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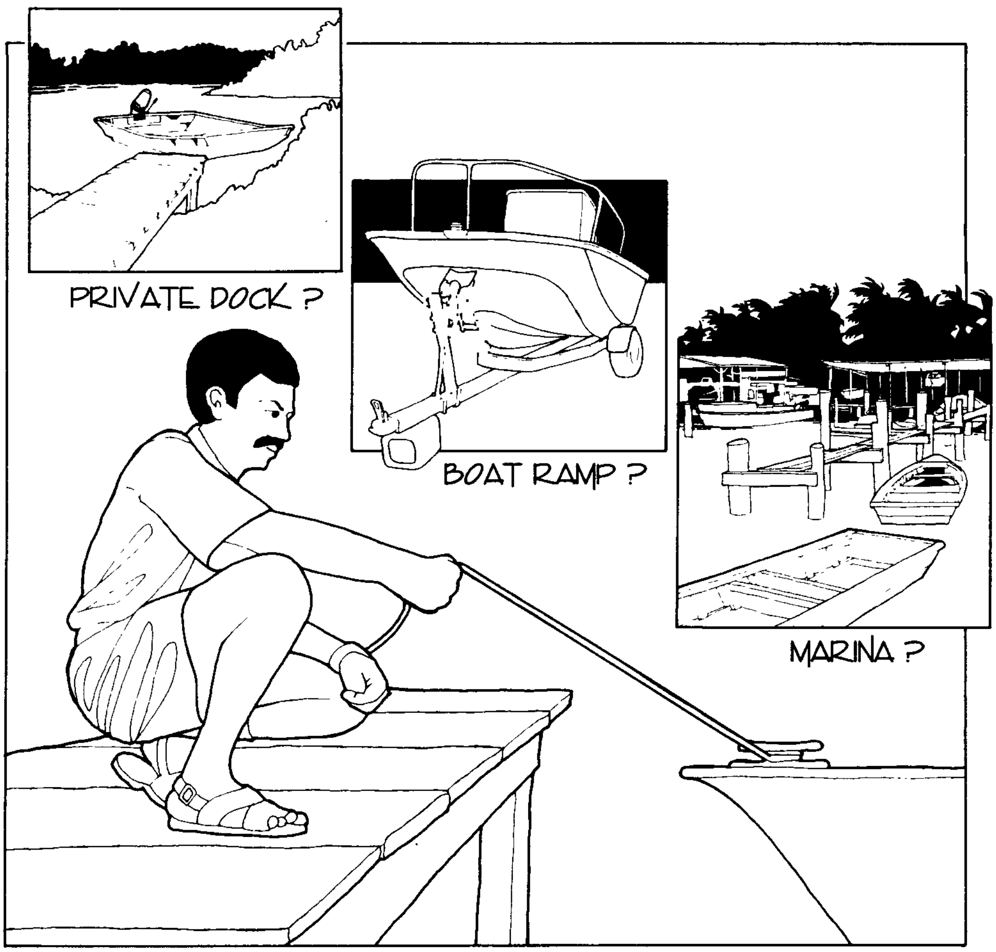
Frederick W. Bell



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by Dr. Frederick W. Bell
Department of Economics
Florida State University

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University of Florida
P.O. Box 110409
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This project was supported by the valuable services of both undergraduate and graduate students at Florida State University. On the graduate side, Brad Bendle and Lee Bour contributed computer skills and great insight into statistical methodology used in this study. These students were also exposed to a valuable learning experience which should help them in their future profession as economists. On the undergraduate side, Ken Meier and Health Hourdequin processed data, analyzed survey information and made phone calls to survey respondents. Both undergraduates did a conscientious and superlative job on this project. Finally Lizette Kelly, Director of the Survey Research Laboratory at Florida State University did a very professional job in surveying boaters in the State of Florida. As usual, the author is totally responsible for the content of this manuscript.

Executive Summary

1. Registered boats less than 26 feet in Florida have expanded from 449,995 in 1982 to 620,548 in 1993, a 38 percent increase. Boats of this size are likely to be trailered to boat ramps for access to waterbodies in and around the state. This increased demand for boat ramps has been accompanied by many studies and surveys indicating a need for more public boat ramps and that existing ramps need improvement;

2. Fifty-three percent of the present boat ramps in Florida is provided by the public sector with municipalities and counties providing the bulk of this capacity. Monies to expand public boat ramp supply are available through the Wallop-Breaux Trust Fund and the Florida Boating Improvement Program;

3. When studying the future demand for boat ramps, one must first consider the demand determinents for pleasure craft in general. As with most durable goods, demand is determined by price, per capita income and population;

4. Using boat registrations by county in Florida over the 1965-92 period, it was found that such registrations were statistically determined by the growth in population and real per capita income in the county and to a lesser extent by boat prices and/or the cost of boat operation. Although the emphasis in this study is coastal counties, regression equations for boat registrations in all 67 Florida counties were estimated for comparison and use in future research on non-coastal counties;

5. Annual long term forecasts for population and real per capita income for the 35 coastal counties in Florida were taken from The Florida Long-Term Economic Forecast 1992 over the 1990-2005 period by five year intervals. The period 2000-2005 was extended to 2000-2010 using the former annual projected growth rates;

6. Using the boat registration regressions over the 1965-1992 period and the projected growth in population over the 1992-2010 period, boat registrations were projected for all 35 Coastal counties in Florida. The larger counties are projected to grow slower (i.e., about 35-40 percent) and smaller

counties (i.e., 100 percent) due to anticipated faster growth in population and real per capita income in the latter. As the number of registered boats increases, this will place increasing pressure on water access points such as private docks, marinas and, of course, boat ramps;

7. A choice model for ramps over other water-access points (i.e., private docks and marinas) was developed to ascertain how boaters are influenced by demographics and other variables in selecting boat ramps to use. From a computer tape of all registered boaters in Florida supplied by the Bureau of Titling and Registration, FDEP, 720 boaters were selected at random to be surveyed by phone. A survey instrument was developed to obtain information to estimate the boater choice model. The survey was conducted by the Florida State University Survey Research Laboratory in 1993;

8. With the data from the survey sample, it was determined through the use of OLS and Logit statistical procedures that Florida boaters were <u>less</u> likely to use a boat ramp with higher household income; advancing age and larger boats. This is a hypothesized finding since the more affluent and aging boater with relatively large boats is more likely to prefer private docks, dockominiums and marinas than ramps which require some work and few amenities. As found in other Florida studies, about two-thirds of all Florida boaters use boat ramps in both the coastal and non-coastal counties;

9. With the choice model in place, a demand model for boat ramps was developed to project over the 1992-2010 period by coastal region in Florida. Instead of projecting by county where sample size was too small in many cases, smaller counties were aggregated to a coastal region having a minimum of 20 observations. Fifteen regions were developed including many of the larger counties as regions;

10. The coastal regional ramp model estimates the number of <u>aggregate boat ramp days</u> (ABRD) or

$(ABRD_i)_t = (BR_i)_t \, (PrBr_i)_t \, (DBOPH_i)_t$

where

$(BR_i)_t$ = boat registrations in i'th region at time, t;

$(PrBR_i)_t$ = Percent of boaters in i'th region at time, t, using ramps;

$(DBOPH_i)_t$ = days boating per household in i'th region at time, t.

If we have 20,000 boats registered in an area where 75 percent used boat ramps and spent, on average, 30 days boating per year, ABRD would be 450,000 boat days (20,000 x .75 x 30);

11. ABRD was projected over the 1992-2010 period by use of boat registration projections, the ramp choice model and a constant number of days per year/household. For practically all regions, ABRD did not expand as rapidly as projected boat registrations since the participation rates (i.e., percent of all boaters using ramps via choice model) were declining as the boater population was becoming more affluent, aging and acquiring somewhat larger pleasure craft;

12. We used a peak demand model to distribute the ABRD among days of the year. On average, about 50 percent of boat ramp demand takes place on 111 weekend days and non-weekend holidays of the year indicating a bunching of demand on peak days. These data were taken from our boater survey sample;

13. On the supply side, an inventory of boat ramp lanes was obtained from the Division of Recreation and parks, FDEP. A lane can handle from 1.5 to 3 boats per hour including launching and retrieval called the 40 minute, 30 minute and 20 minute Scenarios respectively. Which scenario is prevalent depends on waiting during peak times. About a third of boaters using ramps among the coastal regions feel counties do <u>not</u> have an adequate number of boat ramps and nearly one-third are dissatisfied with waiting time on weekends which is consistent with a level of service (LOS) not even close to the 20 minute Scenario which assumes <u>no</u> waiting time. Thus, we feel the 30 minute Scenario reflects supply with a deteriorated LOS in <u>all</u> coastal regions;

14. Using the 30 minute Scenario, it is projected that 10 of the 15 coastal regions will need additional boat ramps over the 1992 baseline supply by 1995 running from 9 lanes in Region 1 (Escambia and Santa Rosa) to 98 lanes in Region 15 (Duval and Nassau). See Table 24 for individual coastal regions. By the year 2010, only 3 of the 15 regions will <u>not</u> need additional boat lane needs;

15. The average boater in Florida is a white male with an average age of 52 years and a household income of $49,336. Such boaters are somewhat older and more affluent than the typical Floridian. The

average Florida boater owns a 17-foot craft propelled by gas driven outboard motor of 118 horsepower;

16. Boaters in Florida are very active in manatee protection. Over 35 percent contribute to such protection through the save the manatee club; manatee license tags and boat registrations with the latter being the most popular vehicle. In terms of regulations, nearly 75 percent of all boaters support manatee zone speed limits as long as they do not exceed 2 miles in any particular area. Almost 69 percent of all boaters would be willing to install prop guards to protect manatees as long as their cost did not exceed $79 per boat.

1.0 **Introduction**

According to the Florida Department of Natural Resources (1989), recreational boating in the State of Florida is enjoyed twelve months of the year by approximately four million residents and tourists. Despite Florida's 8,426 miles of saltwater tidal coastline, it is alleged that adequate boater access to public waterways still remains a serious problem in many coastal counties. There are three main water access modes: (1) marinas; (2) private docks; and (3) boat ramps. Bell (1990) has indicated that saltwater marinas will not be able to absorb projected boater demand because of environmental constraints on wet slip expansion and competition for land by condominiums and other non-water-dependent economic activities, thereby placing added pressure on other water access points. Private docks suffer from many of the problems of wet slips in marinas. Such docks come into conflict with wetlands and the expansion of such access points might be restricted. In 1989, 66 percent of Florida's 679, 710 registered pleasure craft owners trailered their boats to ramps for public access to waterways according to a Florida State University survey (1990) done for the Florida Save the Manatee Club. However, it is hypothesized that the current and possibly potential supply of coastal boat ramps will be inadequate to accommodate present and future boater demand for these facilities in many, if not all, of Florida's 35 coastal counties. Table 1 shows the expansion in total boat registrations and that boat size segment of the market likely to be trailered over the 1982 - 1992 period. Over this period, the State of Florida has added over 170,000 registered boats to the trailered segment of the market, an increase of nearly 38 percent. This demand pressure for boat ramps is already showing up in boater surveys. A Florida State University survey (1990) of a representative sample of Florida's pleasure craft owners found that over 50 percent felt a need for more public ramps and that existing ramps needed improvements. Further, the survey found that some boaters have been discouraged from using public boat ramps for the following reasons: (1) too crowded; (2) shortage of ramps; (3) unsafe ramps; (4) unaffordable launch fee; (5) poor quality; and (6) inconvenient to home.

Using a simple rule of thumb of one boat ramp lane for every 6,700 people in a county, a recent Boat Landing Study (1988) by Collier County, Florida found that the current level of service (LOS) of boat ramps was inadequate (i.e., not enough boat ramps and ancillary facilities) for Lee, Manatee, Charlotte, Sarasota,

Table 1

Total Florida Registered Pleasure Boats and Those Less than 25 Feet in Length, 1982-1993

Year*	Total	Less Than 26 Feet	Percent of Total
1982	480,384	449,995	94
1983	499,264	467,674	94
1984	529,436	494,114	93
1985	554,675	515,682	93
1986	583,035	539,990	93
1987	614,189	566,656	92
1988	644,807	592,862	92
1989	679,710	623,339	92
1990	687,132	627,916	91
1991	685,075	624,196	91
1992	683,780	621,731	91
1993	677,581	620,548	91

* Fiscal year (e.g., 1982 is 1981-82)

Source: Bureau of Vessel Titling and Registration, Florida Department of Natural Resources

Martin, as well as Collier counties. Although this is a much too simplistic approach to addressing boat ramp supply and demand imbalances, the LOS does consider support facilities (e.g., parking) along with boat ramp needs. These Southwest Florida counties found that 75 percent of all pleasure craft are trailered to boat ramps which is nearly 10 percentage points above the state average cited above in the FSU study (1990).

The evidence on boat ramp demand has come into conflict with Florida's State Comprehensive Outdoor Recreation Plan (SCORP) which reaches quite the opposite conclusions regarding the demand and supply imbalances of boat ramps presently and in the future. In Outdoor Recreation in Florida - 1989 (1989) or SCORP, it states, "Because of the large number of existing saltwater and freshwater ramps, there has been a gradual decline in boat ramp construction in the past decade. Overall, boat ramp needs were calculated to be non-existent" (p.173). The SCORP plan was approved by the Governor and Cabinet even though it is inconsistent with perceived boat ramp needs in Florida's coastal counties. The 1994 SCORP admits that localized needs for additional public boat ramp access still exist, but these needs are not reflected in this plan's broad regional estimates. This latest plan (1994) shows no need for saltwater boat ramps at least until the year 2000. This may have serious implications in prioritizing funding for boat ramp expansion, if necessary.

Let us consider the critical area of funding. First, the Wallop-Breaux Trust Fund collects and dispenses monies annually to the states. This money is derived from a Federal excise tax on fishing equipment and gasoline used for recreational boating. The maximum apportioned to a state is 5 percent of total funds. In FY 1994, the State of Florida received about $4.5 million in Wallop-Breaux funds based upon land and water area and the number of paid fishing license holders. The Florida Game and Freshwater Fish Commission received $2.14 million of these funds while the remainder, $2.36 million, went to the Florida Department of Environmental Protection (DEP). The DNR uses its Wallop-Breaux funds primarily for saltwater fisheries. Of particular importance, no less than 12.5 percent of Wallop-Breaux funds must be used for boating facilities including ramps and boat lifts, restrooms, trash receptacles and parking areas. If the boat ramp shortage hypothesis is valid, it will be important to know which coastal counties are experiencing demand-supply imbalances and the severity of the situation. Second, the Florida Boating Improvement Program is administered by DEP for the counties. Funds are generated at the county level by fees on registered pleasure crafts. Over the 1974 - 1994 period, nearly $50 million were generated statewide for use in boating improvements (e.g., boat ramps) and manatee protection. Monies collected by the DEP are returned to the counties upon request for building or maintaining legitimate boating facilities including boat ramps. If the demand for boat ramps were high in all coastal counties relative to supply, one might expect boating improvement funds to be quickly exhausted. Paradoxically enough, Table 2 is not consistent with such a hypothesis. Table 2 may reflect that there is indeed no shortage of saltwater boat ramps in some coastal counties. However, there may be legitimate reasons why these available funds are not fully used. For example, a county may be saving for a large boating facilities project and be waiting for the unobligated money to achieve a certain level.

Boat ramps are far from being homogeneous facilities. Little is known about the economics of providing private boat ramps. This is in sharp contrast to recent studies on marinas in Florida. See Bell and Leeworthy (1984; 1987); Milon et al (1983) and Bell (1990). A search of the Sea Grant Depository at the University of Rhode Island revealed just one economic study of boat ramps demand (Symond, 1975). Studies by Tiedman and Kosko (1988); Lowery and Hosking (1987); and Taylor (1978) were little more than boaters' guides to ramps with a listing of launch fees. Swartz (1979) did analyze the economic impact and boat launching needs for a sport fishery on Lake Ontario while Symond (1975) estimated future demand for recreational boating in California's coastal zone. The Coastal Zone Management Act of 1972 did sponsor a study by Somerson and Neuman (1977) of boat ramp demand based upon population and a given participation rate very similar to many of the SCORP's done in several states, but failed to consider many important economic variables. A review of the literature revealed a general paucity of studies on the economics of boat ramp demand and supply.

Table 3 does show the aggregate supply of Florida boat ramps and reveals that 53 percent of the supply of boat ramps in Florida is provided by the public sector with municipalities and counties providing the bulk of this capacity. Little is known about public sector pricing policies (i.e., launch fees); investment or construction cost; operating cost and financing. Of particular note, the private sector supplies 47 percent of

Table 2

Percent of Monies from the Florida Boating Improvement Trust Fund Used by Selected Counties over the 1974 - 1994 Period

County	Percent of Available Funds Used for Boating
Broward	78
Dade	100
Manatee	77
Collier	88
Lee	68
Charlotte	96
Sarasota	87
Martin	88
Pinellas	73
St. Lucie	62
Hillsborough	76
Nassau	65

Source: Division of Recreation and Parks, Florida Department of Natural Resources

Table 3

The Estimated Aggregate Supply of Saltwater Boat Ramps by Characteristics in Florida, 1985

Kind	Number of Ramps	(Ave. Lanes Per Ramp)	Percent of Total
Public	504	(1.41)	53.0
Federal	43		4.5
State	48		5.0
County	199		21.0
Municipal	214		22.5
Private	450	(1.27)	47.0
Private Commercial	366		38.5
Private Club	80		8.0
Private Non-Profit	4		.5
TOTAL	954		100.0

Source: Division of Recreation and Parks, Florida Department of Natural Resources (1985) all boat ramps in the State with private-commercial dominating this component of supply. It is hypothesized that commercial boat ramps are joint products with other services provided by such businesses as fish camps, marinas and docks. The National Marine Manufacturer Association (1988) states, "There is not a big profit margin in such facilities [private boat ramps]. Further, the facilities needed are in metropolitan areas where the price of land and development are too dear. Without incentives for private capital investment, we have no recourse but to look to government for help -- not handouts, however." If this statement is valid, the public sector may have to play an ever-increasing role in providing boat ramps to accommodate demand. Because of these factors and inconsistencies between the SCORP report; county level studies and the choice of many counties to not use available funding for boat ramp construction, it is the purpose of this proposed study to enhance marine productivity by identifying the current and projected demand and needed supply of saltwater boat ramps for each of the 35 coastal counties in Florida. Marine productivity may be enhanced by identifying those coastal counties where the demand for boat ramps is presently or will in the future (1990 - 2010) exceed supply. The solution to this problem is to efficiently direct present and expected increases in Wallop-Breaux funds to those counties having the greatest severity of need. Also, the Florida Boating Improvement Program should be considered in directing Wallop-Breaux funds to coastal counties with critical boat ramp needs.

