8-23-2009

Florida Boating Access Facilities Inventory and Economic Study, including a Pilot Study for Lee County: A report to the Florida Fish and Wildlife Conservation Commission

Urban Harbors Institute, University of Massachusetts Boston

Bordner Research, Inc.

Recreational Marine Research Center of Michigan State University

Center for Urban and Environmental Solutions of Florida Atlantic University

Environmental Economics, Inc.

See next page for additional authors

Authors

Urban Harbors Institute, University of Massachusetts Boston; Bordner Research, Inc.; Recreational Marine Research Center of Michigan State University; Center for Urban and Environmental Solutions of Florida Atlantic University; Environmental Economics, Inc.; Planning and Zoning Center of Michigan State University; and Resource Economics Research, LLC

Florida Boating Access Facilities Inventory

and

Economic Study

including a pilot study for

Lee County

A report to the

Florida Fish and Wildlife Conservation Commission

August 30, 2009

RFP No. FWC 04/05-23

The

FLORIDA BOATING ACCESS FACILITIES INVENTORY AND ECONOMIC STUDY

including a

PILOT STUDY FOR LEE COUNTY

RFP No. FWC 04/05-23

was conducted for the

Florida Fish and Wildlife Conservation Commission

and

Lee County

with funding from

SPORT FISH RESTORATION

LEE COUNTY
SOUTHWEST FLORIDA

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

CONTENTS

CONTENTS I

LIST OF FIGURES VI

LIST OF TABLES X

ACKNOWLEDGMENTS XIII

ACRONYMS AND ABBREVIATIONS XVI

EXECUTIVE SUMMARY XVII

BACKGROUND XXIII

SUMMARY FINDINGS, OBSERVATIONS AND RECOMMENDATIONS XXIV

Boating Access Facilities Inventory xxiv

Findings xxiv

Observations and Recommendations xxv

Economic Significance of Recreational Boating in Florida xxvii

Findings xxvii

Economic Value xxviii

Findings xxviii

Observations and Recommendations xxviii

Site Suitability xxix

Findings xxix

Observations and Recommendations xxx

Future Demand xxx

Findings xxx

Observations and Recommendations xxxi

Capital Costs to Meet Current and Future Demand xxxi

Findings xxxi

Observations and Recommendations xxxii

SECTION 1 1

1. INTRODUCTION 2

1.1 The Project 2

1.2 Project Team 4

1.3 Lee County Pilot Study 6
1.4 Major Goals and Objectives 7
SECTION 2 9
2. BOATING ACCESS FACILITIES INVENTORY 11
2.1 Goals and Objectives 11
2.2 Terminology 11
2.3 Database Development Method 13
2.4 Lee County Pilot Study 14
2.4.1 Introduction 14
2.4.2 Development and Features of the Online Survey of Boating Facilities 14
2.4.3 Development and Refinement of Field Survey and Manual 15
Field Survey 15
Training Manual 15
2.4.4 Experiences 15
2.4.5 Conclusions and Recommendations 16
Online Data Access for Boating Facility Managers/Owners 16
Single Family Inventory 16
Accessing Residential Properties 20
Variables and the Field Inventory Method 20
2.5 Statewide Boating Access Facilities Inventory 20
2.5.1 Method 20
2.5.2 Online Survey of Marinas and Other Boating Facilities 20
2.5.3 Field Forms 21
2.5.4 Map and Spreadsheet Development 22
Overview of the Process 22
Research Prior to Field Visits 22
GIS and Other Resources 23
2.5.5 Database Results and Discussion 41
Boating Facility Findings 42
Ramp Findings 53
2.6 Residential Sampling 59
2.6.1 Background 59
2.6.2 Justification 59

2.6.3 Method 61
Map Development 61
Residential Sampling Procedures 63
2.6.4 Statistical Analysis 65
2.6.5 Results 67
SECTION 3 74
3. ECONOMIC STUDIES 77
3.1 Introduction: An Overview of Economics 77
3.2 Economic Impact 79
3.2.1 Overview 79
Multipliers 79
3.3 Economic Significance of Recreational Boating in Florida 80
3.3.1 Introduction 80
3.3.2 Recruitment of Florida Registered Boat Owners 80
3.3.3 Monthly "Last Trip" Surveys of Panel Members 81
3.3.4 Analytical Methods 84
Boat Segments 84
Regions 84
Weighting 85
Boat Size/Type Weights 86
3.3.5 Boating Activity 89
Days of Use by Segment 89
Day versus Overnight Trips 89
Origin-Destination Patterns 91
3.3.6 Boater Spending 93
Trip Spending Averages 93
Craft Spending Averages 103
Trip and Craft Spending by Boat Storage Segments 104
Number of Trailering Boat Trips and Related Trip Spending 107
Expanding Results to all Registered Boats 107
3.3.7 Economic Significance of Boater Spending 115
Statewide Significance 115
Regional Significance 124
County-Level Impacts: All Registered Boats and a Sample Marina and Launch Site 131

