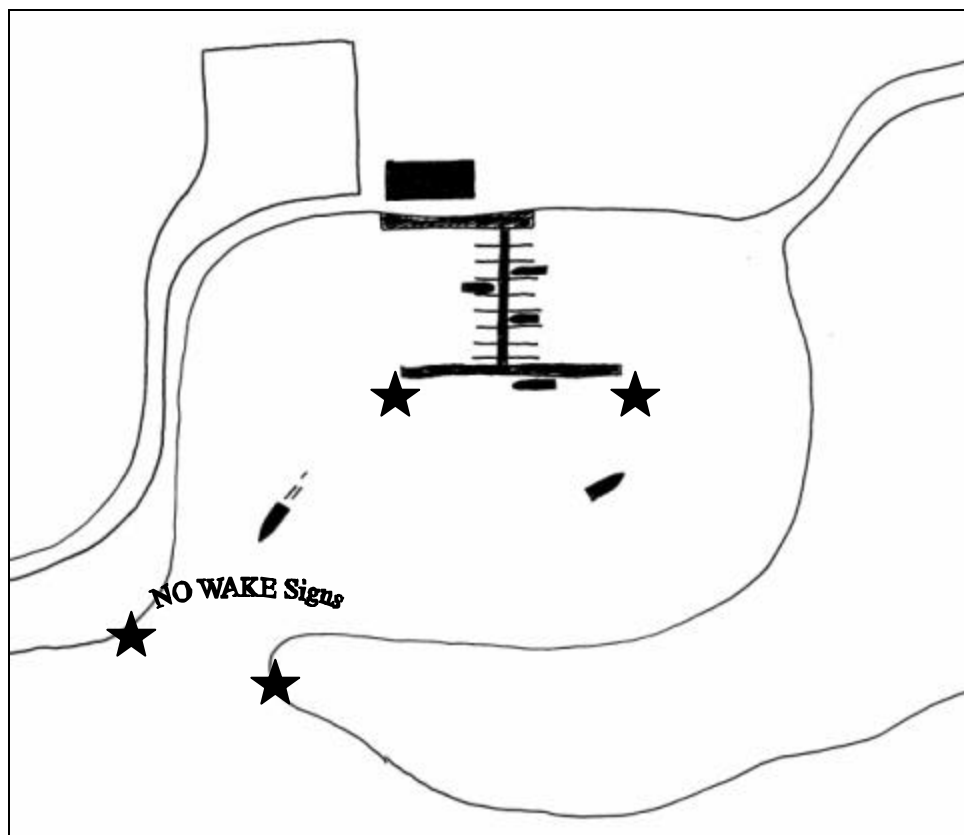
### **Suggested Management Practices**

- Ensuring that no wake zones are posted in and at the approaches to the marina.
- Restricting boat traffic in shallow areas.





**Figure 4.30. NO WAKE Zones.**



**Figure 4.31. Suggested Locations for NO WAKE Zone Signs.**

## **Findings**

Each marina was observed to see if “no wake” zones were designated with signs. Twelve of the 15 marinas in the study did have no wake zones designated and posted. Several were located on tributaries where the entire stream was a no wake zone.

Signs were not observed at two marinas. However, they were located at the upper ends of streams designated no wake zones and did not appear to be navigable past their locations, and therefore had no traffic from passing boats. One marina was in the process of having no wake zones designated in front of their operation. They stated they have had complaints from boat owners about excessive wakes from passing boats. This marina also said they would have already had the zones in place, but were frustrated at the lack of cooperation from the LDWF.

Each of the New Orleans marinas was well posted with no wake zone signs.

## **XV. Education and General**

### **Introduction**

The final section of the questionnaire and evaluation dealt with boater education and general questions about the marina, especially concerning design and operation. Findings in this section were determined primarily by observation and in open discussions with several of the marina operators.

### **Suggested Management Practices**

Suggested management practices for public education should at a minimum include:

- Use of signs to inform boaters about clean marina and boating practices.
- Erecting bulletin boards for environmental messages and information.



**Figure 4.32. Bulletin Board near Marina Office. Photo by author.**

- Use of materials such as handouts, fliers, bill stuffers, posters and newsletters to promote good environmental practices.
- Inserting clauses in leases and contracts with customers requiring compliance with environmental practices.

### **Questions and Evaluations**

The following observations and questions were posed:

- Are marina environmental policies posted or otherwise promoted at the marina?
- Are marina personnel trained on the marina's environmental policies?
- How old is this marina?
- How would you rate the layout and design of this marina?
- Was any professional help used in the layout and design of this marina? (i.e. architects, landscape architects, civil engineers, etc.)
- What would you change about the layout and design of the marina and why?

## **Findings**

Five of the 15 marinas had environmental policies prominently posted and promoted them. Several marinas had no signs whatsoever. Ten marinas stated their employees were familiar with the facility's environmental policies, or had one person designated to monitor this area. The study group marinas ranged in age from 15 to over 60 years. The average age was 30.3 years.