Finally, no saltwater boat ramp study in Florida would be considered complete unless there is an analysis of how this study could be used to guide ramp construction away from manatee habitats. According to the Florida DNR (1989), "Human activities [boat/barge] are the greatest identifiable cause of manatee deaths in Florida, accounting for half of the known causes, and directly or indirectly affecting virtually ever aspect of manatee ecology." (p. 3). DNR generally recommends that new boat ramps and expansion of existing boat ramps should be encouraged at locations with quick access to deep, open water and discouraged at sites of high manatee concentrations. The population of manatees is primarily in ten coastal counties where 80% of all boat/barge mortality occurs: Duval, Brevard, Volusia, Martin, Palm Beach, Broward, Dade, Collier, Lee, and Citrus. Three additional counties -- Indian River, St. Lucie, and Sarasota -- are especially important as travel corridors and as feeding and resting areas for the manatees. According to an FSU (1990) survey, over 95 percent of Florida registered boaters know that the manatee is an endangered species and support current manatee regulations. Within the context of Florida's 35 coastal counties, this proposed study will consider these 13 "manatee counties" and suggest ways that the severity of boat ramp needs can be accommodated without further conflict between boats and manatees.

2.0 Demand for Registered Boats in Coastal Counties

The demand for recreational boats is really a demand for recreational services (e.g., fishing) provided by such boats. These recreational services are part of leisure time enjoyed by Americans. As incomes rise, the demand for leisure time usually increases. The demand for recreational boats is hypothesized to be influenced by the price of boats; the cost of their operation; income and the age structure of existing boats. Demand can be divided into "new" demand and replacement demand. Replacement demand depends upon how fast recreational boats wear out and would be influenced by the age structure of existing boats. Unfortunately, no information is available on the replacement schedule for boats. Therefore, the demand model will be simplified as follows:

$$grb = f(prb, po, y) \qquad (1)$$

where

grb = number of recreational boats demanded;

prb = price of recreational boats;

po = operating cost (i.e., price variable) of a recreational boat;

y = personal income.

Equation (1) was modified in the following manner. First, no consistent series is available on the price of recreational boats. However the National Marine Manufacturers Association does construct an "expenditures per recreational boat series" which would tend to act as a price variable. Second, personal income will be broken down into its two component, population and personal income per capita. The reason is to separate the individual influences of these two variables on the demand for recreational boats. Third, the number of new recreational boats purchased each year is not available especially on a county level. Ideally, a demand equation deals with all flow variables. However, the only series which is readily available for demand analysis is boat registrations which is a combination of stock and flow information. Since changes in the stock of boat registrations (i.e., flow) will be related to changes in income and other variables, the stock - flow problem is of minor importance. Despite the deviations from "pure" demand theory, it is still expected that the specified demand determinants will "explain" the historical pleasure boat registration series. The demand equation was specified using the following variables:

Dependent Variable

BR_i = pleasure boat registrations in the i'th county in Florida

Independent Variables

POP_i	=	population in the i'th county in Florida;
$PYPCD_i$	=	per capita (P) income (Y) deflated (D) by the U.S. consumer price index (1982-84=100) in the i'th county in Florida;
BEXID	=	boat (B) expenditures (EX [retail]) index (I) deflated (D) by the consumer price index for the United States;
D1	=	dummy variable for change in boat registration definition, D=0, 1974 and before; D=1, 1975 and beyond;
D2	=	dummy variable for possible data error in recording boat registrations in 1978, D=0 in all years except 1978; D=1 in 1978.

Some additional independent variables that proved useful in explaining boat registrations were as follows: CPIGD = gasoline price index deflated by overall CPI; CPICD = real commodities index deflated by overall CPI. CPIGD and CPICD were used as a price variable when one or the other out performed BEXID in statistically explaining boat registrations. Of course, gasoline is a major cost in operating a pleasure boat and is contained in BEXID. The operational linear demand model is as follows:

(2) $$BR = a + bPOP + cPYPCD - dBEXID + eD1 - fD2 + U$$

POP, PYPCP, BEXID, D1, and D2 are the independent variables defined above whereas a,b,c,d,e and f are the parameters to be estimated statistically. U is a random error term. The signs of the variables are as hypothesized. POP and PYPCD should be positively related to boat registrations while BEXID should be inversely related to boat registrations. Before 1975, boat registrations were restricted to boats of ten horsepower or greater. In 1975, all motor boats regardless of horsepower were registered so the boat registration series shifted upward. Therefore, the D1 variable should have a positive sign. In 1978, the Florida Department of Natural Resources allegedly did not record many boat registrations since the agency was in the process of moving. The D2 variable would have a negative sign if this allegation has validity.

With respect to data sources, boat registrations were obtained by county from the Florida Department of Natural Resources (now Environmental Protection) over the 1965-1992 period. Population and Per Capita Income were obtained from the Statistical Abstract of Florida (1965-1992). Retail spending per boat expenditures were obtained from the National Marine Manufacturers Association which reflects expenditures for new and used boats, motors and engines, accessories, safety equipment, fuel, insurance, docking, maintenance, launching, storage, repairs, and club membership. This variable represents the combined influences of boat prices and cost of operation. Notice that equation (2) is specified as a linear relationship. Logarithmic and semi-log specifications were also estimated. The choice of functional form was made on the criteria of goodness of fit and minimum or lack of auto-correlation.

Table 4 shows the empirical results for all 67 Florida counties using the "best" form of the demand function for boat registrations. The growth in population and real per capita income were very significant variables in "statistically" explaining increases in boat registrations by county. Expenditures per boat (BEXID) was inversely related to boat registrations as hypothesized with the level of statistical significance varying by county. In only eight counties was the real gas price a better proxy for price than BEXID as measured by the size of the t-value. In all 67 counties, D1 (i.e., dummy variable for change in boat registration definition) was positive and statistically significant. This was consistent with the hypothesis discussed above. In 10 of the counties, D2 was negative, which is consistent with the allegation that boat registrations were not all recorded in 1978.

Table 4

Boat Registration Forecasting Equations for the 67 Counties of Florida, 1965-92*

(Dependent Variable = Boat Registration)

Region-County	Constant	Population	Real Per Capita Income	Real Gas Prices	Real Commodity Prices	Real Expenditures Per Boat	Change in Law, 1975	Adjustment for Data Error, 1978	$\bar{R}^2$	D.W.	Equation Form
	C	POP	PYPCD	CPIGD	CPICD	BEXID	D1	D2			
A. Coastal Counties											
Northwest											
(1) Escambia	-11405.068	0.0495	0.8798				3669.9169	-310.547	0.9822	1.3195	Linear
	(-3.7760)	(1.6497)	(2.1172)				(8.1212)	(-0.5109)			
(2) Santa Rosa	5.3003	6.762E-06	0.0002			-0.0169	0.8510	-0.0046	0.9723	1.0222	Semi-Log
	(14.1134)	(1.5770)	(4.3301)			(-0.7986)	(9.8720)	(-0.0338)			
(3) Okaloosa	-7456.5576	0.0518	0.8561			-118.1250	1924.1795	-360.2918	0.9839	1.7470**	Linear
	(-3.5938)	(1.6080)	(2.0535)			(-1.0643)	(4.7976)	(-0.9079)			
(4) Walton	-14.1851	0.5858	1.6625				0.9106	-0.0563	0.9847	1.3723	Log-log
	(-8.1672)	(2.6539)	(6.7080)				(11.9455)	(-0.5146)			
(5) Bay	-1682.036	0.0246	1.2463		-56.0413		2042.0647	-1160.0871	0.9932	1.4280**	Linear
	(-.2881)	(1.5832)	(4.2723)		(-1.3501)		(6.556)	(-4.3277)			
(6) Gulf	1.1452	0.0004	0.0001				0.3884	-0.1063	0.9576	1.0593	Semi-Log
	(1.1076)	(0.9619)	(1.9411)				(4.2593)	(-0.8135)			
(7) Franklin	-2164.6483	0.3123	0.0670			-28.4669	196.1045	-43.5752	0.9711	0.5792	Linear
	(-6.3112)	(5.7995)	(2.3276)			(-2.5113)	(3.8476)	(-0.5732)			
(8) Wakulla	-12.8275	1.5709	0.5259			-0.1226	0.9425	-0.1082	0.9953	1.8733	Log-Log
	(-12.3109)	(10.0382)	(3.4977)			(-1.4787)	(14.8045)	(-1.4327)			
(9) Jefferson	1.8844	0.0002	8.609E-05				1.4584	-0.1103	0.9909	1.5312	Semi-Log
	(4.6244)	(3.8296)	(3.8664)				(17.5218)	(-1.1030)			

Region-County	Constant C	Population POP	Real Per Capita Income PYPCD	Real Gas Prices CPIGD	Real Commodity Prices CPICD	Real Expenditures Per Boat BEXID	Change in Law, 1975 D1	Adjustment for Data Error, 1978 D2	$\bar{R}^2$	D.W.	Equation Form
					Independent Variables						
(10) Taylor	3.5179	0.0001	0.0002			-0.0173	0.7451	0.0141	0.9866	1.6069	Semi-Log
	(7.9146)	(2.6783)	(6.0314)			(-1.2705)	(9.7923)	(0.1587)			
(11) Dixie	2.515	5.668E-05	0.0004				1.1531	-0.0700	0.9681	1.2392	Semi-Log
	(7.5521)	(1.2596)	(4.9241)				(9.7414)	(-0.3824)			
(12) Levy	-12.9466	1.1259	0.9225				0.7102	-0.0523	0.9910	1.3628	Log-Log
	(-7.6156)	(4.4138)	(2.2605)				(8.5215)	(-0.6409)			
West Central											
(13) Citrus	-8.3180	0.6919	0.9786			-0.0608	0.7973	-0.0985	0.9903	2.0936**	Log-Log
	(-4.4346)	(4.4200)	(3.2159)			(-0.4075)	(7.4733)	(-1.0879)			
(14) Hernando	4.7624	5.290E-06	0.0002			-0.0471	1.2182	-0.7113	0.9650	1.2063	Semi-Log
	(10.5486)	(2.6221)	(5.3881)			(-1.5368)	(9.5054)	(-3.3485)			
(15) Pasco	-3.7041	0.7473	0.3843			-0.1264	0.4053	-0.0490	0.9964	2.2315**	Log-Log
	(-0.9506)	(3.1551)	(1.3863)			(-1.3257)	(6.9113)	(-1.3090)			
(16) Pinellas	-4.3790	0.5270	1.0831		-0.6707		0.3569	0.0011	0.9896	1.9078	Log-Log
	(-1.0517)	(1.7849)	(3.0192)		(-1.1337)		(7.0757)	(0.0192)			
(17) Hillsborough	-16046.175	0.0371	1.1508	-4.0286			8285.9160	-262.4872	0.9772	0.8128	Linear
	(-3.6382)	(2.5023)	(1.1776)	(-0.1415)			(5.7896)	(-0.1431)			
(18) Manatee	-3.0468	0.4506	0.9489		-0.5580		0.4547	-0.0517	0.9962	1.9419**	Log-Log
	(-0.7555)	(2.4757)	(3.3951)		(-1.0848)		(12.2042)	(-1.8043)			
Southwest											
(19) Sarasota	-4.5021	0.5784	0.6900				0.2170	-0.0098	0.9704	0.3694	Log-Log
	(-4.0261)	(2.6229)	(2.1606)				(3.1491)	(-0.1199)			

Table 4, Page 3 of 7

Region-County	Constant C	Population POP	Real Per Capita Income PYPCD	Real Gas Prices CPIGD	Real Commodity Prices CPICD	Real Expenditures Per Boat BEXID	Change in Law, 1975 D1	Adjustment for Data Error,[3] 1978 D2	$\bar{R}^2$	D.W.	Equation Form
					Independent Variables						
(20) Charlotte	7.5818	1.121E-05	7.526E-05		-0.0113		0.7983	-0.1219	0.9879	1.0483	Semi-Log
	(4.7303)	(3.9420)	(3.8889)		(-0.8435)		(12.1234)	(-1.1425)			
(21) Lee	-9.6748	0.5135	1.3775			-0.0885	0.3749	-0.0633	0.9965	1.4590	Log-Log
	(-10.6725)	(5.4995)	(6.9690)			(-1.8258)	(11.7047)	(-1.3935)			
(22) Collier	23836.445	0.0310	0.2119		-226.6889		2373.1399	-1008.9748	0.9845	1.0703	Linear
	(2.8999)	(2.6151)	(2.1768)		(-3.2934)		(6.4069)	(-1.6604)			
(23) Monroe	-3.4713	0.7742	0.4452			-0.0571	0.3094	-0.0142	0.9942	1.9015**	Log-Log
	(-0.6016)	(1.6649)	(1.7987)			(-0.6271)	(5.3761)	(-0.4247)			
Southeast											
(24) Dade	-5.3721	0.5312	0.9184	-0.1070			0.1850	-0.0768	0.9935	2.0610**	Log-Log
	(-5.2823)	(5.2109)	(6.8243)	(-2.7447)			(8.1071)	(-3.7312)			
(25) Broward	-7.5968	0.4916	1.1516	-0.0498			0.2577	-0.0684	0.9913	1.9435**	Log-Log
	(-6.1985)	(2.2998)	(3.9719)	(-0.5937)			(4.5867)	(-1.6738)			
(26) Palm Beach	-7013.5816	0.0133	1.0706	-10.7643			3689.2782	-1553.7989	0.9938	1.3410**	Linear
	(-1.5872)	(2.7333)	(3.7653)	(-0.6718)			(5.5663)	(-3.2023)			
(27) Martin	-7.6864	0.9037	0.7447		-0.2318		0.2434	-0.0844	0.9980	1.9981**	Log-Log
	(-3.757)	(12.2711)	(7.1779)		(-0.6902)		(6.9766)	(-2.2413)			
(28) St. Lucie	5.9144	1.211E-05	8.942E-05	-0.0013			0.4068	-0.1108	0.9977	2.1067	Semi-Log
	(74.3100)	(34.4937)	(11.5061)	(-2.2681)			(14.2304)	(-2.9013)			
East Central											
(29) Indian River	-8.7184	1.3808	0.2105		-0.1263		0.3852	-0.0825	0.9931	0.8221	Log-Log
	(-1.7001)	(7.0691)	(1.5274)		(-0.1725)		(6.9986)	(-1.2302)			

Region-County	Constant C	Population POP	Real Per Capita Income PYPCD	Real Gas Prices CPIGD	Real Commodity Prices CPICD	Real Expenditures Per Boat BEXID	Change in Law, 1975 D1	Adjustment for Data Error, 1978 D2	$\bar{R}^2$	D.W.	Equation Form
					Independent Variables						
(30) Brevard	14634.531	0.0429	0.1696		-164.9115		5292.0564	-411.2047	0.9843	1.8403**	Linear
	(1.1775)	(4.1277)	(0.6337)		(-1.6598)		(10.1404)	(-0.5102)			
(31) Volusia	7.1236	2.131E-06	0.0001		-0.0033		0.5181	-0.1407	0.9895	0.8848	Semi-Log
	(6.2884)	(2.5603)	(5.9573)		(-0.3810)		(11.4895)	(-2.0899)			
Northeast											
(32) Flagler	5.1885	3.957E-05	0.0003		-0.0280		1.4588	-0.1054	0.9784	1.9602**	Semi-Log
	(1.6448)	(2.2895)	(3.7754)		(-1.0883)		(9.7746)	(-0.5520)			
(33) St. Johns	5.2593	5.535E-06	0.0002			-0.0497	0.4769	-0.0286	0.9911	1.2011	Semi-Log
	(30.8043)	(2.1687)	(8.8663)			(-4.1643)	(10.1124)	(-0.3654)			
(34) Duval	-16230.038	0.0163	1.8993				9126.9224	-1477.9266	0.9839	1.2662	Linear
	(-4.3935)	(1.3204)	(4.7973)				(14.8525)	(-1.3967)			
(35) Nassau	5.0449	3.957E-05	3.137E-05				0.7309	-0.0342	0.9808	2.0307	Semi-Log
	(41.3574)	(2.2705)	(0.6143)				(5.9781)	(-0.3078)			
B. Interior Counties											
Northwest											
(36) Washington	-1217.5300	0.0947	0.0457				624.2030	-61.3556	0.9775	1.1472	Linear
	(-6.5381)	(3.7282)	(1.3635)				(10.0869)	(-0.6997)			
(37) Holmes	-914.0457	0.0830	0.0662			-22.3090	455.9526	-87.3214	0.9778	1.5575	Linear
	(-2.3191)	(2.3004)	(2.6237)			(-1.8016)	(5.0625)	(-1.1489)			
(38) Jackson	-4331.0548	0.1238	0.2209		-7.4531		1053.0285	-129.1338	0.9950	1.9260	Linear
	(-2.1197)	(3.9578)	(6.3793)		(-0.7716)		(9.9903)	(-1.4543)			

Table 4, Page 5 of 7

Region-County	Constant C	Population POP	Real Per Capita Income PYPCD	Real Gas Prices CPIGD	Real Commodity Prices CPICD	Real Expenditures Per Boat BEXID	Change in Law, 1975 D1	Adjustment for Data Error, 1978 D2	$\bar{R}^2$	D.W.	Equation Form
					Independent Variables						
(39) Calhoun	-424.4244	0.0577	0.0414				554.8774	-195.3147	.9554	.7093	Linear
	(-2.3628)	(2.3768)	(1.5015)				(10.4591)	(-2.2670)			
(40) Gadsden	-224.8743	0.0490	0.1022		-17.7237		772.3372	35.9811	0.9889	2.0928	Linear
	(-0.1615)	(2.2675)	(4.3020)		(-2.6701)		(16.1023)	(0.4824)			
(41) Liberty	-485.8417	0.1415	0.0296	-1.1104			282.8096	-72.3664	0.9830	2.1069	Linear
	(-6.6255)	(6.2038)	(2.5474)	(-2.4470)			(12.4522)	(-2.0546)			
(42) Leon	-9.9402	1.0359	0.6226				0.8481	0.0244	0.9898	1.3857	Log-Log
	(-7.1178)	(5.1424)	(3.7519)				(13.7912)	(0.2890)			
North Central											
(43) Madison	2.5307	0.0001	8.632E-05				1.5596	-0.0784	0.9589	1.0701	Semi-Log
	(2.4085)	(1.3077)	(1.6839)				(13.5068)	(-0.3791)			
(44) Suwannee	-17.8235	1.9138	0.5732				0.6752	-0.0841	0.9917	1.9005**	Log-Log
	(-1.7054)	(1.8297)	(1.2549)				(6.4398)	(-1.1735)			
(45) Lafayette	256.3423	0.0606	0.0066		-4.0889		143.6109	5.0626	0.9811	1.9408	Linear
	(0.8008)	(3.4715)	(1.8799)		(-1.6057)		(10.7541)	(0.2212)			
(46) Gilchrist	-8.8995	1.0215	0.5691				1.3703	-0.0290	0.9857	1.1621	Log-Log
	(-5.2968)	(7.7568)	(2.8515)				(14.3811)	(-0.2088)			
(47) Hamilton	1.3589	0.0002	0.0002			-0.0115	1.3963	-0.1387	0.9446	0.8348	Semi-Log
	(1.2769)	(2.0442)	(1.6159)			(-0.2681)	(6.7878)	(-0.5152)			
(48) Bradford	5.2356	5.600E-05	5.895E-05				0.4896	-0.1352	0.9799	2.4543**	Semi-Log
	(10.6315)	(2.2917)	(1.1937)				(5.4842)	(-2.1047)			
(49) Columbia	4.4628	3.075E-05	0.0002		-0.0026		0.9133	-0.0933	0.9908	1.1813	Semi-Log
	(3.3765)	(2.0935)	(4.6155)		(-0.2742)		(12.0816)	(-1.0598)			