Impacts of Registered Boaters in Lee County 132
Economic Significance of a 100-Boat Marina on the Lee County Economy 133
Economic Significance of Launch Ramps to the Lee County Economy 136
3.3.8 Florida Online Economic Impact Model 139
3.4 Economic Value 152
3.4.1 Overview 152
3.4.2 Background 153
3.4.3 Random Utility Model 153
3.4.4 Estimation Results 156
On-the-water Destination Choices 157
Marine Ramp Launch Destination Choices 158
Freshwater Ramp Launch Destination Choices 159
Ramp Values 161
3.5 Site Suitability 164
3.5.1 Method 164
Environmental, Physical and Regulatory Assessment 164
Economics Assessment 166
3.5.2 Case Studies – Lee County Random Utility Models for Boating 167
Overview 167
Results 167
Lee County Environmental, Physical and Regulatory Assessment 173
Case Studies 174
3.6 Estimate of Future Demand 182
3.6.1 Projecting boating demand to the year 2025 182
3.6.2 Discussion on capacity and demand 189
Freshwater Capacity and Demand 189
Salt Water Capacity and Demand 196
3.6.3 Supply of Launch Access and Facilities 196
3.7 A Process to Identify What Capital Costs Will be Necessary to Meet Current and Future Access Demand 197
3.7.1 Introduction 197
3.7.2 Capital Budgeting Needs, Projects and Expenditures 197
3.7.3 Utilizing Study-Produced Information and Tools to Improve the Efficiency and Effectiveness of Evaluating Boating Access Investments 202

Future Demand and Launch Site Capacity to Launch Ratios....202
RUM Models and Estimates of Consumer Surplus Associated with Public Boat Launch Sites....220
Economic Significance Models....224
3.7.4 Boating Access Information Needs....225
Performance Utilization of Launch Sites....225
Integrated Boating Access Information System....226
Boating Access Surveillance and Indexing System (BASIS)....228
3.7.5 Outreach....234
SECTION 4....235
4. LITERATURE CITED....236
APPENDIX A – FIELD FORMS....238
APPENDIX B – TRAINING MANUAL....248
APPENDIX C – RESIDENTIAL SAMPLING TABLES....280
APPENDIX D – FLORIDA BOATER PANEL REGISTRATION SURVEY....370
APPENDIX E – FLORIDA BOATER PANEL RESULTS....379
APPENDIX F – FLORIDA MONTHLY TRIP SURVEY WITH ANNUAL SPENDING SURVEY ADDITION....386
APPENDIX G – BOATING ACTIVITY AND SPENDING BY BOAT STORAGE CATEGORIES....427
APPENDIX H – TRAILERING, LAUNCHING AND RELATED SPENDING BY BOAT SEGMENT....433
APPENDIX I – COUNTY LEVEL IMPACTS....436
APPENDIX J – IMPLAN SECTOR BRIDGING TO SPENDING CATEGORIES....446
APPENDIX K – CONTRIBUTION TO REGIONAL ECONOMIES....448
APPENDIX L – CRAFT AND TRIP SPENDING....469
APPENDIX M – SITE SUITABILITY ANALYSIS USING LEE COUNTY AS A CASE STUDY....481
APPENDIX N – CONSUMER SURPLUS PER MARINE ACCESS RAMP BY COUNTY, ESTIMATED LAUNCHES BY DESTINATION COUNTY, AND PERCENTAGE CHANGE IN DEMAND BY COUNTY AND WATER TYPE....506
APPENDIX O – CAPITAL IMPROVEMENTS AT PUBLIC ACCESS SITES SURVEY....553
APPENDIX P – OTHER CAPITAL IMPROVEMENTS AT PUBLIC ACCESS SITES SURVEY DATA....559
APPENDIX Q – FLORIDA VESSEL REGISTRATION FEE REPORT....561

LIST OF FIGURES

Figure 2.1: Single family residential properties on canals in Lee County. As there are bulkheads, even those properties without an apparent dock could be used for berthing. 17

Figure 2.2: An area of Lee County with locations of boating facilities other than those possibly located at single family residences. 18

Figure 2.3: An area of Lee County showing locations of boating facilities and possible locations at single family residences. 18

Figure 2.4: Lee County showing the locations of boating facilities other than those potentially located at single family residences. 19

Figure 2.5: Lee County showing the locations of boating facilities and possible locations at single family residences. 19

Figure 2.6: Comparison of Lee County orthophotographs (top) and those from AirPhoto USA (bottom). 26

Figure 2.7: Orthophotograph sources showing their coverages and the year they were produced. 27

Figure 2.8: Parcel data received from the Department of Revenue. 27

Figure 2.9: Field map used by personnel to locate potential boating facilities in Escambia County. 31

Figure 2.10: Locus map for the south of Escambia County. Numbered boxes identify individual field maps. ...32

Figure 2.11: Flow chart illustrating the inventory process. 34

Figure 2.12 Number of marinas, dockominiums, private clubs and hotels/restaurants in the database. 46

Figure 2.13: The mean number of wetslips (±SE) at marinas by county. 46

Figure 2.14: Number of wetslips at marinas, dockominiums, clubs, and hotels/restaurants in the database by county. 47