Layout and design of the marinas was judged excellent for one operation, nine were good, three were fair, and two poor. Several operators commented that when built, their marinas were very well designed for that time, but had become outdated in some aspects by today's standards.

Four marinas had professional help during construction. These professionals were either marina designers or engineering firms with marina experience. These four marinas were the larger and newer operations, which catered more to powerboats and were located directly on the lake. The remaining eleven either had no professional design at the time of construction or did not know.

The final question was "what would you change about the layout and design of the marina and why?" "Bigger slips" was the answer from many of the marinas. They stated that recreational boats are becoming longer and wider and are too big for many of their existing slips. One operator was actually contemplating removing a dock with smaller slips. Several of the smaller marinas seemed to be quite content with their present facilities. All of the marinas in the study were at or near capacity.

The three New Orleans marinas replies to the questions in this section did not vary much from those of the north shore operations. All were well posted with environmental signs, fliers and bulletin boards, and personnel were trained accordingly.

The average age of these three marinas was 32 years, with the newest 13 years old and the oldest 42. All three rated their layout and design good to excellent, and (not surprisingly), said they had professional help at the time of construction. All three stated they also needed more big slips to meet the demand of larger modern boats.

## **CHAPTER 5: SUMMARY AND CONCLUSIONS**

### **Summary**

The purpose of this thesis was to establish what types of practices are being used in Louisiana's marinas to address environmental management measures, and to make recommendations on ways they can improve their management practices. Since a study of all 138 recreational marinas in the state would have been prohibitive due to time and expense constraints, a group of 15 marinas in a limited geographical area was selected for analysis. Based upon observations and the information gathered, further recommendations can be made for existing and future marinas in general. Suggestions can also be made as to how government can assist marinas in achieving the best management practices, and how landscape architects and other designers can participate in this process.

### **Discussion of the Findings**

By and large, most of the marinas in the study group use good management practices. Marina managers seem well aware of the importance and benefits of a clean marina, not only from an environmental perspective, but also in attracting and keeping happy boat owners.

Some of the management measures, such as the first four discussed; flushing, water quality, habitat assessment and shoreline stabilization; are primarily design measures and are more applicable to the siting and construction phases of marina development, or to expansions of existing marinas. The remaining 11 are operation and maintenance measures applicable to existing marinas, although they should also be considered in the design phase.

Concerning the first four measures, the North Shore marinas rate relatively well. Flushing and water quality are predominantly good. Habitats, although somewhat disturbed, are

at least clean, and shoreline stabilization does not appear to be a problem, with little erosion evident. In these categories, the marina managers seem to have adapted well to the conditions imposed upon them during the original design and construction and are making the best of the situation.

Buffers and porous paving are used at most of the study group marinas. While these were not usually designed specifically to control storm water runoff, they seem to be effective. No use of retention/detention basins was noted. But in their defense, when these marinas were built, such basins were not a common practice.

Findings concerning fueling, petroleum and liquid material management issues are more mixed. Six facilities sell fuel and each uses automatic shutoff nozzles. However, only four of these six keep spill equipment handy, three have berms around fuel tanks, and only one has the fueling station located in a protected place that could be easily isolated in case of a spill. Six of the 15 used designated containers for liquid wastes, and only seven had formal spill responses and recovery plans.

Most of the grounds at the study marinas are generally clean or very clean and free of litter. Only four, however, offered recycling.

Fishing is not important at 14 marinas, but the fifteenth does have a fish cleaning facility. Eleven operations have public restrooms, and four have pumpouts. Eight others have pumpouts nearby.

Boat cleaning does not appear to be a major issue at these marinas. Heavy repair that could be more environmentally problematic is performed at boatyards, not at these marinas. No wake zones and signs are evident at 12 facilities, while the other three either do not require them or are getting them.

Posting of environmental signs, posters, etcetera, is spotty and could be more prevalent with little cost and effort.

Most of the marina operators in this study are fairly content with their operations, although not especially aggressive. All are at or near capacity.

### **Comparison with New Orleans Marinas**

In general, the North Shore marinas do not seem to be as environmentally progressive as the three New Orleans area marinas that were surveyed for comparison purposes. This difference is due to several factors.

First, only two of the North Shore marinas were similar in size and scope to the New Orleans marinas. Larger facilities require trained full-time managers. Many of the study group marinas did not have on-site managers, and most were not professionally trained. Large marinas with considerable activity, traffic and larger boats have the potential for more frequent and significant environmental problems, and require that a manager be present and alert to possible troubles.

Second, while the three New Orleans marina managers are hired and trained for those positions, many of the North Shore operations are family run, and have gradually developed into their present conditions. Management skills and attitudes appeared more lax and not nearly as aggressive and proactive.