Region-County	Constant	Population	Real Per Capita Income	Real Gas Prices	Real Commodity Prices	Real Expenditures Per Boat	Change in Law, 1975	Adjustment for Data Error, 1978	$\bar{R}^2$	D.W.	Equation Form
	C	POP	PYPCD	CPIGD	CPICD	BEXID	D1	D2			
(50) Alachua	-4459.0700	0.0419	0.3351				1587.8654	-412.1641	0.9936	0.8577	Linear
	(-15.9237)	(6.5064)	(3.9221)				(8.1847)	(-1.8725)			
(51) Union	3.6455	0.0002	0.0002		-0.0160		0.8505	-0.0255	0.9569	1.6635	Semi-Log
	(2.1050)	(2.1576)	(2.3387)		(-1.0667)		(3.4718)	(-0.1287)			
<u>Northeast</u>											
(52) Baker	-16.7175	1.4956	0.9043				0.8771	-0.1156	0.9913	1.8432**	Log-Log
	(-7.4089)	(4.1266)	(2.5352)				(7.4880)	(-1.3833)			
(53) Clay	4.8470	1.217E-05	0.0002			-0.0216	0.4632	-0.1006	0.9851	1.1093	Semi-Log
	(16.3527)	(5.4507)	(5.5443)			(-1.1771)	(5.8228)	(-0.8737)			
(54) Putnam	4.4087	2.068E-05	0.0003			-0.0035	0.5231	-0.1067	0.9891	1.5056	Semi-Log
	(16.4487)	(4.9857)	(6.2465)			(-0.2884)	(9.5021)	(-1.3284)			
<u>Central</u>											
(55) Marion	-10.5982	0.5171	1.3996				0.8577	-0.0571	0.9927	1.8984	Log-Log
	(-11.2949)	(5.1328)	(8.6035)				(15.5129)	(-0.7587)			
(56) Sumter	-9.8509	0.4389	1.3404				1.0816	-0.0361	0.9821	0.8165	Log-Log
	(-6.1147)	(1.5195)	(4.7399)				(10.5910)	(-0.2745)			
(57) Lake	7.0465	6.240E-06	8.072E-05			-0.0171	0.6295	-0.0731	0.9938	1.2695	Semi-Log
	(55.9847)	(6.3743)	(5.8590)			(-1.9630)	(17.7289)	(-1.3069)			
(58) Orange	-5.0042	0.5853	0.7377			-0.1815	0.4305	-0.0382	0.9858	1.4510	Log-Log
	(-4.5451)	(3.2877)	(3.4174)			(-0.2605)	(10.8662)	(-0.6596)			
(59) Seminole	-9.7431	0.4547	1.5552	-0.4214			0.5420	-0.2479	0.9937	2.0122	Log-Log
	(-7.8640)	(3.4336)	(6.2722)	(-4.7917)			(9.0520)	(-3.6660)			

Table 4, Page 7 of 7

Region-County	Constant	Population	Real Per Capita Income	Real Gas Prices	Real Commodity Prices	Real Expenditures Per Boat	Change in Law, 1975	Adjustment for Data Error, 1978	$\bar{R}^2$	D.W.	Equation Form
	Independent Variables										
	C	POP	PYPCD	CPIGD	CPICD	BEXID	D1	D2			
(60) Osceola	5.8413	4.992E-05	0.0001			-0.0402	0.5993	-0.1194	0.9874	1.9149	Semi-Log
	(29.0115)	(2.8219)	(5.2877)			(-2.8049)	(12.6797)	(-1.3985)			
(61) Polk	9.4959	2.517E-06	3.979E-05		-0.0160		0.6821	-0.0264	0.9722	1.6496	Semi-Log
	(5.3864)	(1.2748)	(0.7741)		(-1.1990)		(7.7538)	(-0.2149)			
South											
(62) Hardee	5.1129	3.320E-05	8.162E-05			-0.0200	0.6426	-0.1500	0.9590	2.2041	Semi-Log
	(12.9707)	(1.5478)	(3.1622)			(-1.2170)	(6.6507)	(-1.3501)			
(63) Highlands	-2.0365	0.9847	0.5331		-1.2990		0.8594	-0.0823	0.9970	1.4871	Log-Log
	(-0.5757)	(7.0041)	(4.4207)		(-2.6992)		(20.1592)	(-1.5585)			
(64) Okeechobee	-3054.9645	0.1080	0.3445			-29.2782	785.7388	-220.6271	0.9793	0.5821	Linear
	(-3.6349)	(3.9453)	(2.3359)			(-0.8150)	(4.4279)	(-1.0141)			
(65) DeSoto	-12.9784	1.6220	0.4258	-0.1254			0.6509	-0.2208	0.9680	0.9432	Log-Log
	(-4.3853)	(5.5158)	(1.9951)	(-0.6777)			(5.1888)	(-1.5323)			
(66) Glades	6.4492	0.0001	5.683E-05		-0.0190		0.7146	0.0498	0.9735	1.2122	Semi-Log
	(6.1954)	(2.0765)	(2.5136)		(-2.2926)		(6.5704)	(0.4561)			
(67) Hendry	7.3372	7.240E-05	2.929E-05		-0.0236		0.4397	0.0450	0.9893	1.4609	Semi-Log
	(5.9366)	(4.9560)	(3.1433)		(-2.3399)		(7.4418)	(0.5807)			

*T-values in parentheses
**Adjusted for autocorrelation using Cochran-Orcutt.

Note: $\bar{R}^2$ = adjusted coefficient of determination (i.e., goodness of fit); D.W. = Durbin - Watson or test for autocorrelation (i.e., biases equation).

3.0 <u>Projected Demand for Registered Boats by Coastal County</u>

The demand equations for boat registrations in Table 4 can be used to project the future direction of registrations over the 1992-2010 period. To make these projections, one must first project the independent variables. The dummy variables, D_1, and D_2, do not have to be projected since they represent historical structural changes that will not be repeated in the future. Further, it is not possible to project future trends in real prices such as CPIGD; CPICD or BEXID since inflation (i.e., the deflator) is rarely projected beyond two years for the U.S. Long run projections of inflation in the U.S. would amount to complete conjecture. Therefore, all independent variables except population (POP) and real per capital income (PYPCD) were held constant at their 1992 levels. Fortunately, The Florida Long-Term Economic Forecast 1992 (Bureau of Economic and Business Research, University of Florida, May 1993) contains forecasts by county of POP and PYPCD over the 1990-2005 period. These average annual projected changes are shown in Table 5. We assumed that the projected growth rates for the 2000-2005 period would continue over the 2005-2010 period. The reader is referred to the BEBR (1993) for a detailed discussion of the rationale behind the projections.

To make the projections of boat registrations for a particular county, we shall use the following equations beginning in the base year 1992 (actual) to 1995 and from 1995 (i.e., new base) to 2000 and from 2000, etc.:

Linear

(3) BR(92) + b[(1+nr) POP(92) - POP(92)]

+ c [(1+ng) PYPCD(92) - PYPCD(92)]

Semi-Log

(4) Log (BR(92) + b[(1+ng) PYPCD(92) - PYPCD(92)]

(Take anti-log of above expression)

Log-Log

(5) Log BR(92) + b[Log (1+nr) POP(92) - Log POP(92)]

+ c[Log (1+nr) PYPCD(92) - Log POP(92)]

(Take anti-log of above expression)

Table 5

Projected Average Annual Percent Change Personal Income Per Capita Deflated (PYPCD) and Population (POP) for all Coastal Counties in Florida 1992-2005

County	PYPCD			POP		
	1990-95	1995-2000	2000-20005	1990-95	1995-2000	2000-20005
Escambia	0.9	1.4	2.0	0.9	0.7	0.6
Santa Rosa	2.0	1.7	2.2	3.3	2.4	2.1
Okaloosa	1.4	1.5	1.2	2.0	1.6	1.4
Walton	0.9	1.3	1.7	2.4	1.7	1.4
Bay	1.3	1.3	1.7	1.7	1.5	1.3
Gulf	1.6	1.0	1.7	0.7	0.7	0.6
Franklin	1.8	1.5	1.6	1.7	1.0	1.1
Wakulla	2.2	1.9	2.3	1.9	1.7	1.6
Jefferson	0.4	1.6	2.0	2.4	0.8	0.7
Taylor	1.4	1.6	1.4	0.5	0.3	0.3
Dixie	1.4	1.6	1.2	2.0	1.8	1.2
Levy	1.3	1.1	1.3	2.5	1.8	1.6
Citrus	1.5	1.5	1.5	3.1	2.7	2.3
Hernando	0.9	0.9	1.6	4.1	3.5	2.9
Pasco	0.3	0.5	1.5	2.2	2.1	1.8
Pinellas	1.4	1.6	1.7	0.9	0.9	0.8
Hillsborough	0.9	1.5	1.8	1.6	1.4	1.3
Manatee	1.3	0.4	1.2	2.1	1.9	1.7
Sarasota	0.6	0.4	1.0	2.0	1.8	1.6
Charlotte	1.6	1.1	1.4	3.7	3.2	2.6
Lee	0.8	0.8	1.2	2.8	2.5	2.1
Collier	0.7	0.8	1.0	4.4	3.2	2.7
Monroe	0.4	1.6	1.6	1.8	1.4	1.2
Dade	1.1	1.0	1.3	1.0	1.1	1.0
Broward	0.3	1.4	1.5	1.8	1.4	1.3
Palm Beach	0.3	0.9	1.1	2.3	2.1	1.8
Martin	0.9	1.3	1.7	2.6	2.4	2.0
St. Lucie	0.3	0.2	0.2	3.2	2.8	2.3
Indian River	0.0	1.0	0.9	2.5	2.3	1.9
Brevard	0.7	0.8	1.0	2.5	2.1	1.8
Volusia	0.6	1.0	1.3	2.3	2.1	1.8
Flagler	1.1	1.3	1.2	5.6	4.3	3.5
St. Johns	1.2	1.3	1.4	3.0	2.6	2.2
Duval	1.0	1.4	1.5	1.4	1.1	1.0
Nassau	1.0	1.4	2.1	1.9	1.6	1.4

Source: Bureau of Economics and Business Research, University of Florida, The Florida Long-Term Economic Forecast, Vol II, 1992.

where

BR(92)	=	actual boat registrations (1992);
b	=	coefficient on POP
c	=	coefficient on PYPCD
n	=	number of years projected from 1992 (i.e., n = 3 if 1995) but from new base such as 1995 (i.e., n=5 if 2000);
r	=	annual rate of growth in population for interval of projection (See Table 4);
g	=	annual rate of growth in PYPCD for interval of projection (See Table 4);
POP(92)	=	county population, 1992;
PYPCD(92)	=	county real per capita income, 1992.

The projection model may seem a bit complex, but it is actually quite simple. This may be illustrated by an example using Escambia County. From Table 4, the equation form for this county is linear. Therefore, we use the linear model as specified above [i.e., equation (3)]. Assume we wish to project BR from 1992-1995. Table 6 shows boat registrations in the base period to be 15,558 (1992). Table 7 shows the baseline (1992) population (POP) and real per capita income for all of the coastal counties. The implementation of equation (3) using the data from Tables 4 - 7 is as follows:

$$(6)\quad 15{,}558 + .0495\left[(1+3^{*}\ .009)(269{,}700) - 269{,}700\right] + .0798\left[(1+3^{*}\ .009)(12{,}208) - 12{,}208\right] = 16{,}208$$

thus, Escambia County is projected to have 16,207 registered pleasure craft. For the next five years, the parameters will change and the new base will be 1995 and so on. The results of this procedure is shown in Table 6 as the projected increase in boat registrations by coastal county over the 1992-2010 period. These projections will become a valuable input to the next stage of this analysis dealing with boater water-access choice models.

4.0 Choice Model for Boat Ramps Versus Other Waterway Access Facilities

4.1 Theoretical Model

As discussed in the Introduction, recreational boaters have essentially three different choices regarding access to waterbodies in the State of Florida. A boater may berth her both at a marina or build a private dock. This is a two choice option. But, for most recreational boaters in Florida, they trailer their boats from home to a public or private boat ramp. The focus of this study is on the last choice for water access for boaters. Such a choice can be expressed as a binary or dummy variable; therefore, we can use the following

Table 6

Projected Boat Registration for All Coastal Counties in Florida Over 1992-2005

County	1992 Base Year	1995	2000	2005	2010
		Projected			
Escambia	15,558	16,208	17,460	19,066	20,803
Santa Rosa	6,927	8,363	10,988	15,605	22,160
Okaloosa	12,767	13,682	15,175	16,516	17,943
Walton	2,374	2,585	3,010	3,587	4,274
Bay	13,096	13,854	15,131	16,773	18,550
Gulf	1,917	2,219	2,763	3,461	4,334
Franklin	1,366	1,850	2,496	3,237	4,034
Wakulla	2,874	3,243	3,866	4,620	5,521
Jefferson	659	785	928	1,115	1,340
Taylor	2,391	2,694	3,29.8	4,075	4,988
Dixie	1,496	1,783	2,487.7	3,242	4,226
Levy	2,154	2,421	2,802	3,239	3,743
Citrus	11,818	13,121	15,373	17,791	20,590
Hernando	5,312	6,065	7,546	10,221	13,841
Pasco	14,257	15,006	16,323	17,899	19,628
Pinellas	42,427	44,988	50,046	55,811	62,240
Hillsborough	36,399	38,363	41,917	45,801	49,976
Manatee	12,975	13,830	14,681	16,096	17,648
Sarasota	16,802	17,593	18,747	20,271	21,920
Charlotte	13,876	16,908	22,770	30,834	41,753
Lee	29,623	31,901	35,771	40,800	46,536
Collier	13,788	14,574	15,702	16,859	18,153
Monroe	16,341	17,111	18,659	20,201	21,870
Dade	46,291	48,447	52,130	56,684	61,637
Broward	40,381	41,868	46,792	52,455	58,803
Palm Beach	30,417	31,457	33,824	36,395	39,154
Martin	12,080	13,187	15,311	17,734	20,539
St. Lucie	9,093	11,058	15,067	20,141	26,923
Indian River	7,748	8,562	10,053	11,501	13,158
Brevard	25,868	27,575	30,167	32,655	35,363
Volusia	18,417	19,959	23,377	27,889	33,272
Flagler	2,675	3,686	6,301.2	10,695	18,154
St. Johns	5,369	6,282	8,318	11,323	15,413
Duval	27,432	28,691	31,226	34,011	36,989
Nassau	2,940	3,304	3,976	4,839	5,889

Source: Table 1 and Bureau of Economics and Business Research, University of Florida, The Florida Long-Term Economic Forecast, Vol II, 1992.

Table 7

Baseline Population and Real Per Capita Income for Coastal Counties in Florida, 1992

County	Population (POP)	Real Per Capita Income (PYPCD)
Northwest		
(1) Escambia	269,700	12,208
(2) Santa Rosa	86,400	10,877
(3) Okaloosa	149,500	12,513
(4) Walton	29,000	9,193
(5) Bay	151,460	11,680
(6) Gulf	11,700	9,962
(7) Franklin	9,200	9,338
(8) Wakulla	14,800	10,438
(9) Jefferson	11,400	10,051
(10) Taylor	17,200	11,136
(11) Dixie	11,000	8,216
(12) Levy	27,100	9,390
West Central		
(13) Citrus	101,200	11,143
(14) Hernando	111,900	11,065
(15) Pasco	298,700	11,175
(16) Pinellas	874,200	17,173
(17) Hillsborough	868,600	13,425
(18) Manatee	223,500	14,434
Southwest		
(19) Sarasota	292,100	19,524
(20) Charlotte	121,000	13,032
(21) Lee	359,200	14,809
(22) Collier	171,300	19,152
(23) Monroe	80,600	15,401
Southeast		
(24) Dade	1,943,000	14,015
(25) Broward	1,304,500	17,446
(26) Palm Beach	917,200	20,531
(27) Martin	108,200	21,439
(28) St. Lucie	162,200	10,964
East Central		
(29) Indian River	96,100	24,194
(30) Brevard	515,160	13,978
(31) Volusia	392,800	12,593
Northeast		
(32) Flagler	32,300	10,688
(33) St. Johns	89,900	15,602
(34) Duval	691,080	13,795
(35) Nassau	45,800	14,184

Source: BEBR, UF

formulation:

Pr BR 1 = YES (Use Boat Ramp)
0 = NO (Do Not Use Boat Ramp)

Pr BR is the probability (Pr) of using a boat ramp (BR). If we draw a pleasure boat owner at random from the state of Florida, the probability of drawing one that uses a boat ramp depends on the number of "YES" answers from the boating population. The number of "YES" answers as a percent of the population should fall between 0 and 1. The basic question is what determines Pr BR? Thus, Pr BR becomes a dependent variable to be explained. Certainly, demographic variables may explain Pr BR such as income and age. That is, the use of a public boat ramp is cheaper than marina storage (i.e., appeals to lower income groups) and is more physically demanding compared to the use of a marina slip (i.e., appeals to younger individuals). Such statements are hypotheses that must be empirically tested. This will be examined below. There are other factors on variables that might influence Pr BR. The most important is the size of the boat. As boat size (i.e., length) increases, it becomes more difficult to trailer and, of course, launch at a boat ramp. Listed below are the hypothesized variables along with the expected hypothesized sign that may impact Pr BR:

Demographic

(-) HY = household income;

(-) AGE = age;

(+) YRF = year-round resident of Florida (1=YES; 0=NO)

(-) DBOPH = days boating per household in the last 12 months.

Other Variables

(-) SB = Size of boat expressed in linear feet

(±) SFD = salt - freshwater choice (1=Use saltwater boat ramp most of time; 0=Use other than saltwater boat most of time).

(±) DVR = regional dummy variables 1 through 15 (1=region in question; 0 other region)

Some of the above hypothesized variables have already been discussed. We shall comment briefly on the other variables. Year-round residents (YRF) of Florida are more likely to use boat ramps because of greater knowledge of the area. The use of the waterways is easier if one has her own private boat dock or can drive to a marina to use one's boat. Thus, those using a boat ramp are likely to be less frequent users of the waterbodies per year (i.e., DBOPH is relatively less for those using boat ramps). Individuals can select salt or freshwater boat ramps even within coastal counties or between counties. For example, a boater can live in Polk County (i.e., an inland county), but chose a saltwater boat ramp in Pinellas county. Then again, the kind of waterbody (SFD) may have no influence on Pr BR. Finally, the region in which one lives may influence boat ramp use. Residences may be built on a canal system encouraging the use of private docks. This may reduce Pr BR. Because of the sample size, fifteen coastal regions were selected many, of which, are single counties. This will be discussed below.