Figure 2.15: The number and percent of marinas offering pumpout services. 48

Figure 2.16: The number and percent of clubs offering pumpout services. 49

Figure 2.17: The number and percent of marinas with wetslips. 49

Figure 2.18: The number and percent of dockominiums with wetslips. 50

Figure 2.19: The number and percent of clubs with wetslips. 50

Figure 2.20: The number and percent of hotels/restaurants with wetslips. 51

Figure 2.21: The number and percent of marinas that rent wetslips. 51

Figure 2.22: The number and percent of dockominiums that rent wetslips. 52

Figure 2.23: The number and percent of clubs that rent wetslips. 52

Figure 2.24: The number and percent of hotels/restaurants that rent wetslips. 53

Figure 2.25: The number of government- and privately-managed ramps in the database that are open to the public by county. 56

Figure 2.26: The mean number of launch lanes (±SE) at public boat ramps by county. 57

Figure 2.27: The number and percent of government-run ramps that charge use fees by county. 58

Figure 2.28: The number and percent of privately-run ramps that charge use fees by county. 59

Figure 2.29: The edges of waterbodies do not always match the parcel data or orthophotographs. 62

Figure 2.30: Buffering the water boundaries creates the ability to select parcels that intersect the buffered water layer. 62
Figure 2.31: An example of residential land use in Lee County. 63
Figure 2.32: An example of a sampled condo development. 64
Figure 2.33: The estimated number (±SE) of residences with docks and/or wetslips in the 63 counties analyzed. 68
Figure 2.34: The estimated number (±SE) and percent of waterfront single family parcels with wetslips. 70
Figure 2.35: The estimated number (±SE) and percent of waterfront single family parcels with docks. 70
Figure 2.36: The estimated number (±SE) and percent of waterfront multi-family parcels (with 10 units or less) with wetslips. 71
Figure 2.37: The estimated number (±SE) and percent of waterfront multi-family parcels (with 10 or less units) with docks. 71
Figure 2.38: The estimated number (±SE) and percent of waterfront multi-family parcels (with more than 10 units) with wetslips. 72
Figure 2.39: The estimated number (±SE) and percent of waterfront multi-family parcels (with more than 10 units) with docks. 72
Figure 2.40: The estimated number (±SE) and percent of condominiums with wetslips. 73
Figure 2.41: The estimated number (±SE) and percent of condominiums with docks. 73
Figure 3.1: Demand for boating trips demonstrating the relationship between expenditures (spending) and value (consumer surplus). 78
Figure 3.2: Shift in demand. 78
Figure 3.3: Number of respondents by month. 84
Figure 3.4: Florida boating regions. 86
Figure 3.5: Comparison of registered boat population and sample by boat segment. 88
Figure 3.6: Annual average boat days and trips on water by boat segment. 90
Figure 3.7: Percentage of annual trips that are overnight trips by boat segment. 91
Figure 3.8: Annual number of days boat was on day and overnight trips by boat segment. 91
Figure 3.9: Day trips by distance category of trip and by region. 92
Figure 3.10: Overnight trips by distance category of trip and by region. 93
Figure 3.11: Average trip spending by spending location and by boat segment. 94
Figure 3.12: Distribution of day trip spending by spending category. 97
Figure 3.13: Distribution of overnight trip spending by spending category. 97
Figure 3.14: Average trip spending at origin and destination by boat segment. 101
Figure 3.15: Average day trip spending by spending category and boat segment. 101
Figure 3.16: Average overnight trip spending by spending category and boat segment. 102
Figure 3.17: Day trip spending by distance category of trip by boat segment. 103
Figure 3.18: Average total craft spending in 2007 per boat by boat segment. 104
Figure 3.19: Registered boat trips in 2007 by region of destination (thousands of trips). 109

Figure 3.20: Total boater trip spending and total craft spending by boat segment ($millions). 111
Figure 3.21: Total boater trip spending and total craft spending by destination region ($millions). 115
Figure 3.22: Contribution of boater trip spending to Florida state economy, 2007 (direct effects). 117
Figure 3.23: Contribution of boater trip spending to Florida state economy, 2007 (direct effects categories with value added category). 117
Figure 3.24: Effects of boater trip spending to Florida state economy, 2007. 118
Figure 3.25: Effects of boater trip spending to Florida state economy, 2007. 118
Figure 3.26: Contribution of boater craft spending to Florida state economy, 2007. 119
Figure 3.27: Contribution of boater craft spending to Florida state economy, 2007 (direct effects categories within value added category). 120
Figure 3.28: Effect of boater craft spending to Florida state economy, 2007. 120
Figure 3.29: Effect of boater craft spending to Florida state economy, 2007. 121
Figure 3.30: Combined contribution of boater spending to Florida state economy, 2007 (direct effects). 122
Figure 3.31: Combined contribution of boater spending to Florida state economy, 2007 (direct effects categories with value added category). 122
Figure 3.32: Effect of combined boater spending to Florida state economy, 2007.....123
Figure 3.33: Effect of combined boater spending to Florida state economy, 2007.....123
Figure 3.34: Economic effects of boater trip spending on sales by destination region, 2007. 125
Figure 3.35: Economic effects of boater trip spending on number of jobs by destination region, 2007. 125
Figure 3.36: Economic effects of boater trip spending on labor income by destination region, 2007.....126
Figure 3.37: Economic effects of boater trip spending on value added by destination region, 2007. 126
Figure 3.38: Economic effects of boater craft spending on sales by region, 2007. 127
Figure 3.39: Economic effects of boater craft spending on number of jobs by region, 2007.....128
Figure 3.40: Economic effects of boater craft spending on labor income by region, 2007. 128
Figure 3.41: Economic effects of boater craft spending on value added by region, 2007. 129
Figure 3.42: Economic effects of combined boater spending on sales by region, 2007. 130
Figure 3.43: Economic effects of combined boater spending on value added by region, 2007. 130
Figure 3.44: Economic effects of combined boater spending on labor income by region, 2007. 131
Figure 3.45: Economic effects of combined boater spending on value added by region, 2007. 131
Figure 3.46: Economic significance of boating in Palm Beach County. 141
Figure 3.47: Model inputs for a “made-up” marina in Palm Beach County. 143
Figure 3.48: Economic impact of a “made-up” marina in Palm Beach County. 144
Figure 3.49: Input for a “made-up” boat launch in Palm Beach County. 149
Figure 3.50: Output for a “made-up” boat launch in Palm Beach County. 151
Figure 3.51: Illustration of Multi-Level Nested Logit Model Structure. 154
Figure 3.52: Aerial photo of the Ostego Drive ramp. 175