Third, and possibly most important, state and municipal governments own the New Orleans marinas. All of the North Shore marinas are privately owned. Government ownership offers increased access to financial resources that are usually not available to most private marinas, and there is greater emphasis given to environmental compliance. Private marinas often either cannot or will not spend the money to implement better management practices.



## **Conclusions**

### **Existing Marinas**

Many of the marinas surveyed for this thesis are small, with limited management skills and limited financial resources. This is typical of most marinas in Louisiana.

Many of the management practices which would improve the environmental situation at marinas and, therefore, in Louisiana's waters are voluntary and can easily be accomplished at a low cost. Often they amount to nothing more than good housekeeping. Other practices, such as the installation of pumpouts, require money and effort. Since BMPs are voluntary, many marinas will not implement them, whether they see a need or not. On the other hand, if government requires expensive management practices to be implemented, some marinas may not be able to afford the expenses involved. This is a quandary. Society wants and needs clean water as part of a healthy environment. But society also benefits from viable small businesses like marinas. A balance between the two needs to be found.

Marinas must realize that BMPs that may be voluntary today could be required tomorrow. It would be in their best interest, as well as the environments, to get ahead of the curve.

### **Government**

One of the recurring themes in discussions with marina operators was the difficulty in dealing with government agencies concerning environmental matters. Often mentioned was the frustration felt in dealing with multiple federal, state and local agencies with confusing and overlapping missions. These agencies sometimes seem to have a lack of understanding of marinas and the problems they face. Government can help marinas by clearly defining environmental concerns and clearly stating which agency marinas should deal with for specific

problems. Streamlining and elimination of overlapping authorities would help accomplish this task.

Programs administered through agencies such as Louisiana's departments of Wildlife and Fisheries, Health and Hospitals, Natural Resources, and Environmental Quality could provide additional resources such as management training and financial help through grants and loans, like the pumpout and oil spill prevention programs, that are funded on a matching basis.

Environmental education for marinas and their patrons could also be expanded. Louisiana Sea Grant and the LSU Ag Center's Extension Service can provide such assistance. Clean Marina programs and BMP guides directed at marinas have been established and formulated in several states with much success, and could be adopted in Louisiana.

### **Landscape Architects and Other Designers**

Landscape architects, architects, engineers and planners can be an important part of the process when designing marinas. Knowledge and familiarity with marina management issues and environmental concerns would be important not only in marina development and design, but in any waterfront projects, which often include boating activities. Expansions of existing marinas are also areas where landscape architects knowledgeable about marina and pollution issues can play an important function. As environmental concerns become more and more important, this can only help the profession in expanding its role in the design world.

### **Limitations and Areas for Future Study**

An obvious limitation concerning this thesis is the limited geographical area it covers. While the north shore of Lake Pontchartrain represents the greatest concentration of marinas and marina slips in Louisiana, marinas exist across the entire state. Marinas located along Toledo Bend Reservoir, along the Red River in the central and northwestern parts of the state, or in

southwestern Louisiana operate under different environmental and physical conditions. As previously stated, each marina is unique and may require unique BMPs. Extending the scope of this thesis to other areas in Louisiana, or perhaps statewide, would offer additional valuable information on current management practices. Comparisons with neighboring states would also be of interest.

Another important area that was not discussed in this thesis are the financial aspects of operating a marina in Louisiana. Just because a marina is environmentally sound does not necessarily mean it is economically sound. A study looking at BMPs and how they impact marina finances would also be valuable.

Finally, it must be stated again that findings concerning several areas of this thesis are personal observations made by the author and are therefore subjective. While several authorities assisted the author in analyzing these observations, the final judgments were made solely by him and are his opinions. Evaluations of the results of this paper should take this limitation into account.



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**APPENDIX A  
SURVEY QUESTIONNAIRE AND EVALUATION FORM**

**AN ANALYSIS OF MARINA ENVIRONMENTAL PRACTICES ON THE NORTH  
SHORE OF LAKE PONTCHARTRAIN**

**QUESTIONNAIRE AND EVALUATION**

Name of Marina: \_\_\_\_\_

Owner: \_\_\_\_\_ Manager: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: (    ) \_\_\_\_\_ Location: \_\_\_\_\_

Email: \_\_\_\_\_ # of Slips/Berths: \_\_\_\_\_

**MANAGEMENT MEASURES**

**I. Marina Flushing**

**II. Water Quality Assessment**

**III. Habitat Assessment**

**IV. Shoreline Stabilization**

**V. Storm Water Runoff**

Are buffers present between the facility and the water?    Y    N    NA

Are parking lots constructed of porous material?    Y    N    NA

Are retention/detention basins used to control runoff?    Y    N    NA

**VI. Fuel Station Design**

Does this marina have a fueling station? Y N NA

If yes, then:

Is spill response equipment readily available? Y N NA

Is fueling station located so that a spill can be contained  
in a limited area? Y N NA

**VII. Petroleum Control**

Are pumps equipped with automatic shut-off nozzles? Y N NA

**VIII. Liquid Material Management**

Are separate containers for the disposal of liquid materials  
provided? Y N NA

If yes, then: Waste oil/filters? Y N NA

Waste gasoline? Y N NA

Used antifreeze? Y N NA

Waste diesel? Y N NA

Other? \_\_\_\_\_

Are berms or curbs present around liquid material storage  
areas to contain spills?