4.2 Sampling Procedure

Although the emphasis of this study is on coastal counties, it is recognized that all registered boaters in the State of Florida must be sampled. Participants in boat ramp use come from all counties with the main difference between coastal and noncoastal counties being the presence or absence of saltwater. A priori, there should be no apparent reason for Pr BR to be influenced by this divisions. Consequently, a computer tape of all registered boaters in the State of Florida was obtained from the Bureau of Titling and Registration, Florida Department of Natural Resources (now DEP) for the 1992-93 fiscal year. The boater universe was stratified by the 67 counties in Florida (i.e., percent of boaters in each county). The Policy Science Survey Research Laboratory at Florida State University selected a random sample of 720 registered boaters stratified by county. A survey instrument was constructed for a phone interview to ascertain boater behavior and attitudes. This sample is representative of all boaters in the state of which 514 were from coastal counties. This will allow us to make statements about all boaters of the State of Florida who use both fresh and saltwater (e.g., position on manatee protection) and to also predict the Pr BR for any needed segment of the sample. Respondents were surveyed in 1993.

5.0 Empirical Estimation of Boat Ramp Choice Model

Two techniques were used to estimate the relationship between Pr BR and the hypothesized independent variables. The first is linear ordinary least-squares (OLS). This is a well known technique, but does have the limitation of not restricting Pr between 0 and 1. For predictions within a sample, this may not be a significant shortcoming or even, for that matter, outside the sample values. The second statistical technique is logit. Here, Pr BR is specified as a logistic function of the independent variables, but unlike OLS, Pr is automatically constrained to a range between 0 and 1.

Using the sample of recreational boat owners, OLS and logit were estimated. The results for OLS are shown in Table 8. Let us briefly discuss the results. The arithmetic mean of Pr BR is .6639, indicating a two-thirds chance of selecting a boat ramp given the basic three water access choices. This is exactly the percentage found (i.e., Pr BR) in any earlier (1990) phone survey conducted by Florida State University for the Florida Save the Manatee Club which was cited in the Introduction of this report. Four of the independent variables were statistically significant at the 1% level and did exhibit the hypothesized sign. As income (HY), age (AGE); size of boat (SB) and days boated per year (DBOPH) increase, the probability of using a boat ramp (Pr BR) declines. YRF had the hypothesized sign (i.e., positive) but was not statistically significant at even the 5% level. Finally, Pr BR was not statistically different between salt and freshwater boat ramp use (at the 5% level - SFD). Finally, regions 1-15 which encompass the coastal areas or counties in Florida did not show, in general, any statistical difference when compared to all interior counties in terms of impact on Pr BR. Since the sample was 720 observations, some smaller counties had only a few observations. Therefore, we adopted a rule of thumb that a region or county must have a minimum of 20 observations. This made it necessary to consolidate the 35 coastal counties shown in Figure 1 into the regions in Table 9.

Table 10 shows the logit results. With respect to statistical significance and hypothesized signs for the coefficients, the results are identical to those obtained through the use of OLS in Table 8. So, we shall not repeat our more extended discussion of each variable as was done on OLS above.

Table 8

OLS Estimation of the Participation Function for Boat Ramp Use in the State of Florida, 1993
(Dependent Variable: Pr BR)
(Mean of Dependent Variable = .6639)

Independent Variables*	Coefficient	t-Value
Intercept	1.424393	10.773**
HY ($49,169)	-.00000149	-2.620**
AGE (52 years)	-.005898	-4.920**
YRF (97%)	.171420	1.706
SB (19 feet)	-.024581	-8.993**
DBOPH (32 days)	-.000881	-2.893**
SFD (61%)	-.062854	-1.541
DVR 1	-.029731	-.364
DVR 2	-.006841	-.090
DVR 3	-.019310	-.272
DVR 4	.040653	.559
DVR 5	-.062957	-.675
DVR 6	.025369	.304
DVR 7	-.121661	-.1.643
DVR 8	-.216867	-2.291
DVR 9	.040379	.432
DVR 10	-.070848	-.834
DVR 11	-.026542	-.314
DVR 12	-.002541	-.030
DVR 13	.092422	1.230
DVR 14	-.087027	-1.056
DVR 15	.036867	.521
N	720	
$\bar{R}^2$	.2421	
F	11.935	

* Arithmetic Mean in Parentheses after Variable.
** Statistically Significant at 1% Level.

Table 9

Coastal Boat Ramp Regions in Florida with Actual and Predicted Pr BR, 1993

Region	Coastal	N	Pr BR Actual	Pr BR Predicted* OLS	Pr BR Predicted* LOGIT
DVR 1	(1) Escambia (2) Santa Rosa	31	.677	.657	.682
DVR 2	(1) Okaloosa (2) Walton (3) Bay	37	.730	.706	.740
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	42	.714	.684	.720
DVR 4	(1) Pinellas	45	.622	.612	.639
DVR 5	(1) Hillsborough	24	.625	.617	.622
DVR 6	(1) Manatee (2) Sarasota	32	.688	.684	.740
DVR 7	(1) Charlotte (2) Lee	48	.438	.432	.417
DVR 8	(1) Collier (2) Monroe	24	.292	.289	.222
DVR 9	(1) Dade	23	.696	.679	.729
DVR 10	(1) Broward	29	.483	.465	.438
DVR 11	(1) Palm Beach	30	.567	.546	.535
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	32	.625	.619	.637
DVR 13	(1) Brevard	41	.780	.771	.812
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	31	.581	.562	.560
DVR 15	(1) Duval (2) Nassau	45	.778	.758	.795

* Using equations in Tables 8 and 10

Table 10

Logit Estimation of the Participation Function for Boat Ramp Use in the State of Florida, 1993
(Dependent Variable: Pr BR)
(Mean of Dependent Variable: .6639)

Independent Variables*	Coefficient	Wald Chi-Square
Intercept	5.6499	45.5281**
HY ($49,169)	-9.314E-6	7.6856**
AGE (52 years)	-.0370	23.7308**
YRF (97%)	.9807	3.0190
SB (19 feet)	-.1612	59.2825**
DBOPH (32 days)	-.0048	6.9625**
SFD (61%)	-.2911	1.3498
DVR 1	-.1608	.1092
DVR 2	-.0300	.0039
DVR 3	-.0951	.0498
DVR 4	.3824	.7206
DVR 5	-.3841	.4639
DVR 6	.3175	.3722
DVR 7	-.4337	1.0261
DVR 8	-1.0463	3.0026
DVR 9	.3817	.3924
DVR 10	-.2133	.1942
DVR 11	-.0566	.0116
DVR 12	.0379	.0060
DVR 13	.5921	1.5778
DVR 14	-.4560	.9600
DVR 15	.2080	.2150
N	720	
X^2 (-2 LOG L Score)	190.23	

* Arithmetic Mean in Parentheses after Variable
** Statistically Significant at 1% Level

In Table 9, we show the sample size for each selected region or county. The sample is the number of registered recreational boats associated with the region. For example, Pinellas County had 45 registered boats. Of these craft, 62.2 percent were trailered by their owners to boat ramps. This is termed the "actuals" (or observed) Pr BR for each region. Pr BR's range from a high of .780 in Brevard County to low of .292 in Collier/Monroe Counties. This range is largely explained by the four independent variables (i.e., HY; AGE; SB and DBOPH) that were statistically significant at the 1% level. When the independent variables (i.e., average SB for a region, etc.) are inserted into the equations in Tables 8 and 10, we obtain the "predicted" Pr BR for a region for OLS and logit respectively. These predicted values are also shown in Table 9. The predictive power of the equations for the various regions is extremely good given the relatively small samples from each area. The OLS and logit equations will be of further use in forecasting boat ramp demand for the coastal counties in the next section of this report.

6.0 Projection of Boat Ramp Demand for Coastal Regions in Florida

In this section, we shall integrate the work of the previous sections to formulate an aggregate demand model of boat ramp demand for coastal areas (and counties) in Florida. This demand model may be illustrated in the form of the following equations for the ι'th region:

(7) $(BR_\iota)_t = F\ [\ (POP_\iota)_t, (PYPCD_\iota)_t\ ]$

(8) $(PrBR_\iota)_t\ =\ F\ [(HY_i)_t,\ (AGE_i)_t,\ (SB_i)_t]$

(9) $(ABRD_\iota)_t = (BR_\iota)_t(PrBR_\iota)_t(DBOPH_\iota)_t$

where equations (7) contains boat registrations as a function of population (POP) and real per capita income (PYPCD). Equation (8) contains the probability of selecting a boat ramp (among the three access points) as a function of household income (HY); age of the boat owner (AGE) and the size of the boat (SB). Equation (7) has been estimated using time series data while equation (8) utilized a statewide sample of boaters. It might be instructive to look at the anticipated results of projecting BR_ι and $PrBR_\iota$ into the future. The expectations are that income and population will expand over the 1992-2010 period. This will, of course, expand boat registrations in all counties (See Table 6). But, rising affluence (HY) will decrease the probability of using a boat ramp in equation (8). The net effect of rising affluence on the demand for boat ramps is an empirical question. In addition to income, the population and hence the boater population is expected to increase in average age over the projection period. The quantification of this aging process is discussed below. According to our previous analysis shown in Tables 8 and 10, the aging of the population will reduce the probability of using a boat ramp. Finally, we cannot be certain as to what will happen to average boat size in the future. Historically, boat owners have tended to purchase larger boats which would tend to divert demand away from boat ramps to marinas and private docks. Therefore the expectations are that PrBR will fall over time because of an expected increase in HY; AGE and SB.

In equation (9), $ABRD_i$ stands for aggregate boat ramp demand for the i'th region. It is expressed as the annual number of boating days that are associated with launching from a boat ramp. It is derived by multiplying the number of registered boats $(BR_i)_t$ by the probability of using a boat ramp $(PrBR_i)_t$ to first obtain the number of boats using boat ramps per year. Finally, we multiply the average number of boating days per household on an annual basis $(DBOPH_i)_t$ by number of boats using boat ramps to obtain $(ABRD_i)_t$. We could find no basis upon which to project a change in $(DBOPH_i)_t$ over the 1992-2010 period. That is, DBOPH was not related to many conventional demographic variables such as income or age. Therefore, we held DBOPH constant at the 1993 sample value by regions.

We have already discussed the projection of $(POP_i)_t$ and $(PYPCD_i)_t$ in earlier sections. See Table 5. Tables 11, 12, and 13 show projections of income and age for Florida's coastal regions. The purpose of Table 11 is to present the projection rates for real per capita income derived from the BEBR (1993) after weighting, where necessary, the county projections by population to derive the regional rates. In Table 12, we have the observed average household income for the sample of boaters in each region used in this analysis for the survey year 1993. We used the per capita income growth rates to forecast the household income of boaters over the 1995-2010 period. This is an approximation since no projections are available for the boater subset of the population. A backcast for 1992 was made since the model embraced in equations (7) - (9) starts with the boat

Table 11

Projected Weighted Average Annual Growth Rates in Real Per Capita Income for Coastal Regions in Florida

(percentages)

Region	Coastal	1990-1995	1995-2000	2000-2005
DVR 1	(1) Escambia (2) Santa Rosa	1.19	1.48	2.06
DVR 2	(1) Okaloosa (2) Walton (3) Bay	1.30	1.39	1.50
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	0.80	0.89	1.53
DVR 4	(1) Pinellas	1.40	1.60	1.70
DVR 5	(1) Hillsborough	0.90	1.50	1.80
DVR 6	(1) Manatee (2) Sarasota	0.90	0.40	1.08
DVR 7	(1) Charlotte (2) Lee	1.00	0.87	1.25
DVR 8	(1) Collier (2) Monroe	0.60	1.03	1.16
DVR 9	(1) Dade	1.10	1.00	1.30
DVR 10	(1) Broward	0.30	1.40	1.50
DVR 11	(1) Palm Beach	0.30	0.90	1.10
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	0.39	0.72	0.80
DVR 13	(1) Brevard	0.70	0.80	1.00
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	0.74	1.07	1.30
DVR 15	(1) Duval (2) Nassau	1.00	1.40	1.54

Source: BEBR, UF (1993)

Table 12

Projected Average Household Income for Boaters in Coastal Regions in Florida

Region	Coastal	1992	1993	1995	2000	2005	2010
DVR 1	(1) Escambia						
	(2) Santa Rosa	$50,317.32	$50,923.31	$52,142.40	$56,116.70	$62,139.80	$68,809.20
DVR 2	(1) Okaloosa	45,930.40	46,535.40	47,753.20	51,165.60	55,119.70	59,379.40
	(2) Walton						
	(3) Bay						
DVR 3	(1) Gulf	42,771.40	43,116.40	43,809.00	45,793.50	49,405.50	53,302.50
	(2) Franklin						
	(3) Wakulla						
	(4) Jefferson						
	(5) Taylor						
	(6) Dixie						
	(7) Levy						
	(8) Citrus						
	(9) Hernando						
	(10) Pasco						
DVR 4	(1) Pinellas	57,244.60	58,057.40	52,694.40	64,625.20	70,308.30	76,491.20
DVR 5	(1) Hillsborough	55,753.10	56,259.40	57,276.70	61,703.00	67,459.80	73,753.60
DVR 6	(1) Manatee	49,144.40	49,590.70	50,487.40	51,505.20	54,347.20	57,346.00
	(2) Sarasota						
DVR 7	(1) Charlotte	39,381.90	39,779.70	40,579.30	42,375.30	45,090.80	47,980.40
	(2) Lee						
DVR 8	(1) Collier	50,942.50	51,250.00	51,866.80	54,593.40	57,834.20	61,267.30
	(2) Monroe						
DVR 9	(1) Dade	63,933.30	64,644.40	66,074.40	69,444.80	74,077.60	79,019.50
DVR 10	(1) Broward	56,099.80	56,268.60	56,606.70	60,681.70	65,371.40	70,423.60

(continued, next page)

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Region	Coastal	1992	1993	1995	2000	2005	2010
DVR 11	(1) Palm Beach	$76,413.00	$70,624.80	$71,049.20	$74,304.50	$78,482.10	$82,894.60
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	52,824.90	53,031.80	53,446.20	55,398.20	57,678.40	60,052.40
DVR 13	(1) Brevard	50,511.40	50,867.50	51,582.168	53,705.20	56,444.80	59,324.00
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	47,606.40	47,961.30	48,673.70	51,334.10	54,758.70	58,411.80
DVR 15	(1) Duval (2) Nassau	48,219.80	48,706.90	49,685.90	53,262.70	57,492.20	62,057.30

Source: 1993 Phone Survey of Registered Boaters and 1992 and 1995-2010 Projected from BEBR, UF

Table 13

Projected Average Age for Coastal Regions in Florida

Region	Coastal	1992	1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	34.27	34.85	35.59	36.40	37.23
DVR 2	(1) Okaloosa (2) Walton (3) Bay	34.44	35.09	35.92	36.93	37.96
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	44.80	45.64	46.71	47.92	49.16
DVR 4	(1) Pinellas	43.44	43.86	44.39	45.19	46.0
DVR 5	(1) Hillsborough	35.10	35.62	36.27	37.27	38.3
DVR 6	(1) Manatee (2) Sarasota	45.71	45.99	46.35	46.98	47.63
DVR 7	(1) Charlotte (2) Lee	44.13	44.56	45.11	46.04	46.99
DVR 8	(1) Collier (2) Monroe	40.73	41.45	42.25	43.47	44.72
DVR 9	(1) Dade	36.13	36.56	37.11	37.85	38.60
DVR 10	(1) Broward	39.90	40.32	40.85	41.62	42.41
DVR 11	(1) Palm Beach	41.57	42.13	42.83	43.61	44.42
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	42.10	42.54	43.11	43.84	44.58
DVR 13	(1) Brevard	38.09	38.98	40.11	41.46	42.85
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	40.88	41.58	42.47	43.67	44.91
DVR 15	(1) Duval (2) Nassau	33.38	34.11	35.04	36.15	37.30

Source: BEBR, UF

registration base year of 1992. Finally, Table 13 was constructed from data in BEBR (1993) on projected age distribution by county and weighted by population to derive regional average age. The projected average age for all the population in the coastal regions in Table 13 was used as a means to project the average of boaters in the sample shown in Table 14 by coastal regions. Boaters tend to be from 5-15 years older than the general population. As a simplifying assumption, we projected boaters to age at the same rate as the general population. As we can see from Tables 12 and 13, there will be a rising level of affluence or household income combined with an increasing average age of the boater population in Florida's coastal regions. According to our cross section analysis with OLS and logit of our sample of boaters in Florida, these trends will depress the boat ramp participation rate or PrBR. See Tables 8 and 11.

The final variable that influences PrBR is the size of the boat. We have no way of telling whether the average size of pleasure craft will increase in the future. But, we can analyze recent trends in boat size for the 35 coastal counties in Florida. Over the 1981-1992 period, we obtained the weighted average size of registered pleasure craft for each coastal county using published data from the Florida Bureau of Vessel Titling and Registration, DEP. A linear time trend was fitted to the data by county or

$$BR_i = a + b\,T \tag{10}$$

The results are shown in Table 15. Except for Dade County, all Florida's coastal counties showed a persistent increase in the average size of their registered pleasure craft. The twelve year trends were statistically significant at the one percent level for 34 of the 35 with positive signs. Consider Hillsborough County in Table 14. The slope of the time trend would indicate that the average size of pleasure craft increase by about one-tenth of a foot per year. The constant term is an estimate of the average size of registered boats in the particular county in 1980 (i.e., T = 0). For example, Hillsborough County had 16.0683 feet in length for pleasure craft in 1980. By 1992, the average craft length increased to 17.289 feet [i.e., 1980 size plus 12 (.10172)]. Because of the results in Table 15, we felt compelled to extrapolate these trends over the 1993-2010 period. This was done in the following manner. First, the slope coefficients were weighted by the number of boats in the counties comprising the region. The weighted slope coefficient for each region was used to

Table 14

Projected Average Age for Recreational Boaters in Coastal Regions in Florida, 1992-2010

Region	Coastal	1992	1993	1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	50.18	50.39	51.03	52.11	53.30	54.52
DVR 2	(1) Okaloosa (2) Walton (3) Bay	50.18	50.39	51.03	52.11	53.30	54.52
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	49.46	49.69	50.39	51.57	52.91	54.28
DVR 4	(1) Pinellas	50.30	50.42	50.79	51.40	52.33	53.27
DVR 5	(1) Hillsborough	45.04	45.21	45.71	46.55	47.83	49.15
DVR 6	(1) Manatee (2) Sarasota	50.30	50.38	50.61	51.00	51.70	52.41
DVR 7	(1) Charlotte (2) Lee	61.23	61.38	61.83	62.59	63.88	65.20
DVR 8	(1) Collier (2) Monroe	51.30	51.50	52.10	53.11	54.64	56.21
DVR 9	(1) Dade	47.99	48.13	48.56	49.29	50.28	51.28
DVR 10	(1) Broward	50.18	50.31	50.71	51.38	52.34	53.33
DVR 11	(1) Palm Beach	46.91	47.07	47.54	48.32	49.21	50.11
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	50.31	50.44	50.84	51.53	52.40	53.28
DVR 13	(1) Brevard	49.30	49.59	50.45	51.90	53.65	55.46
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	59.07	59.32	60.08	61.37	63.11	64.89
DVR 15	(1) Duval (2) Nassau	51.45	51.73	52.58	54.01	55.72	57.48

Source: FSU Phone Survey and projections in Table 13

Table 15

Trend in Average Size of Recreational Boats in Florida's Coastal Counties, 1981-1992