Figure 3.53: Water depth, existing sites and location of aids to navigation near the Ostego Drive ramp. 176
Figure 3.54: Mangroves, seagrass, manatee boat-related mortality (in the last 10 years) and manatee abundance near the Ostego Drive ramp. 176
Figure 3.55: Protected areas near the Ostego Drive ramp. 177
Figure 3.56: Zoning near the Ostego Drive ramp. 177
Figure 3.57: Land use near the Ostego Drive ramp. 178
Figure 3.58: Aerial photo of Pine Island Marina Ramp and of Bokeelia Boat Ramp and Cottages. 179
Figure 3.59: Aerial photo of Hickory Bait and Tackle at Weeks Landing. 181
Figure 3.60: Number of launches (2009)/number of launch lanes (2009). 205
Figure 3.61: Projected number of launches (2010)/number of launch lanes (2009). 206
Figure 3.62: Projected number of launches (2015),number of launch lanes (2009). 207
Figure 3.63: Projected number of launches (2020)/number of launch lanes (2009). 208
Figure 3.64: Projected number of launches (2025)/number of launch lanes (2009). 209
Figure 3.65: Number of launches (2009)/number of launch site restrooms (2009). 210
Figure 3.66: Projected number of launches (2010)/Number of launch site restrooms (2009). 211
Figure 3.67: Projected number of launches (2015)/number of launch site restrooms (2009). 212
Figure 3.68: Projected number of launches (2020)/number of launch sites per restrooms (2009). 213
Figure 3.69: Projected number of launches (2025)/number of launch site restrooms (2009). 214
Figure 3.70: Number of launches (2009)/square feet of parking (2009). 215
Figure 3.71: Projected number of launches (2010)/square feet of parking (2009). 216
Figure 3.72: Projected number of launches (2015)/square feet of parking (2009). 217
Figure 3.73: Projected number of launches (2020)/square feet of parking (2009). 218
Figure 3.74: Projected number of launches (2025)/square feet of parking (2009). 219
Figure 3.75: Total consumer surplus of saltwater launch sites ($ million). 221
Figure 3.76: Number of saltwater launch sites reporting consumer surplus. 222
Figure 3.77: Total consumer surplus ($ million) of all public launch sites. 223
Figure 3.78: System to update boating access inventory. 227
Figure 3.79: Boating access inventory, capital needs and expenditures reporting system. 227
Figure 3.80: Boating access inventory, capital needs and expenditures and access plan reporting system. 227
Figure 3.81: Demonstration of GIS system for angling and boating. 229
Figure 3.82: Demonstration of GIS system for angling and boating. 230
Figure 3.83: Demonstration of GIS system for angling and boating. 231
Figure 3.84: Demonstration of GIS system for angling and boating. 232
Figure 3.85: Demonstration of GIS system for angling and boating. 233

LIST OF TABLES

Table 2.1: Results of site visits as a percentage of the total number of sites identified in the pre-field research. 16

Table 2.2: The number and status of boating facilities in the database and the success of the inventory.....45

Table 2.3: Summary of inventory data for marinas, dockominiums, clubs and hotels/restaurants. 48

Table 2.4: The number and status of boat ramps in the database and the success of the inventory.....55

Table 2.5: Summary of data on government- and privately-run ramps in the database. 58

Table 2.6: Estimated number of wetslips at residential properties in the 63-county study area. 69

Table 2.7: Estimated number of feet of dock at residential properties in the 63-county study area. 69

Table 3.1: Number of respondents by month. 83

Table 3.2: Number of registered boats in the sample by boat size/type segments. 85

Table 3.3: Monthly trip weights. 85

Table 3.4: Sample of boat owners responding in March by region and boat segment. 87

Table 3.5: Florida boat registrations by region and boat segment, 2006. 87

Table 3.6: Boat weights by region and boat size/type segments. 88

Table 3.7: Monthly and annual average boat days and trips by segment. 89

Table 3.8: Annual average day and overnight trips by boat segment. 90

Table 3.9: Distribution of day and overnight trips by region and trip types 92

Table 3.10: Trip spending averages by boat segment, day, and overnight trips combined. 95