Is a spill response and recovery plan in place? Y N NA

Is spill response equipment readily available? Y N NA

Are signs posted directing patrons as to the proper  
disposal of waste liquid materials? Y N NA

**IX. Solid Waste Management**

Are docks and grounds well maintained and free of clutter? Y N NA

Are covered containers provided for solid waste and trash? Y N NA

Are recycling containers provided? Y N NA

If yes, then: Batteries? Y N NA

Used oil? Y N NA

Aluminum? Y N NA

Plastic? Y N NA

Other? \_\_\_\_\_

Are signs, billboards, flyers, etc. posted conveying the  
importance of environmental precautions? Y N NA

**X. Fish Waste Management**

Is fishing a significant component of patron's activities? Y N NA

If yes, then:

Are fish cleaning areas and/or facilities provided? Y N NA

Are containers and/or a grinder available for disposing  
of fish waste? Y N NA

**XI. Sewage Facility Management**



Are clean public restrooms provided for boaters?	Y	N	NA
Are sewage pumpout facilities or dump stations provided?	Y	N	NA
If yes, then:			
Is the pumpout facility self-serve?	Y	N	NA
Are signs posted making boaters aware of the facility, identifying it and explaining its proper use?	Y	N	NA
If no sewage pumpout or dump station is present, is the Marina interested in obtaining one?	Y	N	NA
Is the marina management aware of the cost-share program available through the Louisiana Depart- ment of Wildlife and Fisheries?	Y	N	NA

## **XII. Maintenance of Sewage Facilities**

Is facility well maintained and clean?	Y	N	NA
--	---	---	----

## **XIII. Boat Cleaning**

Does the cleaning of boat topsides and hull scrubbing occur on site?	Y	N	NA
If yes, then:			
Are boat owners encouraged to remove the boat from the water (where feasible) and perform cleaning where debris can be captured and properly disposed of?	Y	N	NA
Is the use of phosphate-free and biodegradable detergents and cleaning compounds encouraged?	Y	N	NA
Is boat maintenance and repair permitted?	Y	N	NA
If yes, then:			
Are designated work areas provided and clearly marked?	Y	N	NA
Do tenant contracts clearly require designated areas and techniques be used when performing boat maintenance?	Y	N	NA
Are vacuum sanders used?	Y	N	NA
Are tarps used to catch debris?	Y	N	NA
Is maintenance performed inside buildings where possible?	Y	N	NA

## **XIV. Boat Operation**

Are NO WAKE zones designated with signs?	Y	N	NA
--	---	---	----

**XV. Education and General**

Are marina environmental policies posted or otherwise  
promoted at the marina? Y N NA

Are marina personnel trained on the marina's environ-  
mental policies? Y N NA

How old is this marina?

How would you rate the layout and design of this marina?

Was any professional help used in the layout and design of this marina?  
(i.e. architects, landscape architects, civil engineers, etc.)

What would you change about the layout and design of the marina and why?

## APPENDIX B

### SPREADSHEET OF QUESTIONNAIRE AND EVALUATION RESULTS

QUESTIONS	MARINA 1	MARINA 2	MARINA 3	MARINA 4	MARINA 5
<b>I. MARINA FLUSHING</b>	GOOD	GOOD	POOR	GOOD	GOOD
<b>II. WATER QUALITY</b>	FAIR TO GOOD	FAIR	POOR	GOOD	GOOD
<b>III. HABITAT ASSESSMENT</b>	DEVELOPED	SEMI DEVELOPED	SEMI NATURAL	NATURAL	SEMI NATURAL
<b>IV. SHORELINE STABILIZATION</b>	GOOD, BULKHEADS	GRASS, GOOD	GOOD, GRASS	GRASS, GOOD	GOOD, GRASS
<b>V. STORM WATER RUNOFF</b>					
BUFFERS PRESENT?	YES	YES	YES	YES	YES
POROUS PAVEMENT?	SOME	YES	YES	YES	YES
RETENTION/DETENTION BASINS?	NO	NO	NO	NO	NO
<b>VI. FUEL STATION DESIGN</b>					
STATION PRESENT?	YES	NO	NO	NO	NO
IF YES, THEN:					
RESPONSE EQUIP CLOSE BY?	YES				
LOCATED TO CONTAIN SPILL?	YES				
<b>VII. PETROLEUM CONTROL</b>					
AUTOMATIC SHUTOFF NOZZLES?	YES	NA	NA	NA	NA
<b>VIII. LIQUID MATERIAL MGT.</b>					
SEPARATE CONTAINERS?	YES	NO	NO	NO	NO
IF YES, THEN:					
WASTE OIL/FILTERS?	YES				
WASTE GASOLINE?					
USED ANTIFREEZE?					
WASTE DIESEL?					
OTHER?					
BERMS PRESENT?	NO	NA	NA	NA	NA
RESPONSE PLAN IN PLACE?	YES	NO	NO	NO	NO
RESPONSE EQUIP CLOSE BY?	YES	NO	NO	NO	NO
SIGNS POSTED?	YES	NO	NO	NO	NO
<b>IX. SOLID WASTE MGT.</b>					
DOCKS/GROUNDS MAINTAINED?	YES	YES	YES	YES	YES
COVERED TRASH CONTAINERS?	YES	YES	NO	NO	YES
RECYCLING CONTAINERS?	YES	NO	NO	NO	NO
IF YES, THEN:					
BATTERIES?	YES				
USED OIL?	YES				
ALUMINUM?	YES				
PLASTIC?	YES				
OTHER?					