Region	Counties		Constant	T Coefficient	t-Value
DVR 1	(1)	Escambia	16.0097	0.09838	18.01
	(2)	Santa Rosa	14.976	0.13226	16.23
DVR 2	(1)	Okaloosa	16.3994	0.10611	25.88
	(2)	Walton	14.1302	0.09096	10.29
	(3)	Bay	15.9055	0.12185	18.35
DVR 3	(1)	Gulf	14.2068	0.12176	14.56
	(2)	Franklin	15.983	0.08779	3.35
	(3)	Wakulla	15.6658	0.12381	7.22
	(4)	Jefferson	14.2596	0.10125	2.57
	(5)	Taylor	14.8945	0.06524	13.00
	(6)	Dixie	15.8372	0.09758	9.92
	(7)	Levy	15.2958	0.08594	9.97
	(8)	Citrus	15.7847	0.11952	21.27
	(9)	Hernando	15.1769	0.1333	13.57
	(10)	Pasco	15.9045	0.11449	8.35
DVR 4	(1)	Pinellas	18.5376	0.08072	7.06
DVR 5	(1)	Hillsborough	16.0683	0.10172	18.77
DVR 6	(1)	Manatee	17.3432	0.12585	13.55
	(2)	Sarasota	18.8378	0.045	5.34
DVR 7	(1)	Charlotte	17.7473	0.16711	29.06
	(2)	Lee	18.6227	0.07313	24.38
DVR 8	(1)	Collier	18.5842	0.12319	6.71
	(2)	Monroe	20.1959	0.00043	0.039
DVR 9	(1)	Dade	20.3712	-0.02421	-3.90
DVR 10	(1)	Broward	20.2151	0.04804	3.59
DVR 11	(1)	Palm Beach	19.1719	0.03455	4.00
DVR 12	(1)	Martin	19.5601	0.11497	7.88
	(2)	St. Lucie	17.4551	0.12265	9.26
	(3)	Indian River	17.104	0.10847	7.48
DVR 13	(1)	Brevard	17.0839	0.06933	17.25
DVR 14	(1)	Volusia	16.7934	0.04955	12.39
	(2)	Flagler	17.237	0.1167	3.81
	(3)	St. Johns	16.6178	0.11908	18.99
DVR 15	(1)	Duval	16.7765	0.08389	3.64
	(2)	Nassau	15.1465	0.13822	39.72

Source: Florida Bureau of Vessel Titling and Registration, DEP.

project the size of the pleasure craft using the observed sample in 1993 as the basis for the projections [e.g., DVR1 = 18.26 feet + 7 (weighted coefficient of .11041) = 19.033 for the year 2000]. The results are shown in Table 16. Since pleasure craft are expected to increase in size in 34 out of 35 coastal counties over the 1993-2010 period, this will have the impact of lowering PrBR or the participation rate for boat ramp users. Boaters will increasingly turn to marinas and private docks to launch their pleasure craft. Although PrBR will decline, this does not mean that ABRD in equation (9) will decline since the total number of registered boats or BR will be expanding. This was shown in Table 6. Equation (7) through (9) can be implemented by utilizing Table 6 or equation (7) combined with the projected HY, AGE and SB to arrive at PrBR in equation (8). Finally, DBOPH or days boating per household per year will be constant for each region over the projection period.

Once the forecast of income, age and boat size was made, we are in position to implement equation (9) which yields the aggregate boat ramp demand or ABRD for each of our 15 coastal regions. As discussed before, the projections of boat registrations or BR are contained in Table 6 by county. Using the OLS and logit equations in Tables 8 and 10, we projected the participation rate or PrBR as indicated by equation (8). The results are shown in Table 17. As expected, PrBR declined over the 1992-2010 period in every coastal region because of increasing income, average age and boat size. For example, in 1992, it was estimated that 61.589 percent of boat owners used boat ramps in Pinellas County, Florida. By the year 2010, it is projected that only 53.405 percent will be using boat ramps, a drop of over 8 percentage points, using the OLS equation. There were some noticeable differences in the OLS as compared to the logit projections. But, in general the two different statistical models (i.e., OLS versus logit) showed general similarity after the 18 year forecast of PrBR to the year 2000. Table 16 would indicate, if valid, a long run softening in the demand for boat ramps in Florida's coastal counties.

Finally, DBOPH must be estimated for each coastal region to implement equation (9) and derive ABRD. Table 18 shows the average number of boating days per boating household in 1993. These estimates were derived from the boater survey discussed above. Yearly boating days range from 27.52 in DVR1

Table 16

Average Size of Pleasure Boats and Projected Increase in Size of Pleasure Boats for Coastal Regions in Florida

Region	Counties	Average Size* 1993	Projected 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	18.26	18.480	19.033	19.585	20.13
DVR 2	(1) Okaloosa (2) Walton (3) Bay	18.92	19.151	19.728	20.306	20.88
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	17.90	18.122	18.679	19.235	19.791
DVR 4	(1) Pinellas	21.96	22.121	22.525	22.929	23.332
DVR 5	(1) Hillsborough	19.17	19.373	19.882	20.391	20.899
DVR 6	(1) Manatee (2) Sarasota	19.88	20.036	20.425	20.814	21.203
DVR 7	(1) Charlotte (2) Lee	20.29	20.495	21.008	21.521	22.033
DVR 8	(1) Collier (2) Monroe	23.42	23.513	23.745	23.978	24.210
DVR 9	(1) Dade**	20.04	19.992	19.871	19.749	19.627
DVR 10	(1) Broward	23.07	23.166	23.406	23.646	23.886
DVR 11	(1) Palm Beach	21.67	21.739	21.912	22.085	22.257
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	19.71	19.940	20.515	21.091	21.666
DVR 13	(1) Brevard	18.76	18.899	19.245	19.592	19.938
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	17.71	17.854	18.212	18.571	18.929
DVR 15	(1) Duval (2) Nassau	16.96	17.135	17.573	18.010	18.447

* Taken from boater sample.

** Region exhibits decreasing boat size over time.

Table 17

Projected Participation Rates for Boat Ramp Use (PrBR) for Coastal Regions in Florida, 1992-2010

Region	Coastal		Method	1992	1995	2000	2005	2010
DVR 1	(1)	Escambia	OLS	.66185	.64600	.62019	.59043	.55978
	(2)	Santa Rosa	Logit	.68872	.66652	.62875	.58333	.53507
DVR 2	(1)	Okaloosa	OLS	.71109	.69482	.66916	.64129	.61303
	(2)	Walton	Logit	.74724	.7270	.69308	.6538	.61174
	(3)	Bay						
DVR 3	(1)	Gulf	OLS	.68857	.67343	.64975	.62270	.59529
	(2)	Franklin	Logit	.72590	.70613	.67354	.63431	.59269
	(3)	Wakulla						
	(4)	Jefferson						
	(5)	Taylor						
	(6)	Dixie						
	(7)	Levy						
	(8)	Citrus						
	(9)	Hernando						
	(10)	Pasco						
DVR 4	(1)	Pinellas	OLS	.61589	.60345	.58242	.55864	.53405
			Logit	.64473	.62628	.59429	.55722	.51825
DVR 5	(1)	Hillsborough	OLS	.62122	.60762	.58353	.55487	.52517
			Logit	.62836	.60774	.57036	.52501	.47763
DVR 6	(1)	Manatee	OLS	.68710	.67737	.66397	.64627	.62802
	(2)	Sarasota	Logit	.74383	.73171	.71434	.69060	.66504
DVR 7	(1)	Charlotte	OLS	.43594	.42299	.40330	.37911	.35448
	(2)	Lee	Logit	.42318	.40298	.37283	.3373	.30295
DVR 8	(1)	Collier	OLS	.29187	.28233	.26641	.24690	.22688
	(2)	Monroe	Logit	.26253	.25094	.23235	.21099	.1906
DVR 9	(1)	Dade	OLS	.68039	.67556	.66918	.65939	.64908
			Logit	.73069	.72480	.71694	.70451	.69109
DVR 10	(1)	Broward	OLS	.46725	.45968	.44376	.42521	.40594
			Logit	.47160	.45953	.43446	.40575	.37662
DVR 11	(1)	Palm Beach	OLS	.5480	.54087	.52725	.51135	.49529
			Logit	.53817	.52687	.50525	.48005	.45471
DVR 12	(1)	Martin	OLS	.62301	.61037	.58913	.56659	.54361
	(2)	St. Lucie	Logit	.67376	.65553	.62392	.58926	.55298
	(3)	Indian River						
DVR 13	(1)	Brevard	OLS	.77496	.76142	.74110	.71834	.69477
			Logit	.81584	.80250	.78110	.75560	.72649
DVR 14	(1)	Volusia	OLS	.56572	.55301	.53259	.50838	.48359
	(2)	Flagler	Logit	.56584	.54583	.51332	.47477	.43563
	(3)	St. Johns						
DVR 15	(1)	Duval	OLS	.76259	.74710	.72277	.69557	.66757
	(2)	Nassau	Logit	.79975	.78343	.75588	.72240	.68526

Source: Application of OLS and logit equations in Tables 8 and 10 using projections of income, age and boat size.

Table 18

Estimated Average Number of Boating Days Per Boating Household (DBOP) for Coastal Regions in Florida, 1993

Region		Coastal	DBOPH/Per Year
DVR 1	(1)	Escambia	27.52
	(2)	Santa Rosa	
DVR 2	(1)	Okaloosa	24.59
	(2)	Walton	
	(3)	Bay	
DVR 3	(1)	Gulf	32.43
	(2)	Franklin	
	(3)	Wakulla	
	(4)	Jefferson	
	(5)	Taylor	
	(6)	Dixie	
	(7)	Levy	
	(8)	Citrus	
	(9)	Hernando	
	(10)	Pasco	
DVR 4	(1)	Pinellas	38.36
DVR 5	(1)	Hillsborough	37.94
DVR 6	(1)	Manatee	32.00
	(2)	Sarasota	
DVR 7	(1)	Charlotte	34.54
	(2)	Lee	
DVR 8	(1)	Collier	35.50
	(2)	Monroe	
DVR 9	(1)	Dade	28.28
DVR 10	(1)	Broward	26.20
DVR 11	(1)	Palm Beach	31.97
DVR 12	(1)	Martin	43.92
	(2)	St. Lucie	
	(3)	Indian River	
DVR 13	(1)	Brevard	28.17
DVR 14	(1)	Volusia	30.52
	(2)	Flagler	
	(3)	St. Johns	
DVR 15	(1)	Duval	32.00
	(2)	Nassau	

Source: FSU Phone Survey

(Escambia and Santa Rosa Counties) to 43.92 in DVR12 (Martin, St. Lucie and Indian River Counties). These figures seem plausible since boaters have 104 days from weekends and several more days from holidays falling on weekdays. In addition, many boaters are retired and have more leisure time.

Using Tables 6, 16 and 17, we can derive aggregate boat ramp days per year as shown in equation (9). ABRD is contained in Tables 19 and 20.

7.0 Baseline Boat Ramp Supply

In the last section, we projected the aggregate boat ramp demand (ABRD) over the 1992-2010 period for coastal regions in Florida. In making the projections, we implicitly assumed that the supply of boat ramps would expand to meet such demands. The existing situation could be one of an excess supply of boat ramps, but whether this will prevail over nearly the next two decades is in question. Alternately, existing supply could be inadequate leading to move immediate needs through the use of Wallop-Breaux funds as discussed in the Introduction of this report. When we talk about the supply of boat ramps, we are talking about materials and land for both the boat ramp and parking for autos and trailers.

In this section, we shall define boat ramps in a very restrictive sense. Since a boat ramp may have multiple lanes, a ramp's capacity may vary depending on how many lanes it possesses. We shall not deal with parking constraints in the model, but will consider the evaluation of parking facilities by boaters using ramps in the sample survey.

Table 21 shows an inventory of the 1992 supply of boat ramps and lanes organized by the coastal regions used in the demand analyses in the previous section. This inventory was supplied by Division of Recreation and Parks, Florida Department of Environmental Protection. As expected, the number of ramps is less than the number of lanes in each coastal region. For example, Hillsborough County has 132 lanes provided by 83 ramps placed somewhere in the county. So, most of the ramps are two laned in this county. Notice that we have included both fresh and saltwater ramps in each county. The reason for this is that

Table 19

Projected Aggregate Boat Ramp Days (ABRD) Per Year for Coastal Regions in Florida, 1992-2010
(OLS)

Region	Coastal	1992	1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	409,544	436,821	485,557	563,356	661,851
DVR 2	(1) Okaloosa (2) Walton (3) Bay	493,734	514,619	548,203	581,509	614,553
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	987,983	1,074,190	1,220,370	1,391,378	1,587,761
DVR 4	(1) Pinellas	1,002,361	1,041,398	1,118,109	1,195,998	1,275,058
DVR 5	(1) Hillsborough	857,891	884,386	928,006	964,192	995,769
DVR 6	(1) Manatee (2) Sarasota	654,713	681,120	710,246	752,114	795,184
DVR 7	(1) Charlotte (2) Lee	654,980	713,088	815,475	938,009	1,080,975
DVR 8	(1) Collier (2) Monroe	312,178	317,570	324,971	324,820	322,355
DVR 9	(1) Dade	890,704	925,572	986,530	1,057,017	1,131,408
DVR 10	(1) Broward	494,342	504,242	544,027	584,375	625,407
DVR 11	(1) Palm Beach	532,893	543,942	570,144	594,980	619,981
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	791,366	879,472	1,046,136	1,228,704	1,447,348
DVR 13	(1) Brevard	564,714	591,461	629,790	660,795	692,113
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	456,870	506,121	617,612	774,345	986,488
DVR 15	(1) Duval (2) Nassau	741,164	764,911	814,174	864,733	915,948

Source: Equation (9) in text and OLS PrBR.

Table 20

Projected Aggregate Boat Ramp Days (ABRD) Per Year for Coastal Regions in Florida, 1992-2010
(Logit)

Region	Coastal		1992	1995	2000	2005	2010
DVR 1	(1) (2)	Escambia Santa Rosa	426,171	450,697	492,259	556,582	632,636
DVR 2	(1) (2) (3)	Okaloosa Walton Bay	518,844	538,453	567,799	592,853	613,260
DVR 3	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10)	Gulf Franklin Wakulla Jefferson Taylor Dixie Levy Citrus Hernando Pasco	1,041,545	1,126,349	1,265,053	1,417,319	1,580,826
DVR 4	(1)	Pinellas	1,049,298	1,080,796	1,140,896	1,192,958	1,237,336
DVR 5	(1)	Hillsborough	867,751	884,560	907,061	912,305	905,629
DVR 6	(1) (2)	Manatee Sarasota	708,769	735,761	764,127	803,704	842,058
DVR 7	(1) (2)	Charlotte Lee	635,809	679,355	753,865	834,560	923,836
DVR 8	(1) (2)	Collier Monroe	280,797	282,262	283,424	277,577	270,808
DVR 9	(1)	Dade	956,553	993,034	1,056,939	1,129,346	1,204,635
DVR 10	(1)	Broward	498,944	504,078	532,626	557,631	580,235
DVR 11	(1)	Palm Beach	523,333	529,863	546,354	558,561	569,185
DVR 12	(1) (2) (3)	Martin St. Lucie Indian River	855,817	944,542	1,107,913	1,277,865	1,472,295
DVR 13	(1)	Brevard	594,503	623,372	663,791	695,070	723,712
DVR 14	(1) (2) (3)	Volusia Flagler St. Johns	456,991	498,563	595,265	723,151	888,653
DVR 15	(1) (2)	Duval Nassau	777,280	802,107	861,471	898,137	940,221

Source: Equation (9) in text and Logit PrBR.

Table 21

Estimated Number of Boat Ramps and Lanes for Coastal Regions in Florida (Salt and Freshwater), 1992

Region	Coastal			Ramps	Lanes
DVR 1	(1)	Escambia		32	48
	(2)	Santa Rosa		39	43
			Total	71	91
DVR 2	(1)	Okaloosa		72	75
	(2)	Walton		29	31
	(3)	Bay		55	69
			Total	156	175
DVR 3	(1)	Gulf		18	24
	(2)	Franklin		35	43
	(3)	Wakulla		29	30
	(4)	Jefferson		1	1
	(5)	Taylor		15	17
	(6)	Dixie		24	45
	(7)	Levy		19	25
	(8)	Citrus		58	55
	(9)	Hernando		14	10
	(10)	Pasco		15	19
			Total	228	269
DVR 4	(1)	Pinellas	Total	83	132
DVR 5	(1)	Hillsborough	Total	60	82
DVR 6	(1)	Manatee		45	54
	(2)	Sarasota		27	31
			Total	72	85
DVR 7	(1)	Charlotte		29	35
	(2)	Lee		69	85
			Total	98	120
DVR 8	(1)	Collier		29	41
	(2)	Monroe		137	169
			Total	166	210
DVR 9	(1)	Dade	Total	99	170
DVR 10	(1)	Broward	Total	85	198
DVR 11	(1)	Palm Beach	Total	76	111
DVR 12	(1)	Martin		41	48
	(2)	St. Lucie		16	21
	(3)	Indian River		18	24
			Total	75	93
DVR 13	(1)	Brevard	Total	87	104
DVR 14	(1)	Volusia		85	115
	(2)	Flagler		17	18
	(3)	St. Johns		29	32
			Total	131	165
DVR 15	(1)	Duval		52	59
	(2)	Nassau		13	18
			Total	65	77

Source: Division of Recreation and Parks, Department of Environmental Protection aggregate demand at the county level cannot be divided into salt and freshwater ramp demand. But, restricting the analyses to coastal counties insures that we are predominantly discussing saltwater boat ramps.

We shall refer to Table 21 as our baseline supply which is an estimate of the existing number of lanes (i.e., fresh and saltwater) provided by each of Florida's coastal regions. The fundamental question is whether this 1992 baseline supply should be expanded or in some way augmented to accommodate projected demand. In fact, this is the fundamental question addressed by this report. Yet, the answer is more complicated by a consideration of how boat ramp lanes service boaters at slack times as opposed to peak demand during a week of a year for example. Long lines or queuing-up on weekends to use a boat ramp yields what is called a low "level of service" (LOS). Thus, the supply of boat ramps is complicated by potential congestion which diminishes the "quality of supply". To avoid this problem, some excess capacity must be tolerated during weekdays to solve congestion on weekends and holidays. To explore this problem, let us turn once again to interaction of demand and supply during peak periods.

8.0 The Peak Demand Model

The LOS or level of service is of great importance for public goods such as boat ramps since peak demand is involved. Since the public good is provided by the government, complaints to officials will arise as the LOS declines. This is true for private goods as well since congestion will decrease demand for a marina's boat ramp. Nearly 39 percent of the saltwater boat ramps in Florida are provided by private commercial facilities. See Table 3 in the Introduction. As a simplification, we shall assume that the LOS for publicly provided boat ramps must be the same as those provided by the private sector. This avoids the rich literature on public choice. Unfortunately, recreational demand such as boat ramp use is bunched on weekends and holidays. Consider the following peak demand equation:

(11) $$PD/D = \left[\frac{a\ ABRD}{111}\right]$$

PD/D is peak demand per day (D) while a = percent of yearly total demand occurring on 111 weekend days and holidays. ABRD is aggregate boat ramps demand per year as discussed in Section 6. An a of .304 (111/365) would indicate no peak demand.