Table 3.11: Trip spending averages by boat segment, day, and overnight trips combined. 96

Table 3.12: Distribution of trip spending by spending category. 96

Table 3.13: Average trip spending at origin and destination by boat segment. 98

Table 3.14: Trip spending averages by boat segment, day trips 99

Table 3.15: Trip spending averages by boat segment, overnight trips. 100

Table 3.16: Trip spending by trip distance category ($ per trip) 102

Table 3.17: Percentage of boat owners spending money on their boat (craft-related) in 2007 by boat segment and spending category. 105

Table 3.18: Average craft-related spending in 2007 by boat segment and spending category ($ per boat). .106

Table 3.19: Registered boat trips in 2007 by region of origin (thousands of trips). 108

Table 3.20: Registered boat trips in 2007 by region of destination (thousands of trips). 109

Table 3.21: Regional boating trip origin-destination matrix (thousands of trips). 110

Table 3.22: Total registered boater trip spending in 2007 by boat segment ($ millions) 112

Table 3.23: Total registered boater trip spending in 2007 by destination region ($ millions). 112

Table 3.24: Total craft-related spending on registered boats in 2007 by boat segment and spending category ($ millions) 113

Table 3.25: Total craft-related spending on registered boats in 2007 by region and spending category ($ millions).....114
Table 3.26: Contribution of boater trip spending to Florida state economy, 2007.....116
Table 3.27: Contribution of boater craft expenses to Florida state economy, 2007.....119
Table 3.28: Overall contribution of boater spending to Florida state economy, 2007. 121
Table 3.29: The economic contribution of owners of registered boats to the Florida economy, 2007. 123
Table 3.30: Economic significance of registered boaters trip spending by region, 2007. 124
Table 3.31: Economic significance of registered boat craft spending by region, 2007. 127
Table 3.32: Economic significance of registered boaters craft and trip spending by region, 2007. 129
Table 3.33: Contribution of boater trip spending to Lee county economy, 2007. 132
Table 3.34: Contribution of boater craft spending to Lee county economy, 2007.....133
Table 3.35: Overall contribution of boater spending to Lee county economy, 2007. 133
Table 3.36: Trip spending by owners storing their boat at a marina ($ per trip); by boat segment. 134
Table 3.37: Annual craft spending by owners storing their boat at a marina ($ per boat per year); by boat segment. 134
Table 3:38: Total spending from a 100-boat marina in 2007 ($000s).....135
Table 3.39: Economic impacts of boater trip spending, 100-boat marina. 135
Table 3.40: Economic impacts of craft expenses, 100-boat marina. 136
Table 3.41: Average spending on boating trips involving a launch. 137
Table 3.42: Total spending for 20,000 launches ($000s). 137
Table 3.43: Economic impacts of 20,000 launches, all day trips. 138
Table 3.44: Economic impacts of 20,000 launches, 10% overnight trips.....138
Table 3.45: Economic impacts of 20,000 launches, 50% overnight trips.....139
Table 3.46: Random Utility Model estimates for choice of water sites available from ramps with marine access. 158
Table 3.47: Random Utility Model estimates for choice of marine ramps (nested within a county and across counties). 160
Table 3.48: Random Utility Model estimates for choice of freshwater ramp groups by counties.....161
Table 3.49: Access values (consumer surplus) for publicly accessible ramps within a county. 162
Table 3.50: List of Lee County public boat ramp choices used in RUM (n=35). 169
Table 3.51: Random Utility Model estimates for choice of water sites. 170
Table 3.52: Random Utility Model estimates for choice of ramp groups. 171
Table 3.53: Estimated site values and observed and predicted trips to the ramp groups. 172
Table 3.54: Results of Lee County's marine facility siting element method for a boat ramp on Ostego Drive. 175
Table 3.55: Results of Lee County's marine facility siting element method for boat ramps at Pine Island Commercial Marina and at Bokeelia Boat Ramp and Cottages. 179

Table 3.56: Results of Lee County's marine facility siting element method for a boat ramp at Hickory Bait and Tackle. 181
Table 3.57: Regression of Public launches per county on county-level demographic interactions for white, black, and Hispanic males aged 35-64. 183
Table 3.58: Estimated launches by origin county, 2006 – 2025. 185
Table 3.59: Estimated total launches by destination county, 2006 – 2025. 187
Table 3.60: Launch capacity by county - freshwater and salt water access, 2006 – 2025 (per lanes). 190
Table 3.61: Parking capacity by county - freshwater and salt water access, 2006 – 2025 (launches per parking sq. ft.). 192
Table 3.62: Restroom capacity by county - freshwater and salt water access, 2006 – 2025 (launches per restroom). 194
Table 3.63: Percent with and without estimates of number of launches per year at public access sites operated by city/county. 199
Table 3.64: Methods for arriving at annual launch estimates. 199
Table 3.65: Comparison of 2009 spending on maintenance/operations to spending in 2008. 199
Table 3.66: Funding Sources used to maintain/operate public access sites. 199
Table 3.67: Types of capital improvements to be accomplished in 2009. 199
Table 3.68: Percent with prioritized list that identifies future needed capital improvements. 200
Table 3.69: Identified needed improvements in public access sites. 200
Table 3.70: Major problems/concerns related to adequacy/operation of public access sites. 200
Table 3.71: Percent considering actions in response to expected future access site issues. 200
Table 3.72: Cost of waterfront property in Florida regions 201
Table 3.73: Capital budget projections to 2025 by county and access type (marine and freshwater). Estimates in 2009 dollars. 203
Table 3.74: Economic perspectives of different models 224