ENV. AWARENESS SIGNS?	YES	NO	NO	NO	NO
<b>X. FISH WASTE MGT.</b>					
FISHING IMPORTANT HERE?	NO	NO	NO	NO	NO
IF YES, THEN:					
FISH CLEANING AREAS?					
DISPOSAL CONT./GRINDERS?					
<b>XI. SEWAGE FACILITY MGT.</b>					
CLEAN PUBLIC RESTROOMS?	YES	YES	YES	NO	NO
SEWAGE PUMPOUTS?	YES	NO	NO, NEARBY	NO, NEARBY	NO, NEARBY
IF YES, THEN:					
PUMPOUT SELF SERVE?	NO				
SIGNS POSTED?	YES				
IF NO, THEN:					
INTEREST IN GETTING PUMPOUT?		NO	NO	NO	NO
AWARE OF LDWG PROGRAM?		YES	YES	YES	YES
<b>XII. MAINT. OF SEWAGE FACILITY</b>					
CLEAN AND MAINTAINED?	YES	NA	NA	NA	NA
<b>XIII. BOAT CLEANING</b>					
CLEANING OF DECKS, SIDES?	YES	YES	YES	YES	YES
IF YES, THEN:					
ENCOURAGED TO LAND BOATS?	NO	NO	NO	NO	NO
PHOSPHATE FREE ENCOURAGED?	YES	YES	YES	YES	YES
MAINT. AND REPAIR ALLOWED?	NO	NO	NO	NO	NO
IF YES, THEN:					
DESIGNATED WORK AREAS?					
CONTRACT SPECIFICATIONS?					
VACUUM SANDERS?					
TARPS FOR DEBRIS?					
MAINT. INSIDE BUILDINGS?					
<b>XIV. BOAT OPERATION</b>					
NO WAKE ZONES POSTED?	YES	ENTIRE BAYOU IS NOWAKE ZONE	ENTIRE BAYOU IS NOWAKE ZONE	ENTIRE BAYOU IS NOWAKE ZONE	ENTIRE BAYOU IS NOWAKE ZONE
<b>XV. EDUCATION AND GENERAL</b>					
ENV. POLICIES POSTED?	YES	NO	NO	NO	NO
PERSONNEL TRAINED?	YES	YES	YES	YES	YES
AGE OF MARINA	26	20	25	25	25
RATING OF LAYOUT & DESIGN	POOR BY TODAY'S STANDARDS	POOR, TOO BIG NEED BIG SLIPS	GOOD	GOOD	GOOD
PROFESSIONAL HELP USED?	NO	ENGINEER	NO	NO	NO
WHAT WOULD YOU CHANGE?	BIGGER SLIPS	REMOVE SOME SMALL SLIPS			