On the supply side, there are boat lanes (i.e., not ramps since a ramp may have more than one lane) in the region according to Table 21. A boat must be launched and retrieved after boating. Both operations may take 20, 30, or even 40 minutes during especially peak days (i.e., closer to 40 minutes). Planners such as FDEP consider a day to be 12 hours so a lane may have a capacity of the following, dependent on time taken:

(12) $$(60'/20')\ (12\ \text{hours}) = 36$$

(13) $$(60'/30')\ (12\ \text{hours}) = 24$$

(14) $$(60'/40')\ (12\ \text{hours}) = 18$$

This will be called BLC/D or boat lane capacity per day. To obtain the capacity per day (CD) for a region, we must multiply by the number of lanes or BL, or:

(15) $$C/D = (BLC/D)\ (BL)$$

Therefore, we may evaluate the ability to provide or satisfy peak demand with existing supply by using the following equation:

(16) $$(PD/D) \quad (C/D)$$

If the left hand side of equation (16) exceeds the right hand side, more boat lanes may be needed to attain the stipulated LOS. The empirical inputs to equation (11) are ABRD which is continued in Tables 19 and 20. The parameter "a" is presented in Table 22 from the boater sample survey for boat ramp users. The empirical input to equation (15) is contained in Table 21 discussed above.

Table 22

Percent Peak Boater Demand Days by Florida Coastal Regions - Boat Ramp Users, 1993

Region	Weekends and Holidays Per Household (W & H)*	Total Days Per Household	Percent (W & H) ("a")
1	16.34	27.52	.5937
2	17.70	24.59	.7200
3	15.59	32.43	.4807
4	17.99	38.36	.4692
5	17.44	37.94	.4597
6	19.91	32.00	.6223
7	17.90	34.54	.5184
8	16.40	35.50	.4620
9	19.12	28.28	.6761
10	11.86	26.20	.4527
11	20.50	31.97	.6413
12	22.77	43.92	.5184
13	14.61	28.17	.5186
14	15.82	30.52	.5184
15	18.98	32.00	.5933

* W + H = weekends and holidays

Source: FSU Phone Survey.

9.0 Projection of Boat Ramp Needs Over Baseline Supply Using Peak Demand Model

In the previous section, we discussed the peak demand model. This can be used in conjunction with the 1992 baseline supply of boat ramp lanes to estimate the number of boat lanes (and ramps) needed now and in the future. The following equation will be used in the analysis:

$$[(\frac{aABRD_t}{111})_t - (BL*NBPLD)_b]_i \tag{17}$$

where

a = percent of annual demand on weekends and holidays in i'th region;

$ABRD_t$ = annual number of boat ramp days in period "t" for the i'th region;

111 = estimated number of weekends and holidays per year;

BL = number of boat lanes in the 1992 baseline period (b) in the i'th region;

NBPLD = estimated number of boats per lane per day.

The first term in equation (17) is the peak demand or "D". Since "a" and "111" are constants, peak demand is a function of the level and growth in ABRD-aggregate boat ramp demand for the region. The previous sections were designed to project ABRD over the 1992-2010 period. Therefore, as ABRD expands, peak demand will grow. The second term in equation (17) is the baseline or existing (i.e., 1992 inventory of the number of boat lanes multiplier by the carry capacity (NBPLD) of each lane per day). This we shall call supply or "S". Notice that carrying capacity as discussed in the last section is a function, in part, of the time needed to launch and retrieve the recreational craft. According to the Florida Division of Recreation and Parks in their SCOPP (1994), they assumed that each boating party will use the boat ramp for 20 minutes per day. Thus, during a 12-hour day, an average of 36 boats could use a single-lane. This would be the optimum scenario since it assumes that access to the boat ramp is instantaneous. On peak days, this assumption may be erroneous since access may not be instantaneous causing the 20 minute scenario to rise to 30 or even 40 minutes. Thus, we shall consider all three possibilities. Further evidence will be presented to indicated that access is not instantaneous. This evidence will be discussed later in this section.

To find out whether additional boat lanes are needed in the i'th region, the following expression can be used in any time period.

$$\frac{D_t}{S_b}(BL)_b - (BL)_b \tag{18}$$

where D_t is peak demand per day in period t (e.g., year 2000) and S_b is the carrying capacity per day while $(BL)_b$ is the number of boat ramp lanes in the base year (i.e., 1992). For a need to occur, the following condition must hold;

$$(\frac{D_t}{S_b}) > 1 \tag{19}$$

or demand must exceed supply.

To simplify the analysis using equation (18), we averaged the results of OLS and logit. Appendix A contains the separate results using each statistical technique. As the reader can readily see, the projections are relatively insensitive to the choice of OLS or logit. The reason is to be found in the generally small differences in the participation rates or PrBR shown in Table 17 above. This is the main justification for averaging the two results.

Tables 23-25 show the baseline stock of boat lanes in the Florida coastal regions (1992). Table 23 is what we call the 20-minute Scenario which, as discussed above, is the carrying capacity of a lane per boat measured in minutes. Three boats per hour can be accommodated for 12 hours per day or 36 boats per day. This may be unlikely during peak periods since it assumes no waiting time. In Table 23, Regions 1-3 show no need for additional boat lanes (and consequently ramps) over the baseline stock of boat lanes in 1992. This means that $D_t < S_b$ throughout the projection period. Consider Region 5 or Hillsborough County as another example from Table 23. The stock of boat lanes was 82 in 1992. The projection model indicates that $D_t > S_b$ over the 1995-2010 period. In 1995, 20 additional lanes will be needed, bringing the stock of lanes to 102. The reader should note the interpretation of the 2000-2010 projections. By the year 2000, 24 more lanes will

Table 23

Projected Number of Additional Boat Lanes Needed Over 1992 Baseline Stock of Boat Lanes - 20-minute Scenario*

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	91	0	0	0	6
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	0	0	0	0
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	0	0	0	0
DVR 4	(1) Pinellas	132	0	1	9	16
DVR 5	(1) Hillsborough	82	20	24	26	28
DVR 6	(1) Manatee (2) Sarasota	85	26	30	37	43
DVR 7	(1) Charlotte (2) Lee	210	0	0	0	0
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0
DVR 9	(1) Dade	170	0	5	16	28
DVR 10	(1) Broward	198	0	0	0	0
DVR 11	(1) Palm Beach	111	0	0	0	0
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	26	47	76	97
DVR 13	(1) Brevard	104	0	0	0	0
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	0	0
DVR 15	(1) Duval (2) Nassau	77	40	47	55	61

* Average of OLS and logit results. See Appendix A.

Table 24

Projected Number of Additional Boat Lanes Needed Over 1992 Baseline Stock of Boat Lanes - 30-minute Scenario*

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010	% Change**
DVR 1	(1) Escambia (2) Santa Rosa	91	9	19	35	54	60
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	0	0	0	0	0
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	0	0	0	18	7
DVR 4	(1) Pinellas	132	56	67	79	90	68
DVR 5	(1) Hillsborough	82	71	77	81	83	101
DVR 6	(1) Manatee (2) Sarasota	85	81	88	97	107	126
DVR 7	(1) Charlotte (2) Lee	120	16	33	53	76	64
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0	0
DVR 9	(1) Dade	170	74	90	108	127	75
DVR 10	(1) Broward	198	0	0	0	0	0
DVR 11	(1) Palm Beach	111	19	24	29	33	30
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	85	117	152	192	206
DVR 13	(1) Brevard	104	15	23	29	34	33
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	0	18	11
DVR 15	(1) Duval (2) Nassau	77	98	109	120	130	168

* Average of OLS and logit results. See Appendix A.
** Percent increase of projected boat lane needs by 2010 over baseline or 1992 stock.

Table 25

Projected Number of Additional Boat Lanes Needed Over 1992 Baseline Stock of Boat Lanes - 40-minute Scenario*

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	91	41	55	76	102
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	16	27	37	47
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	1	31	69	113
DVR 4	(1) Pinellas	132	118	134	149	164
DVR 5	(1) Hillsborough	82	122	130	134	138
DVR 6	(1) Manatee (2) Sarasota	85	137	145	158	171
DVR 7	(1) Charlotte (2) Lee	120	62	84	111	141
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0
DVR 9	(1) Dade	170	156	176	201	226
DVR 10	(1) Broward	198	0	0	0	0
DVR 11	(1) Palm Beach	111	62	69	149	80
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	144	187	233	287
DVR 13	(1) Brevard	104	54	65	73	80
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	30	79
DVR 15	(1) Duval (2) Nassau	77	157	171	185	199

* Average of OLS and logit results. See Appendix A.

be required in Hillsborough County compared with the 1992 baseline. This is important since it only means that 4 lanes must be added between 1995 and year 2000 if 20 lanes are added next year (1995). The marginal number of boat ramp lanes needed from period to period is expected to decline for one fundamental reason and that is the declining participation rate or PrBR over the 1992-2010 period. See Table 17. If the cross-section boater choice access equations are correct, demographics and boat size trends portend relatively less use of boat ramps by boaters and more use of marinas and private docks. According to Table 23, 8 out of the 15 regions will need additional boat ramps by the year 2010. We believe this understates the need for boat lanes since many boat ramp users are somewhat or very dissatisfied with regional boat ramp usage throughout coastal Florida. This will be documented below.

Table 24 shows the boat ramp lane needs using a 30-minute Scenario which makes it more likely that some waiting time and/or parking problems are factored into the equation.[1] With this scenario, only 24 boats (i.e., 2 boats per hour x 12 hours) can be handled daily by a ramp. The reader should remember that for each boat the time launching is 15 minutes while retrieval takes 15 minutes for a total of 30 minutes of use plus any waiting time. It is assumed that there is a disutility of waiting time that can be eliminated by providing more boat lanes. In Table 24, the 30-minute Scenario yields only 3 of 15 coastal regions not needing additional boat lanes by 2010. Many regions must double their current stock of boat ramp lanes by the year 2010 so the level of service (LOS) will minimize or eliminate extensive waiting and/or parking time. More research is needed on the quantification or the disutility arising from a low LOS. Table 24 implies, for example, that the addition of 74 boat lanes in Dade County (Region 9) by 1995 will eliminate most, if not all, of the disutility associated with a declining LOS if the stock of boat ramp lanes remains at its 1992 level. We cannot be certain whether the 30-minute Scenario is accurate enough to reflect the existing waiting and/or parking time on peak days. The 20-minute Scenario was developed by the National marine Manufacturers Association and includes no waiting time.

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[1]For an illustration of the use of equations (17) and (18) see Appendix A.

Finally, Table 25 presents a 40-minute Scenario of boat ramp lane needs which obviously includes more waiting time than the 30-minute Scenario. By the year 2000, 12 of the 15 regions will need more boat ramp lanes to make the LOS free of the disutility of waiting and/or parking time. A 40-minute Scenario would imply widespread dissatisfaction with boat ramp LOS throughout the coastal regions in Florida. Under this Scenario, all but 2 of the 15 regions will need additional boat ramp lanes by the year 2010. We regard the 40-minute Scenario as a LOS providing the majority of boat ramp user with little disutility of waiting time. To select the most probable scenario, we asked boat ramp users how they perceived the current boating conditions in their coastal regions.

Table 26 presents the results of an overall perception of boat ramp needs in the Florida coastal regions under study taken from the boater survey discussed above. Amazingly, 52.2 percent of the sample of boat ramp users in Dade County (Region 8) said the number of boat ramps was inadequate compared to just 20.8 percent in Collier and Monroe Counties (Region 8). Approximately one-third of the boaters, on average, in the 15 coastal regions felt that the existing stock of boat ramps was not enough or adequate which implies a deteriorated level of service (LOS). For this reason, we do not think the 20-minute Scenario is realistic for boating conditions in Florida. That is, only 4 of the 15 regions in Florida show a projected need for more boat ramp lanes in 1995 (from Table 23) while boaters in all 15 regions indicate some dissatisfaction with the number of boat ramps in their area. Of course, except for Regions 6, 9, 11, 14 and 15, a majority of boaters felt the existing stock was adequate in 1993, the year of the survey. In passing, it is somewhat perplexing at the percent of boat ramp users that answered don't know (DK) to this question. However, Table 26 does show widespread disutility from the current level of service provided by boat ramps in coastal regions. This provides evidence upon which to reject Table 23 as a representation of boat ramp need. This is the scenario used in the SCORP (1994) which is inconsistent with Table 26. For this reason, Tables 24 and 25 may be more reflective of boat ramp needs. For example, we formed the hypothesis that the perceptions (i.e., % NMBR-percent need more boat ramps) in 1993 are positively correlated with projected needs (i.e., % NB-percent increase needed over baseline, 1992-1995). This is quite crude, but will add to our thesis of a LOS providing

Table 26

Would You Say Your County Has An Adequate Number of Boat Ramps?*

Region	Coastal	Percent Yes	Percent No	Percent DK	N
DVR 1	(1) Escambia (2) Santa Rosa	67.7	29.0	3.2	31
DVR 2	(1) Okaloosa (2) Walton (3) Bay	73.0	27.0	0	37
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	52.4	28.6	19.0	42
DVR 4	(1) Pinellas	71.1	26.7	2.2	45
DVR 5	(1) Hillsborough	58.3	37.5	4.2	24
DVR 6	(1) Manatee (2) Sarasota	46.9	37.5	15.6	32
DVR 7	(1) Charlotte (2) Lee	56.3	27.1	16.7	48
DVR 8	(1) Collier (2) Monroe	54.2	20.8	25.0	24
DVR 9	(1) Dade	43.5	52.2	4.3	23
DVR 10	(1) Broward	51.7	34.5	13.8	29
DVR 11	(1) Palm Beach	36.7	30.0	33.3	30
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	62.5	25.0	12.5	32
DVR 13	(1) Brevard	61.0	31.7	7.3	41
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	48.4	38.7	12.9	31
DVR 15	(1) Duval (2) Nassau	46.7	46.7	6.7	45

* Boat Ramp Users Only

Source: FSU Boat Ramp Survey

disutility and an increased need for boat lanes. Using data from Tables 25 and 26, the following OLS regression was calculated:

(19)
$$(\%\ NMBR) = -39.45 + \underset{(1.82)}{2.296}(\%\ NB)$$
$$N = 15 \qquad R^2 = .203$$

where the t-value for the coefficient on (% NB) is in parenthesis. The regression coefficient, 2.296, is statistically significant at the 9 percent level. Thus, there is some basis to say that the perceptions in Table 26 are correlated or explained statistically by the projection model presented in this manuscript.

Finally, we talked extensively about parking at boat ramps and waiting time. We ask boat ramp users about their level of satisfaction (i.e., utility) with the parking at boat ramps. Additionally, we asked about waiting time to use a boat ramp on weekends (i,.e, peak days) as opposed to weekdays. Table 27 presents the results. From 0-29.2 percent of the boat ramp users were somewhat to very dissatisfied with overall parking at boat ramp areas. Among the 15 regions, nearly 21 percent, on average, were not happy with parking adding disutility thereby depressing the LOS. Nearly 22 percent of boat ramp users were not satisfied with waiting time on weekends compared to just 3.4 percent on weekdays as shown in Table 27 (i.e., overall percent obtained as simple average of the 15 regions). These results indicate that waiting time is more than six times a problem on weekends than weekdays. We must be mindful that a large majority have no objections to waiting time on weekends or peak days (i.e., 20-minute Scenario in Table 23). However, the disutility related to waiting ranges from 6.7 percent Region 5 (i.e., Hillsborough County) to 36.4 percent in Region 12 (i.e., Martin, St. Lucie and Indian River Counties). On the basis of this evidence, we feel that the 30-minute Scenario represents the best estimate of boat ramp lane needs for the coastal regions in Florida. This has been discussed above and is contained in Table 24. Although not too statistically reliable, projections of boat ramp needs for individual counties of a region, where applicable, are presented as OLS and logit averages in Appendix B. The reader should be cautioned as to statistical reliability.

Table 27

Percent of Boater Respondents Somewhat and Very Dissatisfied with Overall Parking, Waiting Time on Weekends and Waiting Time on Weekdays at Boat Ramps in Coastal Regions in Florida*

Region	Coastal	Overall Parking	Waiting Time on Weekends	Waiting Time on Weekdays
DVR 1	(1) Escambia (2) Santa Rosa	9.5	17.7	5.0
DVR 2	(1) Okaloosa (2) Walton (3) Bay	25.9	23.1	4.3
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	12.1	25.8	3.7
DVR 4	(1) Pinellas	14.2	19.2	4.0
DVR 5	(1) Hillsborough	20.0	6.7	0.0
DVR 6	(1) Manatee (2) Sarasota	21.7	15.0	0.0
DVR 7	(1) Charlotte (2) Lee	20.0	12.5	6.3
DVR 8	(1) Collier (2) Monroe	25.0	12.5	0.0
DVR 9	(1) Dade	17.7	18.8	8.3
DVR 10	(1) Broward	0.0	21.4	0.0
DVR 11	(1) Palm Beach	23.5	33.3	8.3
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	29.2	36.4	4.3
DVR 13	(1) Brevard	21.9	31.0	0.0
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	21.1	25.0	0.0
DVR 15	(1) Duval (2) Nassau	20.0	26.7	6.8

* Boat Ramp Users Only

Source: FSU Phone Survey (Boat Ramp Users Only)

10.0 Boaters Activities, Demographics and Boat Characteristics

In our phone survey, we asked boaters what kinds of activities they engage in while boating in the coastal waters of Florida. Table 28 shows the results. Clearly, sport fishing and cruising topped the list while rafting-up and racing were near the bottom of the list. There is a diversity of activities in which boaters engage. In this section, we refer to all boaters and not just those using boat ramps.

Table 29 shows some of the demographics of all boaters in Florida. The average boater is 52 years and for those that moved to Florida, it was, on average, about 20 years ago (1973).[2] Only 36.9 percent of all boaters were born in Florida. Boaters are somewhat older than the general populations of Florida (i.e., about 47 year old). Of the boater respondents, 96.4 percent are year-round residents of Florida, indicating relatively few "snowbirds". The overwhelming majority of the boater respondents were white males as might be expected. Boater household income averaged $49,336 which is considerably higher than the state average of about $36,000.[3] As in Section 2.0 (Table 4), boat registrations are positively influenced by per capita income; therefore, it is not surprising to find that the incidence of boat ownership is directly related to income. Finally, the typical Florida boater has been boating in Florida for nearly 16 years, spends over $41 per day on boating with an average size of the boating party at a little over two and one half persons.

Table 30 shows some of the important characteristics of registered boats used by Florida boaters. These characteristics were derived from our boater sample. Over 76 percent of the recreational boats are propelled by outboard motors averaging 118 horsepower. The typical craft is a little over 17 feet and was built in 1979. Over three quarters of the boats were made of fiberglass. Gasoline was used by over 96 percent of the boaters to power their engines. Finally, almost 72 percent of boat owners had only one boat. Thus, multiple boat ownership was not uncommon.

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[2]The average age is for those 18 years and older.