ACKNOWLEDGMENTS

The Florida Fish and Wildlife Conservation Commission would like to acknowledge the following individuals for their significant contributions in assisting with the

Florida Boating Access Facilities Inventory and Economic Study

David Harding, Ph.D.
Project Manager
Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute

STEERING COMMITTEE

Steve Boutelle
Marine Engineering Manager
Lee County

Lt. Col. Jim Brown
Deputy Director
Division of Law Enforcement,
Florida Fish and Wildlife Conservation Commission

Major Paul Ouellette
Division of Law Enforcement
Boating and Waterways,
Florida Fish and Wildlife Conservation Commission

Mahmoud Madkour
Professional Engineer
Administrator
Division of Habitat and Species

David Harding
Economist
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Patricia Harrell
Boating Access Coordinator
Boating and Waterways,
Florida Fish and Wildlife Conservation Commission

VENDOR SELECTION

Henry Norris
Program Administrator
Information Science and Management
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Bill Sargent
Government Analyst
Boating and Waterways Section
Division of Law Enforcement,
Florida Fish and Wildlife Conservation Commission

Alice Heathcock
Office of Submerged Lands
Department of Environmental Protection

Carol Knox
Environmental Administrator
Imperiled Species Management
Division of Habitat and Species Conservation,
Florida Fish and Wildlife Conservation Commission

Major Paul Ouellette
Division of Law Enforcement
Boating and Waterways,
Florida Fish and Wildlife Conservation Commission

Lt. Col. Jim Brown
Deputy Director
Division of Law Enforcement,
Florida Fish and Wildlife Conservation Commission

Thomas J. Murray
Virginia Institute of Marine Science
College of William and Mary

PURCHASING

Barbie Levins
Purchasing Director
Office of Finance and Budget,
Florida Fish and Wildlife Conservation Commission

Don Smith
Contracts Administrator
Office of Finance and Budget,
Florida Fish and Wildlife Conservation Commission

CONTRACT MANAGER

Patricia Harrell
Boating and Waterways
Florida Fish and Wildlife Conservation Commission

SPECIAL TASKS

Paul Kubilis
Statistician
Residential Sampling
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Brian Beneke
GIS Technician
GIS Mapping Interface
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Henry Norris
Program Administrator
GIS Database Design, Data Review
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Kathleen O'Keife
Research Administrator
GIS Database
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Greg Jenssen
GIS Analyst, Ramp Inventory/Verification
Division of Law Enforcement,
Florida Fish and Wildlife Conservation Commission

Chris Anderson
Marine Research Associate
Ramp Verification/Inventory
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Ryan Druyor
Environmental Specialist
Ramp Verification/Inventory
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Craig Harmak
Environmental Specialist
Ramp Verification/Inventory
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Tom Talley
Senior Information
Business Consultant
Ramp/Verification/Inventory
Fish and Wildlife Research Institute,
Florida Fish and Wildlife Conservation Commission

Jacob Tustison
GIS and Mapping Coordinator
Ramp Verification/Inventory
Division of Law Enforcement,
Florida Fish and Wildlife Conservation Commission

Elise Mathes
Attorney
Office of General Counsel
Legal Issues
Florida Fish and Wildlife Conservation Commission

Shane Collier
Research Data Administrator
Ramp Verification/Inventory
Fish and Wildlife Research Institute,
Fish and Wildlife Conservation Commission

John Bomba
Scientific Engineering Programmer
Ramp Verification/Inventory
Fish and Wildlife Research Institute,
Fish and Wildlife Conservation Commission

INVESTIGATORS

Jack Wiggin
Director
Urban Harbors Institute,
University of Massachusetts Boston

Diane Bordner, Ph.D.
Director
Bordner Research, Inc.

Mike Thomas, Ph.D.
Principal
Environmental Economics, Inc.

John Warbach, Ph.D.
Associate Director
Michigan Higher Education Land Policy Consortium
Planning and Zoning Center,
Michigan State University

Edward Mahoney, Ph.D.
Co-Director
Recreational Marine Research Center,
Michigan State University

Lenore Alpert, Ph.D.
Assistant Director of Research
Center for Urban and Environmental Solutions,
Florida Atlantic University