QUESTIONS	MARINA 6	MARINA 7	MARINA 8	MARINA 9	MARINA 10
<b>I. MARINA FLUSHING</b>	GOOD	GOOD	GOOD	GOOD	GOOD
<b>II. WATER QUALITY</b>	GOOD	GOOD	GOOD	GOOD	GOOD
<b>III. HABITAT ASSESSMENT</b>	DEVELOPED	SEMI NATURAL	SEMI NATURAL	SEMI DEVELOPED	DEVELOPED
<b>IV. SHORELINE STABILIZATION</b>	BULKHEADS	GOOD	BULKHEADS	GOOD, BULKHEADS	BULKHEADS, GOOD
<b>V. STORM WATER RUNOFF</b>					
BUFFERS PRESENT?	NO	YES	YES	YES	YES
POROUS PAVEMENT?	NO	YES	YES	YES	NO
RETENTION/DETENTION BASINS?	NO	NO	NO	NO	NO
<b>VI. FUEL STATION DESIGN</b>					
STATION PRESENT?	NO	NO	YES	YES	YES
IF YES, THEN:					
RESPONSE EQUIP CLOSE BY?			YES	YES	YES
LOCATED TO CONTAIN SPILL?			NO	NO	NO
<b>VII. PETROLEUM CONTROL</b>					
AUTOMATIC SHUTOFF NOZZLES?	NA	NA	YES	YES	YES
<b>VIII. LIQUID MATERIAL MGT.</b>					
SEPARATE CONTAINERS?	YES	NO	NO	YES	YES
IF YES, THEN:					
WASTE OIL/FILTERS?	YES			YES	YES
WASTE GASOLINE?				YES	
USED ANTIFREEZE?				YES	
WASTE DIESEL?				YES	
OTHER?					
BERMS PRESENT?	NA	NA	NO	YES	YES
RESPONSE PLAN IN PLACE?	NO	NO	YES	YES	YES
RESPONSE EQUIP CLOSE BY?	NO	NO	YES	YES	YES
SIGNS POSTED?	NO	NO	NO	YES	NO
<b>IX. SOLID WASTE MGT.</b>					
DOCKS/GROUNDS MAINTAINED?	YES	YES	NO	YES	YES
COVERED TRASH CONTAINERS?	YES	YES	NO	YES	YES
RECYCLING CONTAINERS?	NO	NO	NO	YES	NO
IF YES, THEN:					
BATTERIES?				YES	
USED OIL?				YES	
ALUMINUM?				NO	
PLASTIC?				NO	
OTHER?					
ENV. AWARENESS SIGNS?	NO	NO	NO	YES	NO

**X. FISH WASTE MGT.**

FISHING IMPORTANT HERE?	NO	NO	NO	NO	NO
IF YES, THEN:					
FISH CLEANING AREAS?					
DISPOSAL CONT./GRINDERS?					

**XI. SEWAGE FACILITY MGT.**

CLEAN PUBLIC RESTROOMS?	YES	NO	YES	YES	YES
SEWAGE PUMPOUTS?	YES	NO	NO	YES	YES
IF YES, THEN:					
PUMPOUT SELF SERVE?	YES			YES	YES
SIGNS POSTED?	YES			YES	YES
IF NO, THEN:					
INTEREST IN GETTING PUMPOUT?		NO, NOT YET	YES		
AWARE OF LDWG PROGRAM?		YES	YES		

**XII. MAINT. OF SEWAGE FACILITY**

CLEAN AND MAINTAINED?	YES	NA	NA	YES	YES
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**XIII. BOAT CLEANING**

CLEANING OF DECKS, SIDES?	YES	YES	YES	YES	YES
IF YES, THEN:					
ENCOURAGED TO LAND BOATS?	NO	NO	NO	NO	NO
PHOSPHATE FREE ENCOURAGED?	YES	YES	YES	YES	YES
MAINT. AND REPAIR ALLOWED?	NO	NO	NO	NO	NO
IF YES, THEN:					
DESIGNATED WORK AREAS?					
CONTRACT SPECIFICATIONS?					
VACUUM SANDERS?					
TARPS FOR DEBRIS?					
MAINT. INSIDE BUILDINGS?					

**XIV. BOAT OPERATION**

NO WAKE ZONES POSTED?	NO, PENDING. LDWF IS NOT HELPING	NO, NOT A PROBLEM	YES	YES	YES
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**XV. EDUCATION AND GENERAL**

ENV. POLICIES POSTED?	NO	NO	NO	YES	YES
PERSONNEL TRAINED?	YES	NO	YES	YES	NO
AGE OF MARINA	26	35	60	27	15
RATING OF LAYOUT & DESIGN	GOOD	GOOD	GOOD	GOOD	"BEST MARINA FROM HERE TO FLORIDA"
PROFESSIONAL HELP USED?	DO NOT KNOW	NO	NO	YES	YES
WHAT WOULD YOU CHANGE?	MORE SLIPS, BIGGER SLIPS	EXPAND IF POSSIBLE	UPDATE SLIPS	"SPRUCE UP" MORE LANDSCAPING	NOTHING