[3]1993 Florida Statistical Abstract

Table 28

Activities Participated in While Boating Recreationally in the State of Florida, 1993

	Activity	Yes %	No %
1.	Sport Fishing	80.3	19.7
2.	Pleasure Cruising	75.4	24.6
3.	Wildlife Observation	53.6	46.4
4.	Water Skiing	28.2	71.8
5.	Diving	25.3	74.7
6.	Shellfishing	16.3	83.8
7.	Raft Up	13.9	86.1
8.	Racing	2.4	97.6
9.	Commercial Fishing	1.8	98.2

Source: FSU Phone Survey

Table 29

Some Characteristics of Boaters in the State of Florida, 1993

Characteristic	Mean	Range
Age	52	20-88
Year Moved to Florida	1973	1920-1992
% Live in FL - Life	36.9	N/A
% Year-around FL Residents	96.4	N/A
% White (Race) of Respondent	97.2	N/A
% Hispanic (Race) of Respondent	1.2	N/A
Gender of Respondent-Male	82.8%	N/A
Number of Persons Over 18 Living in Household	2.12	0-22
Number of Persons Under 18 Living in Household	.58	0-6
Average Educational Level Attained	13 years	N/A
Household Income	$49,336	under $10,000 over $100,000
# Years Boating in Florida	15.58	1-30 plus
Daily Boating Expenditure	$41.05	0-over $1,000
Average Size of Boating Party	2.61	0-20

Source: FSU Phone Survey

Table 30

Some Selected Characteristics of Recreational Boats Used by State of Florida Boaters

Propulsion	Frequency	Percent	Cum. Percent
Outboard	548	76.1	76.1
Inboard	77	10.7	86.8
Sail	16	2.2	89.0
In/Outboard	70	9.7	98.8
Other	4	0.6	99.4
Air Prop	5	0.7	100.0
Hull			
Fiberglass	542	75.3	75.3
Aluminum	148	20.6	95.9
Wood	10	1.4	97.3
Steel	1	.1	97.4
Other	19	2.6	100.0
Fuel			
Gas	694	96.4	96.4
Diesel	17	2.4	98.8
Other	9	1.3	100.0
Year Built/Purchased			
Mean = 1979			
Median = 1969			
Mode = 1987			
Range = 1945-1992			
Number of Boats or Jet Skis Registered			
One Boat	518	71.9	71.9
Two Boats	161	22.4	94.3
Three Boats	28	3.9	98.2
Four Boats	10	1.4	99.6
Five Boats/Six Boats	2/1	0.3/0.1	99.9/100.0
Mean Feet Length of Boat: 17.06			
Mean Total Horsepower of Main Engine: 118.0			

Source: FSU Phone Survey Sample

11.0 Manatee Protection

The West Indian manatee is considered endangered throughout its range. Nearly 50 percent of all manatee mortalities where a cause of death has been determined, have been attributed to human activities, and over 80 percent of these deaths have been attributed to watercraft collisions. See Reynolds and Gluckman (1988). In Florida, there are thirteen "key" manatee protection counties where motorboat speed is controlled. Seven different operating speed zones are in effect. They are idle speed zone; motorboats prohibited zone; slow speed zone; caution zone; maximum 25 MPH speed zone; 30 MPH speed zone, and a maximum 35 MPH speed zone. Many of the businesses serving boaters have argued that such zones diminish business. Slower speeds could mean that guides and concessions will now be bypassed because of their distance from boaters. See Diamond (1991).

As part of our boater survey, we wished to see how willing boaters were to both contribute to manatee protection and to abide by existing and proposed manatee protection regulations. Hopefully, such information would be useful to state and county authorities in formulating a manatee protection program. Table 31 was prepared from the questions asked boaters about manatee protection as part of our overall boater survey discussed above. Boaters may contribute in several ways so percentages refer to all that contribute. Over one-third of Florida's boaters presently contribute money and/or time to manatee protection. Of those currently not contributing, nearly 40 percent would be willing to contribute money. This would indicate a latent market for contributions. Of those that contribute, over one-third channel their donations through the Save the Manatee Club -- an educational and research organization devoted to manatee protection. Boaters say that the average contribution to the Save the Manatee Club is $37.58 per household yearly. Twenty-six percent of <u>contributing boaters</u> purchase a manatee license plate and, on average, have been purchasing the manatee tag for 2.4 years. Boaters also can contribute to manatee protection when they annually renew their boat registration. According to Table 31, nearly 50 percent of those that contribute to manatee protection use the boat registration vehicle with average donation of $24.40 per household yearly. Boaters have been using this

Table 31

Manatee Protection and Boaters in the State of Florida, 1993

	Yes %		No %
Currently contribute money and/or time to manatee protection	35.1		63.2
If currently do not contribute, would contribute money	39.8		63.2
If contributes, does a portion go to Save the Manatee Club, and	36.2		55.5
Average amount/year donated to this Club/Household	$37.58		$1-$300
Number years contributed to the Save the Manatee Club	4.28	range	1-30
If contributes, does a portion go to purchase/renew manatee tag	26		74
Modal number of tags renewed per year	1	range	1-6
Number years purchase manatee tag	2.4	range	1-5
If contributes, does a portion go through Boat registration donations in past years	49.8		50.2
Average donation/year/household	$24.40	range	$1-1000
Number of years donation made through boat registration	17.8	range	1-30
If contributes, do you donate personal time	6.8%		92.1%
Have seen a manatee in last year	66.7		33.3
If seen a manatee, how many times in last year (average)	10	range	1-1000

*Answers may not add up due to "Don't Know", "Unsure", etc. responses.

Source: FSU Phone Survey

vehicle for nearly 18 years (i.e., boat registrations) longer than either the Save the Manatee Club or manatee license plates. Only 6.8 percent of boating contributors donate their time to manatee protection. Finally, nearly two-thirds of all boaters have seen a manatee in the last year and the average number of sightings is 10 times per year. Table 31 indicates substantial involvement in manatee protection by boaters in Florida. But would boaters be willing to abide by regulations or potential regulations to protect the manatee?

Table 32 shows the results of our survey regarding speed restrictions and prop guards. The median speed on Intercoastal Waterways was 21 MPH which indicates that moderate cruising is more typical of Florida boaters. Of great importance to current regulations, nearly 75 percent of boaters support manatee speed zone limits in Florida. Yet, boaters may want speed limit zones restricted. To examine this issue, we asked when the length of the speed zone would be too high. The median response was about 2 miles. Presently, prop guards are not required on registered boats in Florida. Such guards would not only protect the manatee, but protect the propeller against rocks and debris. According to Table 32, over 68 percent of boaters would be willing to install prop guards <u>if a practical design were available at a reasonable price</u>. Finally, we read a list of increasing prices for a propeller guard, including installation to the boater respondent and asked to be stopped when the cost would be to high. The following information was obtained:

Prop-Guard Cost too High	Respondents	Percent
$25-$50	248	48.0
$51-$200	242	46.8
$201-$400	25	4.8
$401-$600	1	.2
$601+	1	.2
	517	100.0

Nearly one half of the responses had a maximum purchase price of no higher than $50. But, nearly 47 percent of the boaters were willing to pay from $51-$200 for a prop guard. Waiting the two intervals at the mid-point by the number responding, we obtain a maximum willingness to pay of about $79. A preliminary survey of

Table 32

Willingness to Comply With Speed Restrictions and Install Prop Guards to Protect the Manatee for the State of Florida, 1993

		Yes %	No %
1.	Median Speed on Intercoastal Waterway	21 mph	idle- 30 MPH+
2.	Support Manatee Zone Speed Limits	74.6	21.4
3.	Median Threshold Length of Zone to High	2 miles	less than 1-10+
4.	Would Install Prop Guards	68.3	21.3
5.	Average Price ($) Considered Too High to Purchase Prop Guards	$79	$25-$600+

Source: FSU Phone Survey

marine dealers indicates prop guards may cost as much as \$350.[4] If this is the general case, boaters may be unwilling to install prop guards at current prices. But, there are other economic benefits to such prop guards that need to be researched and are beyond the scope of this study.

12.0 Some Important Qualifications

Every study has its critics and this study will be no exception. Certain decisions had to be made along the way that should be addressed. In essence, this is the author's self-critique. The problems fall into seven areas. First, the participation rate equation (i.e., explaining PrBR) has two independent variables, income (HY) and boat size (BS), that might be related to each other. This would introduce not only multicollinearity, but might produce a conflict in the separate influence of each variable. Some researchers might have eliminated boat size and had income act as a proxy for both variables. In the sample, the correlation coefficient between SB and HY is .247 and statistically significant at the 1 percent level. However, this also means that HY only explains 6.11 percent of the variation in boat size (i.e., r^2). Thus, SB may increase with little or no change income. In Table 16, SB is projected to increase by less than 2 feet over the 1993-2010 period. That is, some people with average income may own relatively large or small boats so we were reluctant to drop boat size from the equation. The boat size variable adds more to $\bar{R}^2$ than income ceteris paribus. To see the impact, we did eliminate boat size and then calculate the participation rates or PrBR over the 1992-2010 period. These rates are contained in Appendix C. The reader may easily substitute these rates in the forecasting model to derive boat ramp lane needs over the 1992-2010 period. That is, substitute the new rates into equation (9) in Section 6.0. Also, see Appendix D for entire model with instructions on how to modify results. If boat size

[4]Personal correspondence with Mr. Bob Hooper (Prop Buddy) in Rockledge, Florida. The \$350 price refers to a stainless steel prop guard for an average size boat (i.e., 17 feet, 118 HP). A steel guard would be much less at \$125 per guard. In addition to manatee protection, prop guards would protect sea grass and swimmers. Benefits to boaters would include increased engine life; reduction of noise and vibration, fuel savings and avoidance of weeds in the prop according to Mr. Hooper.

is eliminated, the projections of boat ramp lane needs will increase by about 15 percent by 2010 since PrBR declines less rapidly (i.e., about 5 percentage points less).

Second, tourists are not directly accounted for in the boat ramp model. Of course, some tourists from out-of-state do trailer their boat to even the Florida Keys. Tourist use of boat ramps is likely to be of some significance in northern Florida counties. Indirectly, some tourists are already in the boat registration series as those having out-of-state residences. Thus, the basic boater registration series is not confined to just residences of Florida. Thus, some tourists are indirectly included in our projections. In a 1990 Florida Recreation Survey (1991), 1,019 tourists 18 years and older to Florida were asked whether they used their own boat while in Florida. Only 1 percent answered "yes". Remember that 50 percent of tourists come by air and would not be expected to trailer a boat. Tourists may, of course, accompany residents and/or guides that use boat ramps, but the model is framed in terms of the number of boats passing through boat ramp access points and not the number of users. Of the 1 percent, 90 percent used marinas and only 10 percent used ramps. There are about 40 million tourists visits to Florida annually (FDOC, 1993) and with about 1.6 visits per person (Bell, 1993), this means about 25 million people enter the state. About 83 percent (20 million) (FDOC, 1993) are over 18 years old. The size of a party is 2.5 which makes about 8 million parties. Taking 1 percent, would imply 80,000 boats of which 10 percent or 8,000 boats use ramps. Thus, to some extent, we may be projecting boat ramp need without the tourist component. Thus, the projections are conservative. But, it must be remembered that 1992-93 boat registrations were 677,581 so we conclude that demand, in general, for boat ramps may be slightly underestimated.

Third, boat size may not continue to increase at the 1981-1992 rate. This assumption in the projections may be erroneous. However, a heavy luxury tax has been lifted off boats of larger size. This may be a factor in keeping this trend in the projections. Of course, eliminating boat size entirely will increase the projected demand for boat ramp lanes. See Appendix C.

Fourth, the data base of boat ramps and lanes has not been updated by the DEP for several years. If new boat ramps have been added, the demand projections and consequent needs will be exaggerated. If the reader has more up-to-date information on the boat ramp lane stock in a region or county, she may plug the next data into equation (17) and reestimate the needs. The model is user friendly in this respect.

Fifth, in our discussion on which scenario to use, there is no precise way that we can document at 30-minute Scenario during peak demand. The researcher should have asked for launch and retrieval time via boat ramps on peak days including waiting time and parking difficulties that would increase waiting time. In retrospect, this issue should have been included on the survey instrument. It could be the subject matter of further research.

Sixth, we have neglected the area of intercounty flow of boat ramp use. It was assumed that those coming from interior counties to coastal counties would be offset by those coming from coastal counties to interior counties for freshwater boating. Also, flows among coastal counties have not been addressed. The survey did indicate the median distance from home to the first boat ramp used was but 5 miles and nearly 40 percent of the boaters choose a boat ramp for use because it was close to home. It would appear that residence and ramps used is a short distance to minimize travel time, but this topic needs more research.

Seventh, in a few regions, there was no need for additional boat lanes even by the year 2010. Yet, all regions showed some dissatisfaction with waiting time to use boat ramps on weekends in 1993. Even the 40-minute Scenario showed two regions with no needs projected by the model. Possibly, the scenario should in some way be linked to the level of dissatisfaction. Further research is needed.

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Appendix A

OLS and Logit Boat Lane Needs Over Baseline Stock of Lanes for Florida Coastal Regions and a Numerical Example on How Tables Were Calculated

Table A.1

Projected Number of Additional Boat Lanes Needed Over Baseline Stock of Boat Lanes - (OLS 20 Minute) Scenario

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	91	0	0	0	8
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	0	0	0	0
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	0	0	0	0
DVR 4	(1) Pinellas	132	0	0	9	18
DVR 5	(1) Hillsborough	82	20	25	29	33
DVR 6	(1) Manatee (2) Sarasota	85	22	26	33	39
DVR 7	(1) Charlotte (2) Lee	120	0	0	2	21
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0
DVR 9	(1) Dade	170	0	0	9	22
DVR 10	(1) Broward	198	0	0	0	0
DVR 11	(1) Palm Beach	111	0	0	0	0
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	22	43	67	95
DVR 13	(1) Brevard	104	0	0	0	0
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	0	0
DVR 15	(1) Duval (2) Nassau	77	37	44	52	59

Table A.2

Projected Number of Additional Boat Lanes Needed Over Baseline Stock of Boat Lanes - (Logit 20 Minute) Scenario

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	91	0	0	0	3
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	0	0	0	0
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	0	0	0	0
DVR 4	(1) Pinellas	132	0	2	9	14
DVR 5	(1) Hillsborough	82	20	23	23	23
DVR 6	(1) Manatee (2) Sarasota	85	30	34	41	47
DVR 7	(1) Charlotte (2) Lee	120	0	0	0	0
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0
DVR 9	(1) Dade	170	0	9	22	34
DVR 10	(1) Broward	198	0	0	0	0
DVR 11	(1) Palm Beach	111	0	0	0	0
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	30	51	73	98
DVR 13	(1) Brevard	104	0	0	0	0
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	0	0
DVR 15	(1) Duval (2) Nassau	77	43	50	57	63

Table A.3

Projected Number of Additional Boat Lanes Needed Over Baseline Stock of Boat Lanes - (OLS 30 Minute) Scenario

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	91	7	18	35	57
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	0	0	0	0
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	0	0	0	18
DVR 4	(1) Pinellas	132	52	65	79	93
DVR 5	(1) Hillsborough	82	71	79	85	90
DVR 6	(1) Manatee (2) Sarasota	85	75	81	91	101
DVR 7	(1) Charlotte (2) Lee	120	19	39	63	91
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0
DVR 9	(1) Dade	170	65	81	99	118
DVR 10	(1) Broward	198	0	0	0	0
DVR 11	(1) Palm Beach	111	20	27	33	39
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	79	111	147	189
DVR 13	(1) Brevard	104	12	19	25	31
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	0	27
DVR 15	(1) Duval (2) Nassau	77	94	105	116	127

Table A.4

Projected Number of Additional Boat Lanes Needed Over Baseline Stock of Boat Lanes - (Logit 30 Minute) Scenario

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	91	10	19	34	50
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	0	0	0	0
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	0	0	0	17
DVR 4	(1) Pinellas	132	59	69	79	86
DVR 5	(1) Hillsborough	82	71	75	76	76
DVR 6	(1) Manatee (2) Sarasota	85	87	94	103	112
DVR 7	(1) Charlotte (2) Lee	120	13	27	43	60
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0
DVR 9	(1) Dade	170	83	99	117	136
DVR 10	(1) Broward	198	0	0	0	0
DVR 11	(1) Palm Beach	111	17	21	24	27
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	91	123	156	194
DVR 13	(1) Brevard	104	18	26	32	37
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	0	0
DVR 15	(1) Duval (2) Nassau	77	102	113	124	133

Table A.5

Projected Number of Additional Boat Lanes Needed Over Baseline Stock of Boat Lanes - (OLS 40 Minute) Scenario

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	91	39	54	77	106
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	11	23	35	47
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	0	25	66	113
DVR 4	(1) Pinellas	132	113	131	149	168
DVR 5	(1) Hillsborough	82	122	132	140	148
DVR 6	(1) Manatee (2) Sarasota	85	128	137	150	163
DVR 7	(1) Charlotte (2) Lee	120	66	92	124	161
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0
DVR 9	(1) Dade	170	144	164	188	213
DVR 10	(1) Broward	198	0	0	0	0
DVR 11	(1) Palm Beach	111	64	72	80	88
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	136	179	226	283
DVR 13	(1) Brevard	104	50	60	68	76
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	36	91
DVR 15	(1) Duval (2) Nassau	77	151	165	180	195

Table A.6

Projected Number of Additional Boat Lanes Needed Over Baseline Stock of Boat Lanes - (Logit 40 Minute) Scenario

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
DVR 1	(1) Escambia (2) Santa Rosa	91	43	56	75	97
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	20	30	39	46
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	2	36	72	112
DVR 4	(1) Pinellas	132	122	136	149	159
DVR 5	(1) Hillsborough	82	122	127	128	128
DVR 6	(1) Manatee (2) Sarasota	85	145	153	166	178
DVR 7	(1) Charlotte (2) Lee	120	57	76	97	120
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0
DVR 9	(1) Dade	170	167	188	213	238
DVR 10	(1) Broward	198	0	0	0	0
DVR 11	(1) Palm Beach	111	60	65	69	72
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	153	195	239	290
DVR 13	(1) Brevard	104	58	69	77	84
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	23	66
DVR 15	(1) Duval (2) Nassau	77	162	176	190	203

Numerical Example

Derive Boat Lane Needs for Region 1 in Table A.3 or OLS-30-minute Scenario for 2010

See Equation (17) in Text

(1) $$\left[\frac{(.5937)(661{,}851)}{111}\right] - [91(2x12)]$$

where .5937	=	(Table 22 in text)
661,851	=	(Table 19 in text)
111	=	constant
91	=	(Table 21 in text)
2	=	(30' Scenario -- See Section 9 in text)
12	=	(hours per day)

(2) $$\frac{D}{S} = \frac{3540}{2184} = 1.621$$

(3) (D/S) 91 = (1.621)(91) = 148

(4) 148 lanes - 91 lanes = 57 Needed Lanes

Appendix B

Estimated Boat Ramp Lane Needs for the 35 Coastal Counties in Florida - OLS and Logit Averages, 1992-2010 With Explanation on Numerical Derivation

Derivation of County Level Boat Ramp Lane Needs

To obtain the county level needs, certain assumptions used at the coastal regional level were employed. See Figure B.1 for coastal counties. Boat OLS and logit statistical techniques were used. A numerical example for one case will be used. The reader may derive any number in Tables B.1-B.3 using this example and Tables in text. We shall show the boat ramp lane needs using a 30-minute Scenario for 2010 in Escambia County.