Frank Lupi, Ph.D.
Principal
Resource Economics Research, LLC

Dan Stynes, Ph.D.
Recreational Marine Research Center
Michigan State University

ACRONYMS AND ABBREVIATIONS

AAA	American Automobile Association
BAF	Boating Access Facility
BRI	Bordner Research, Inc.
CUES	Catanese Center for Urban and Environmental Solutions, Florida Atlantic University
DCA	Department of Community Affairs
DEP	Department of Environmental Protection
DRI	Developments of Regional Impact
EEI	Environmental Economics, Inc.
EV	Equivalent Variation
FGDL	Florida Geographic Data Library
FIML	Full-Information Maximum Likelihood Model
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
GIS	Geographic Information System
GPS	Global Positioning System
LABINS	Land Boundary Information System
LIMDEP	Limited Dependent Variable Package
MFSE	Marine Facility Siting Element
MPP	Manatee Protection Plan
MNL	Multinomial Nested Logit
NAICS	North American Industry Classification System
NHDWB	National Hydrography Dataset - Waterbodies
PZC	Planning and Zoning Center of the Land Policy Institute, Michigan State University
RER	Resource Economics Research, LLC
RFP	Request for Proposals
RMRC	Recreational Marine Research Center, Michigan State University
RUM	Random Utility Model
UHI	Urban Harbors Institute, University of Massachusetts Boston
USGS	Unites States Geological Survey
WFP	Waterfront residential Property
WTP	Willingness to Pay

EXECUTIVE SUMMARY

The "Statewide Boating Access Facilities Inventory and Economic Study Including a Pilot Study for Lee County, Florida" was commissioned by the Florida Fish and Wildlife Conservation Commission (FWC) in 2005. The study was funded in part by a grant to the FWC from the U.S. Fish and Wildlife Service and by Lee County.

The project required expertise and capabilities in a range of disciplines and the project team involved researchers from seven different organizations. The team was led by the Urban Harbors Institute of the University of Massachusetts Boston, and included Bordner Research, Inc., Recreational Marine Research Center of Michigan State University, Center for Urban and Environmental Solutions of Florida Atlantic University, Environmental Economics, Inc., Planning and Zoning Center of Michigan State University, and Resource Economics Research, LLC. Work began in 2005 and was completed in 2009. The project entailed several data collection efforts:

- A comprehensive statewide inventory of coastal and inland boating access facilities;
- A survey of recreational boaters;
- A visual survey (using aerial photographs and GIS data) of the number and type of boat berthing opportunities at a sample of waterfront residential properties in 63 counties; and
- A survey of a sample of public agencies for data and information on planned or programmed capital investments in boating facilities.

The project also included a number of economic studies that used the data from the inventory and surveys to:

- Quantify the economic impact of recreational boating to the State of Florida;
- Estimate the present and projected demand for boating facilities;
- Conduct site suitability analyses for potential new or expanded facilities; and
- Estimate capital costs of new or improved boating facilities.

The inventory of recreational boating access facilities, which began with a pilot project in Lee County, includes boat ramps, marinas, dry storage facilities, moorings, commercial establishments, and large residential developments with dockage in or along the state's coastal and inland waters. The facilities were identified via a method that involved existing datasets from government and industry, GIS data, aerial photographs, websites, and relevant publications.

Data were collected for each site by a field team trained to gather specific information on a multitude of variables pertaining to each facility's location, size, boat storage options, amenities, and other characteristics. The data were gathered (1) to generate a baseline inventory of all recreational boating facilities in Florida, and (2) to provide information for use in the economic analysis portions of the project described below.

The data and information from the boating facilities inventory are stored and maintained by the Florida Fish and Wildlife Research Institute for purposes of informing public and private planning and decision making, and for making this information available to the boating public, public officials and researchers through an interactive website.

The database contains records for over 2,700 boating access facilities. Of these, over 24% are commercial marinas, over 28% are condominiums with boating facilities and almost 13% are

hotels/restaurants with an associated boating facility. Additionally, the database contains records for over 3,100 boat ramps of which over 51% are open to the public. The majority of these public ramps are managed by a municipal, county, state or federal entity. The database is structured so that researchers with database knowledge are able to run queries to obtain specific information. For example, the database can be used to answer questions such as:

- Which boat ramps in Lee County have parking, and how much parking do they have?
- How many private clubs have pumpout capabilities in the state?
- Which county has the most boat slips?
- Are there any boat ramps on Lake Okeechobee, and if so, are there any that do not charge launch fees?
- Which boat ramps in Monroe County are in need of repair?

Some simple queries show that Monroe County has the highest number of commercial marinas, followed by Lee and Pinellas counties and that, on average, there are 64 wetslips (as opposed to broadside berthing) per commercial marina across the state. Dockominium marinas average 66 wetslips, while private clubs have an average of 52 wetslips. Boat ramps can be found at over 34% of the commercial marinas that were inventoried. The largest number of publicly accessible boat ramps can be found in Polk and Lake Counties. The database also suggests that over 87% of government-run public boat ramps are in good to excellent condition and the same is true for 77% of the public ramps that were privately-run.

Given the rapid rate of land use change along Florida's coastal and inland waterways, maintaining and updating the database is essential to preserve the long-term value of the effort and investment made to date. While the method for future updating of the database has yet to be determined, the comprehensiveness and structure of this "baseline" database lends itself to routine updating by state, county and municipal personnel as facilities are added or improved.

In addition to the database on public and private boating facilities, a sampling procedure was developed to estimate the number of wetslips and feet of broadside berthing available at waterfront residential properties. These largely private boating facilities are at single family homes, apartment buildings, condominiums, and mobile home parks (both residential and recreational use/visitor accommodation). While the necessary data were not available to sample all counties (specifically, data were not available to sample Citrus, Highlands, Martin, or Sumter counties), estimates were developed for 63 counties.