QUESTIONS	MARINA 11	MARINA 12	MARINA 13	MARINA 14	MARINA 15
<b>I. MARINA FLUSHING</b>	GOOD	FAIR	GOOD	FAIR	GOOD
<b>II. WATER QUALITY</b>	FAIR	GOOD	GOOD	GOOD	GOOD
<b>III. HABITAT ASSESSMENT</b>	SEMI NATURAL	SEMI DEVELOPED	DEVELOPED	DEVELOPED	SEMI NATURAL
<b>IV. SHORELINE STABILIZATION</b>	FAIR, GRASS	GOOD, GRASS	GOOD, BULKHEADS	BULKHEADS, GOOD	FAIR, BULKHEADS
<b>V. STORM WATER RUNOFF</b>					
BUFFERS PRESENT?	YES	YES	NO	YES	NO
POROUS PAVEMENT?	YES	YES	YES	NO	YES
RETENTION/DETENTION BASINS?	NO	NO	NO	NO	NO
<b>VI. FUEL STATION DESIGN</b>					
STATION PRESENT?	NO	NO	YES	NO	YES
IF YES, THEN:					
RESPONSE EQUIP CLOSE BY?			YES		NO
LOCATED TO CONTAIN SPILL?			NO		NO
<b>VII. PETROLEUM CONTROL</b>					
AUTOMATIC SHUTOFF NOZZLES?	NA	NA	YES	NA	YES
<b>VIII. LIQUID MATERIAL MGT.</b>					
SEPARATE CONTAINERS?	NO	NO	YES	NO	YES
IF YES, THEN:					
WASTE OIL/FILTERS?			YES		YES
WASTE GASOLINE?			YES		
USED ANTIFREEZE?			YES		
WASTE DIESEL?			NA		
OTHER?					
BERMS PRESENT?	NA	NA	YES	NA	NO
RESPONSE PLAN IN PLACE?	NO	NO	YES	YES	YES
RESPONSE EQUIP CLOSE BY?	NO	NO	YES	YES	YES
SIGNS POSTED?	NO	NO	YES	NO	NO
<b>IX. SOLID WASTE MGT.</b>					
DOCKS/GROUNDS MAINTAINED?	NO	YES	YES	YES	NO
COVERED TRASH CONTAINERS?	YES	YES	YES	YES	YES
RECYCLING CONTAINERS?	NO	NO	YES	NO	YES
IF YES, THEN:					
BATTERIES?			YES		YES
USED OIL?			YES		YES
ALUMINUM?					
PLASTIC?					
OTHER?					
ENV. AWARENESS SIGNS?	NO	NO	NO	YES	NO

**X. FISH WASTE MGT.**

FISHING IMPORTANT HERE?	NO	NO	NO	NO	YES
IF YES, THEN:					
FISH CLEANING AREAS?					YES
DISPOSAL CONT./GRINDERS?					NO

**XI. SEWAGE FACILITY MGT.**

CLEAN PUBLIC RESTROOMS?	YES	YES, NEARBY	YES	NO	YES
SEWAGE PUMPOUTS?	NO	NO	NO	NO	NO
IF YES, THEN:					
PUMPOUT SELF SERVE?					
SIGNS POSTED?					
IF NO, THEN:					
INTEREST IN GETTING PUMPOUT?	NO	NO	YES	NO	YES
AWARE OF LDWG PROGRAM?	YES	YES	YES	YES	YES

**XII. MAINT. OF SEWAGE FACILITY**

CLEAN AND MAINTAINED?	NA	NA	NA	NA	NA
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**XIII. BOAT CLEANING**

CLEANING OF DECKS, SIDES?	YES	YES	NO	YES	YES
IF YES, THEN:					
ENCOURAGED TO LAND BOATS?	NO	NO		NO	NO
PHOSPHATE FREE ENCOURAGED?	YES	YES		YES	YES
MAINT. AND REPAIR ALLOWED?	YES	NO	NO	NO	NO
IF YES, THEN:					
DESIGNATED WORK AREAS?	NO				
CONTRACT SPECIFICATIONS?	NO				
VACUUM SANDERS?	NO				
TARPS FOR DEBRIS?	NO				
MAINT. INSIDE BUILDINGS?	NO				

**XIV. BOAT OPERATION**

NO WAKE ZONES POSTED?	YES	NO	YES	YES	YES
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**XV. EDUCATION AND GENERAL**

ENV. POLICIES POSTED?	NO	NO	YES	YES	NO
PERSONNEL TRAINED?	NO	NO	YES	NO	YES
AGE OF MARINA	40	30	30	30	40
RATING OF LAYOUT & DESIGN	FAIR	FAIR	FAIR	GOOD	GOOD
PROFESSIONAL HELP USED?	NO	NO	NO	YES	NO
WHAT WOULD YOU CHANGE?					