OLS

(PrBr) (1)	x	(BR) (2)	x	(DBOPH) (3)	=	ABRD (4)

Logit

(PrBr) (1)	x	(BR) (2)	x	(DBOPH) (3)	=	ABRD (4)
.53978	x	20,803	x	27,52	=	306,327

(1) Region 1 PrBr. See Table 17 in text; (2) County boat registration, BR projections. See Table 6 in Text; (3) Region 1 days boating per household/yr., DBOPH. See Table 22 in text; (4) ABRD = aggregate boat ramp demand in Escambia County in boat days per year.

OLS

(1) $\frac{(.5937)^1 (320,473)^2/24^4 (48)^5}{111^3}$

(2) 1714/1152 = 1.487

(3) 1.487 (48) - (48) = 23 lanes

1. Region 1 "a". See Table 22 in text; 2. Escambia County estimate of ABRD from above; 3. Peak days/yr.; 4. 30′ Scenario; 5. Escambia County boat lanes. See Table 21 in text.

Logit

Substitute 306,327 from above into equation (1) or

(4) $\frac{(.5937)\ (306{,}327)}{111}/24\ (48)$

(5) 1638/1152 = 1.422

(6) 1.422 (48) - (48) = 20

$\frac{\text{OLS (23) + Logit (20)}}{2}$ = 22 lanes

in Table B.2 this appendix.

Figure B.1

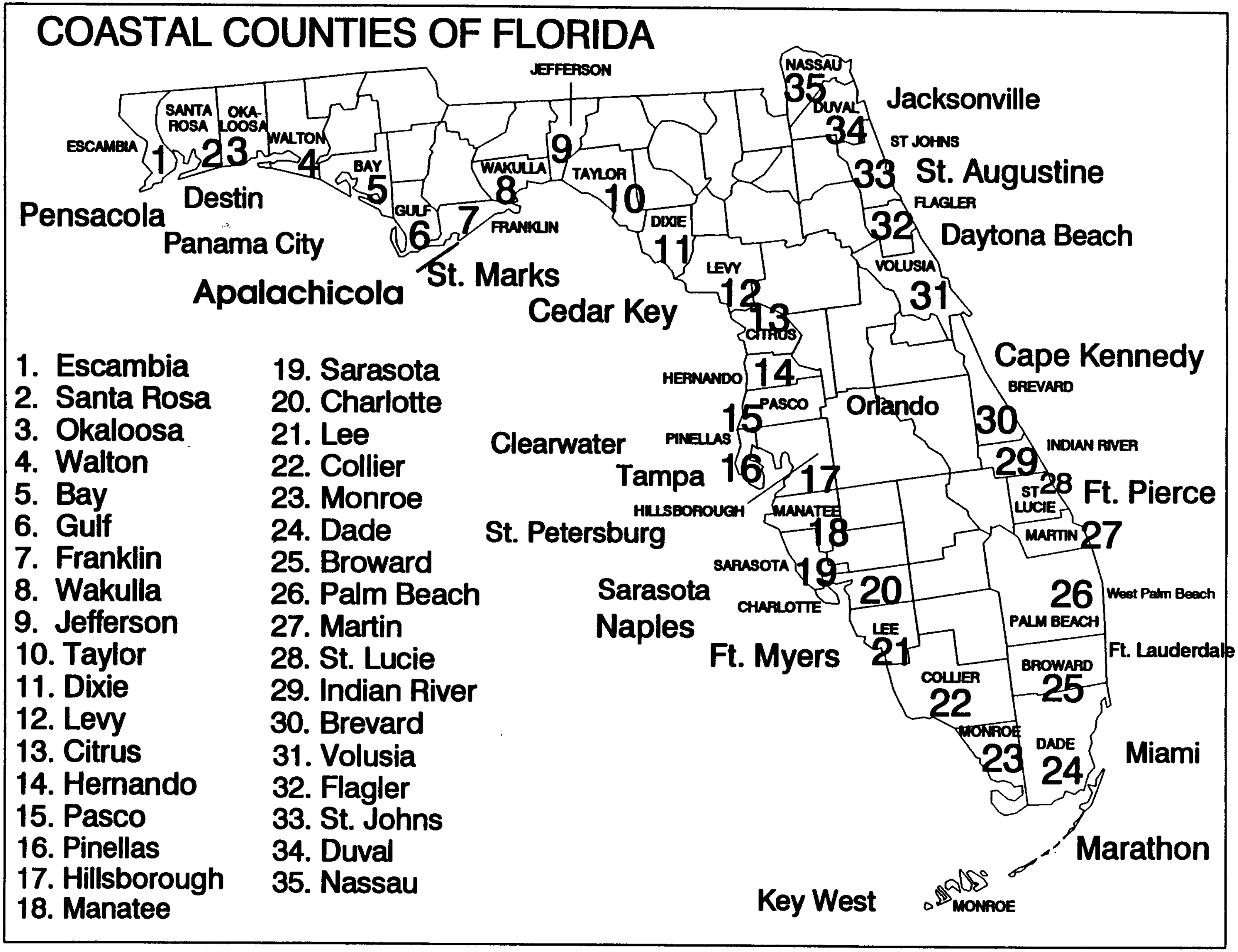
COASTAL COUNTIES OF FLORIDA
ESCAMBIA
SANTA ROSA
OKALOOSA
WALTON
BAY
GULF
WAKULLA
JEFFERSON
TAYLOR
FRANKLIN
DIXIE
LEVY
CITRUS
HERNANDO
PASCO
PINELLAS
HILLSBOROUGH
MANATEE
SARASOTA
CHARLOTTE
LEE
COLLIER
MONROE
DADE
BROWARD
PALM BEACH
MARTIN
ST LUCIE
INDIAN RIVER
BREVARD
VOLUSIA
FLAGLER
ST JOHNS
DUVAL
NASSAU
Pensacola
Destin
Panama City
Apalachicola
St. Marks
Cedar Key
Clearwater
Tampa
St. Petersburg
Sarasota
Naples
Ft. Myers
Key West
Marathon
Miami
Ft. Lauderdale
West Palm Beach
Ft. Pierce
Cape Kennedy
Orlando
Daytona Beach
St. Augustine
Jacksonville
1. Escambia
2. Santa Rosa
3. Okaloosa
4. Walton
5. Bay
6. Gulf
7. Franklin
8. Wakulla
9. Jefferson
10. Taylor
11. Dixie
12. Levy
13. Citrus
14. Hernando
15. Pasco
16. Pinellas
17. Hillsborough
18. Manatee
19. Sarasota
20. Charlotte
21. Lee
22. Collier
23. Monroe
24. Dade
25. Broward
26. Palm Beach
27. Martin
28. St. Lucie
29. Indian River
30. Brevard
31. Volusia
32. Flagler
33. St. Johns
34. Duval
35. Nassau

Table B.1

Projected Number of Additional Boat Lanes by County Needed Over Baseline Stock of Boat Lanes - 20 Minute Scenario

County	Baseline 1992	Needed Ramp Lanes Over Baseline (Projected) 1995	2000	2005	2010
Escambia	48	0	0	0	0
Santa Rosa	43	0	0	0	0
Okaloosa	75	0	0	0	0
Walton	31	0	0	0	0
Bay	69	0	0	0	0
Gulf	24	0	0	0	0
Franklin	43	0	0	0	0
Wakulla	30	0	0	0	0
Jefferson	1	1	1	2	2
Taylor	17	0	0	0	0
Dixie	45	0	0	0	0
Levy	25	0	0	0	0
Citrus	55	0	0	0	0
Hernando	10	7	10	15	22
Pasco	19	21	23	25	27
Pinellas	132	0	1	8	16
Hillsborough	82	20	24	26	28
Manatee	54	0	0	0	1
Sarasota	31	31	34	37	40
Charlotte	35	0	2	9	20
Lee	85	0	0	0	0
Collier	41	0	0	0	0
Monroe	169	0	0	0	0
Dade	170	0	5	15	28
Broward	198	0	0	0	0
Palm Beach	111	0	0	0	0

Table B.1 (continued)

County	Baseline 1992	Needed Ramp Lanes Over Baseline			
		1995	2000	2005	2010
		Projected			
Martin	48	0	0	1	4
Indian River	24	7	9	12	14
Brevard	104	0	0	0	0
Flagler	18	0	0	2	9
St. Johns	32	0	0	0	0
Duval	59	24	51	56	60
Nassau	18	0	0	0	1

Table B.2

Projected Number of Additional Boat Lanes by County Needed Over Baseline Stock of Boat Lanes - 30 Minute Scenario

County	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
		Projected			
Escambia	48	17	19	21	22
Santa Rosa	43	0	0	7	17
Okaloosa	75	0	0	0	0
Walton	31	0	0	0	0
Bay	69	0	1	3	7
Gulf	24	0	0	0	0
Franklin	43	0	0	0	0
Wakulla	30	0	0	0	0
Jefferson	1	2	3	3	4
Taylor	17	0	0	0	0
Dixie	45	0	0	0	0
Levy	25	0	0	0	0
Citrus	55	0	5	11	17
Hernando	10	15	20	28	38
Pasco	19	42	44	47	49
Pinellas	132	55	67	79	90
Hillsborough	82	71	77	80	82
Manatee	54	0	10	12	15
Sarasota	31	62	66	71	75
Charlotte	35	12	18	31	47
Lee	85	4	3	4	6
Collier	41	0	0	0	0
Monroe	169	0	0	0	0
Dade	170	74	89	108	127
Broward	198	0	0	0	0
Palm Beach	111	19	24	28	32

Table B.2 (continued)

County	Baseline	Needed Ramp Lanes Over Baseline			
	1992	1995	2000	2005	2010
		Projected			
Martin	48	0	0	13	17
Indian River	24	23	25	29	33
Brevard	104	14	22	28	34
Volusia	115	0	0	0	0
Flagler	18	0	1	7	17
St. Johns	32	0	0	1	6
Duval	59	98	106	113	120
Nassau	18	0	0	3	5

Table B.3

Projected Number of Additional Boat Lanes by County Needed Over Baseline Stock of Boat Lanes - 40" Scenario

County	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010
		Projected			
Escambia	48	39	42	44	45
Santa Rosa	43	1	7	16	29
Okaloosa	75	11	17	20	22
Walton	31	0	0	0	0
Bay	69	18	23	27	33
Gulf	24	0	0	0	0
Franklin	43	0	0	0	0
Wakulla	30	0	0	0	0
Jefferson	1	3	4	5	5
Taylor	17	0	0	2	3
Dixie	45		0	0	00
Levy	25	0	0	0	0
Citrus	55	16	25	32	41
Hernando	10	23	29	41	54
Pasco	19	62	66	69	72
Pinellas	132	118	134	149	163
Hillsborough	82	122	130	134	137
Manatee	54	0	22	25	28
Sarasota	31	93	98	105	110
Charlotte	35	28	36	53	74
Lee	85	33	26	31	36
Collier	41	0	0	0	0
Monroe	169	0	0	0	0
Dade	170	155	176	200	226
Broward	198	0	0	0	0
Palm Beach	111	62	68	74	80

Table B.3 (continued)

County	Baseline 1992	Needed Ramp Lanes Over Baseline			
		1995	2000	2005	2010
		Projected			
Martin	48	0	0	25	31
Indian River	24	38	41	47	53
Brevard	104	54	64	72	80
Volusia	115	0	0	0	6
Flagler	18	0	5	13	26
St. Johns	32	0	2	7	14
Duval	50	150	160	170	179
Nassau	18	0	0	7	10

Appendix C

Impact of Eliminating Boat Size from the OLS Equation on Participation Rates

Table C.1

Projection of Boat Ramp Lane Needs in Coastal Regions of Florida Without Including Boat Size - OLS Example - 1992-2010 - 30 Minute Scenario

Region	Coastal	Baseline 1992	Needed Ramp Lanes Over Baseline 1995	2000	2005	2010	2010*
DVR 1	(1) Escambia (2) Santa Rosa	91	7	20	44	68	+19.3
DVR 2	(1) Okaloosa (2) Walton (3) Bay	175	0	0	0	4	NA
DVR 3	(1) Gulf (2) Franklin (3) Wakulla (4) Jefferson (5) Taylor (6) Dixie (7) Levy (8) Citrus (9) Hernando (10) Pasco	269	0	0	0	40	+122.2%
DVR 4	(1) Pinellas	132	52	69	87	106	+13.9%
DVR 5	(1) Hillsborough	82	71	82	93	103	+14.4%
DVR 6	(1) Manatee (2) Sarasota	85	75	84	96	110	+8.9%
DVR 7	(1) Charlotte (2) Lee	120	20	45	76	115	+26.3%
DVR 8	(1) Collier (2) Monroe	210	0	0	0	0	0%
DVR 9	(1) Dade	170	65	78	95	112	-5.0%
DVR 10	(1) Broward	198	0	0	0	0	0%
DVR 11	(1) Palm Beach	111	20	27	35	42	+7.7%
DVR 12	(1) Martin (2) St. Lucie (3) Indian River	93	79	117	160	213	+12.7%
DVR 13	(1) Brevard	104	12	20	28	36	+16.1%
DVR 14	(1) Volusia (2) Flagler (3) St. Johns	165	0	0	0	39	+44.4%
DVR 15	(1) Duval (2) Nassau	77	94	108	122	138	+8.7%

* projected lanes in this table for 2010 divided by Table A.3 in Appendix A.

Table C.2

OLS Estimation of the Participation Function for Boat Ramp Use in the State of Florida, 1993
(Dependent Variable: Pr BR)
(Mean of Dependent Variable = .6639)

Independent Variables*	Coefficient	t-Value
Intercept	1.173349	8.601**
HY ($49,169)	-0.000002521	-4.288**
AGE (52 years)	-0.007686	-6.160**
YRF (97%)	0.168167	1.586
DBOPH (32 days)	-0.001242	-3.899**
SFD (61%)	-0.168696	-4.091**
DVR 1	0.000055731	0.001
DVR 2	-0.014809	-0.184
DVR 3	-0.005016	-0.067
DVR 4	0.008497	0.111
DVR 5	0.008497	-0.361
DVR 6	0.037841	0.429
DVR 7	-0.106385	-1.362
DVR 8	-0.265565	-2.662**
DVR 9	-0.265565	-2.662
DVR 10	-0.141344	-1.582
DVR 11	-0.066013	-0.741
DVR 12	0.026144	0.297
DRV 13	0.127365	1.608
DRV 14	-0.026336	-0.304
DRV 15	0.097107	1.304
N	720	
$\bar{R}^2$	.1555	
F	7.617	

* Arithmetic Mean in Parentheses after Variable.
** Statistically Significant at 1% Level.

Table C.3

Logit Estimation of the Participation Function for Boat Ramp Use in the State of Florida, 1993
(Dependent Variable: Pr BR)
(Mean of Dependent Variable = .6639)

Independent Variables*	Coefficient	t-Value
Intercept	3.6315	24.4962**
HY ($49,169)	-0.000013	17.4597**
AGE (52 years)	-0.0417	34.8640**
YRF (97%)	0.7619	2.0419
DBOPH (32 days)	-0.00641	12.2656**
SFD (61%)	-0.8954	15.2656**
DVR 1	-0.0109	0.0006
DVR 2	-0.1064	0.0582
DVR 3	0.0231	0.0030
DVR 4	0.0521	0.0167
DVR 5	-0.1758	0.1157
DVR 6	0.2257	0.2293
DVR 7	-0.4105	1.0665
DVR 8	-1.2793	5.7154**
DVR 9	0.2355	0.1919
DVR 10	-0.6840	2.3061
DVR 11	-0.3084	0.4448
DVR 12	0.1233	0.0697
DRV 13	0.6727	2.1783
DRV 14	-0.0841	0.0356
DRV 15	0.5508	1.6314
N	720	
X^2 (-2 LOG L Score)	135.93	

* Arithmetic Mean in Parentheses after Variable.
** Statistically Significant at 1% Level.

Table C.4

Projection of Boat Ramp Participation Rates or PrBR Without Including Boat Size As A Variable - OLS

Region		Coastal	OLS 1992	1995	2000	2005	2010
DVR 1	(1) (2)	Escambia Santa Rosa	.657	.651	.639	.623	.606
DVR 2	(1) (2) (3)	Okaloosa Walton Bay	.706	.700	.689	.675	.661
DVR 3	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10)	Gulf Franklin Wakulla Jefferson Taylor Dixie Levy Citrus Hernando Pasco	.684	.679	.669	.656	.642
DVR 4	(1)	Pinellas	.612	.607	.596	.582	.568
DVR 5	(1)	Hillsborough	.617	.613	.601	.585	.568
DVR 6	(1) (2)	Manatee Sarasota	.684	.681	.677	.669	.660
DVR 7	(1) (2)	Charlotte Lee	.432	.428	.421	.409	.397
DVR 8	(1) (2)	Collier Monroe	.289	.285	.275	.261	.246
DVR 9	(1)	Dade	.679	.674	.665	.652	.639
DVR 10	(1)	Broward	.465	.462	.452	.439	.426
DVR 11	(1)	Palm Beach	.546	.543	.533	.522	.510
DVR 12	(1) (2) (3)	Martin St. Lucie Indian River	.619	.616	.609	.601	.592
DVR 13	(1)	Brevard	.771	.765	.753	.739	.724
DVR 14	(1) (2) (3)	Volusia Flagler St. Johns	.562	.556	.545	.530	.514
DVR 15	(1) (2)	Duval Nassau	.758	.752	.738	.721	.704

Appendix D

Generalized Boat Ramp Lane Projection Model

General Boat Ramp Demand and Supply Model

(1) $$(BR_i)_t = F[(POP_i)_t, (PYPCD_i)_t]$$

(2) $$(PrBR_i)_t = F[HY_i)_t, (AGE_i)_t, (BS_i)_t]$$

(3) $$(ABRD_i)_t = (BR_i)_t \ (PrBR_i)_t \ (DBOPH_i)_t$$

(4) $$(E)(D/S) = [(\frac{a(ABRD)_t}{111} - (BL * NBPLD_b)]_i$$

(5) $$(E)(D/S)_t > 1 \quad \text{excess(E)demand}$$

(6) $$(E)(D/S)_t < 1 \quad \text{excess(E)supply}$$

(7) $$(E)(D/S) = 1 \quad \text{equilibrium}$$

If Excess Demand or Equation (5) Needed Boat Lanes =

(8) $$E(D/S)_t \ BL_b - BL_b$$

Definition of Terms

BR	=	boat registrations;
POP	=	population;
PYPCD	=	personal income per capita deflated;
PrBr	=	percent of all boaters using boat ramps (participation rate);
HY	=	household income;
AGE	=	age of boater;
BS	=	boat size in feet;
ABRD	=	aggregate boat ramp demand in boat days;
a	=	percent of ABRD falling on 111 peak demand days;
BL	=	boat lanes
NBPLD	=	number of boats per lane per day
D	=	peak day demand
S	=	peak day supply