QUESTIONS	NEW ORLEANS 1	NEW ORLEANS 2	NEW ORLEANS 3
<b>I. MARINA FLUSHING</b>	GOOD	GOOD	GOOD
<b>II. WATER QUALITY</b>	GOOD	GOOD	GOOD
<b>III. HABITAT ASSESSMENT</b>	URBAN	URBAN	URBAN
<b>IV. SHORELINE STABILIZATION</b>	GOOD, BULKHEADS	GOOD, BULKHEADS	GOOD, BULKHEADS
<b>V. STORM WATER RUNOFF</b>			
BUFFERS PRESENT?	YES	YES	YES
POROUS PAVEMENT?	NO	NO	NO
RETENTION/DETENTION BASINS?	NO	NO	NO
<b>VI. FUEL STATION DESIGN</b>			
STATION PRESENT?	NO	NO	NO
IF YES, THEN:			
RESPONSE EQUIP CLOSE BY?			
LOCATED TO CONTAIN SPILL?			
<b>VII. PETROLEUM CONTROL</b>			
AUTOMATIC SHUTOFF NOZZLES?	NA	NA	NA
<b>VIII. LIQUID MATERIAL MGT.</b>			
SEPARATE CONTAINERS?	YES	YES	YES
IF YES, THEN:			
WASTE OIL/FILTERS?	YES	YES	YES
WASTE GASOLINE?	NO	NO	NO
USED ANTIFREEZE?	NO	NO	NO
WASTE DIESEL?	NO	NO	NO
OTHER?			
BERMS PRESENT?	YES	YES	YES
RESPONSE PLAN IN PLACE?	YES	YES	YES
RESPONSE EQUIP CLOSE BY?	YES	YES	YES
SIGNS POSTED?	YES	YES	YES
<b>IX. SOLID WASTE MGT.</b>			
DOCKS/GROUNDS MAINTAINED?	YES	YES	YES
COVERED TRASH CONTAINERS?	YES	YES	YES
RECYCLING CONTAINERS?	YES	YES	YES
IF YES, THEN:			
BATTERIES?			
USED OIL?	YES	YES	YES
ALUMINUM?			
PLASTIC?			

OTHER?			
ENV. AWARENESS SIGNS?			
<b>X. FISH WASTE MGT.</b>			
FISHING IMPORTANT HERE?	NO	NO	NO
IF YES, THEN:			
FISH CLEANING AREAS?			
DISPOSAL CONT./GRINDERS?			
<b>XI. SEWAGE FACILITY MGT.</b>			
CLEAN PUBLIC RESTROOMS?	YES	YES	YES
SEWAGE PUMPOUTS?	YES	YES	YES
IF YES, THEN:			
PUMPOUT SELF SERVE?	YES	YES	YES
SIGNS POSTED?	YES	YES	YES
IF NO, THEN:			
INTEREST IN GETTING PUMPOUT?			
AWARE OF LDWG PROGRAM?			
<b>XII. MAINT. OF SEWAGE FACILITY</b>			
CLEAN AND MAINTAINED?	YES	YES	YES
<b>XIII. BOAT CLEANING</b>			
CLEANING OF DECKS, SIDES?	YES	YES	YES
IF YES, THEN:			
ENCOURAGED TO LAND BOATS?	YES	YES	YES
PHOSPHATE FREE ENCOURAGED?	YES	YES	YES
MAINT. AND REPAIR ALLOWED?	NO	NO	NO
IF YES, THEN:			
DESIGNATED WORK AREAS?			
CONTRACT SPECIFICATIONS?			
VACUUM SANDERS?			
TARPS FOR DEBRIS?			
MAINT. INSIDE BUILDINGS?			
<b>XIV. BOAT OPERATION</b>			
NO WAKE ZONES POSTED?	YES	YES	YES
<b>XV. EDUCATION AND GENERAL</b>			
ENV. POLCIES POSTED?	YES	YES	YES
PERSONNEL TRAINED?	YES	YES	YES
AGE OF MARINA	13	40	42
RATING OF LAYOUT & DESIGN	GOOD, BUT POOR CONSTRUCTION	GOOD, NOT ENOUGH PARKING	EXCELLENT
PROFESSIONAL HELP USED?	YES	YES	YES
WHAT WOULD YOU CHANGE?	BETTER MATERIALS USED IN CONST. MORE BIG SLIPS	MORE BIG SLIPS	MORE BIG SLIPS, SOME COMPONENTS NEED UPDATING

## **VITA**

Arthur Hunter Marks III was born December 4, 1961, in Knoxville, Tennessee. He was raised in Knoxville and graduated from Bearden High School in 1980. He enrolled at the University of Tennessee at Martin in 1980, and graduated in May of 1984 with a Bachelor of Science degree in agriculture. Upon graduation, the author moved to Norfolk, Virginia, where he worked as an Assistant Trainmaster for the Norfolk and Western Railway and later as Agricultural Marketing Manager for Chilean Nitrate Corporation. He moved to Nashville, Tennessee, in 1990 and assumed the position of Senior Sales Representative with Mallinckrodt Veterinary in 1992. From 1996 to 1999 he worked on the family farm in Clarksville, Tennessee. In the fall of 1999 the author enrolled at Louisiana State University to pursue the Master of Landscape Architecture degree in the School of Landscape Architecture.

He is married to Lynn Moyer Marks, originally of Boyertown, Pennsylvania. They have one daughter, Mary Lynn. Upon his graduation in May 2002 they plan to return home to Tennessee.