The results of the residential sampling procedure suggest that there are an estimated 28,794 waterfront residential properties with boat slips, and an estimated 49,832 private residential boat slips in those 63 counties. The results also indicate that there are an estimated 158,556 waterfront residential properties with some sort of dock configuration other than wetslips in those 63 counties. The method, which relied heavily on GIS resources and statistical analysis, was developed in such a way as to allow the procedures to be cost-effectively replicated in the future as a means to identify trends in available residential boating capacity.

The inventory and the residential sampling, taken together, provide a reliable approximation of the current supply of recreational boating facilities in Florida. Building off of the information in the inventory and the results of the residential sampling, additional work was conducted to provide the basis for estimating boating access demand in Florida for the next 16 years; for modeling the change in social benefit resulting in the addition and/or improvement of boating access facilities at the county or regional level; and for examining the economic significance of recreational boating in Florida.

As decision makers consider where to build new boating access points, repair existing access points, or add new amenities to existing access points, it is helpful to understand how those decisions impact existing and potential users. Using a set of random utility models (RUMs) of consumer choice developed for this study, decision makers will be able to estimate the dollar change in social benefit resulting in the addition and/or improvement of boating access facilities (both coastal and fresh/inland waters) at the county and regional level. (RUMs are econometric models that use information about individual trips, and statistical techniques to explain boaters' site choices and to relate those choices to the costs and characteristics of alternative boating sites.) Specifically these models were designed to estimate the economic benefits of the demand for access to boating sites and are suitable for valuing the characteristics of boating sites.

The economic models presented in this study will serve as new tools for efficient planning and budgeting of future boating access and present site remediation. The models allow policy makers to project the future use and economic value of potential ramps and/or launch site enhancements. Knowing the potential benefits of a new site before construction will permit policy makers to better plan for future boating related capital projects.

The RUM models employed by this study are state-of-the-art econometric tools that require a moderate degree of technical knowledge to operate and modify. FWC and other public resource agencies presently employ people with this level of technical knowledge and, with some assistance from the model developers, should be able to operate and make minor modifications to evaluate the reduction of boating access and alternations of site attributes. More complex alterations such as the addition of new sites and/or fundamental changes in boating demand would require a systemic change to the models and likely need the assistance of econometricians with a high degree of technical expertise.

The data used in the RUM model consists of the site description data contained in the inventory (mentioned above) and details about the origins and destinations of actual boating trips obtained in the boater survey (described below). Additionally, destination site characteristics were provided in GIS format, with the state's lakes, rivers, bays, harbors, estuaries and open ocean (out to 15 miles) broken into one-minute grid cells each containing information on approximately 30 attributes including the presence or absence of navigational aids, artificial reefs, natural reefs, seagrass, boat ramp(s); marine protection/conservation status; and distance to nearest incorporated area, artificial reef, shoreline and boat ramp. (As time passes, if water conditions or boating access and demand in Florida change significantly, the models will lose their effectiveness and should be re-estimated; however, this effort would be considerably easier than the initial effort since the process has been developed and documented.)

Based upon the theory that a person will select the boating launch site and destination that provides the most satisfaction, or "utility", the model was designed so that boaters' decisions on where to launch their crafts and where to go to included factors such as the cost of traveling to a ramp, the cost of boating to a water destination, and the characteristics of the ramp and destination site.

Once developed, the model was then applied to existing destination and launch sites in Lee County. Results show that boater destinations in Lee County seem to be positively influenced by the presence of marine protected or conservation zones, and negatively affected by the presence of manatee zones, artificial reefs, and navigation aids. Water depth and distance to nearby ramps also seemed to influence a boater's destination site, with boaters seeking destinations close to a ramp, and in deep water. The model also showed that launch sites that were developed (had parking and other amenities) were preferred to undeveloped launch sites. Finally, the model estimated the per trip value provided by public access launch sites in Lee.

The RUM model was also applied to predict the marginal social benefits of adding or reconstructing boat ramps by developing a series of individual-based RUMs of consumer choice for the state of Florida. Results indicate that for destinations from ramps with marine access (as opposed to freshwater access), the cost of accessing a site, the presence of seagrass, the presence of artificial reefs, the presence of a marine protected area, and the presence of navigation aids are significant factors in ramp choice statewide – though the level of significance varied depending on if the ramp was on the east or west coast of the state. Significant factors were also found statewide for the marine ramp sites themselves, including the number of lanes available at a ramp, available parking, and the development index indicating how many facilities and amenities a ramp offered. Additional factors were also analyzed and significant distinctions were made depending on if the launch site was on the east or west coast of the state. Freshwater site analysis also indicated that travel cost was a significant factor, as was available parking, ramp condition, the development index, and the presence of a marina.

The estimated model parameters can also be used to estimate the value of changes in the site characteristics at one or more sites and to compute the value of access to an existing ramp by computing the estimated loss in consumer surplus if the site is removed from boater's choice sets. Additionally, the model parameters can be used to determine the county values for freshwater and marine access. These access values represent economic benefits to boaters using publicly accessible ramps that are above and beyond their boating expenditures. Adding these county level values, a lower bound value for access to all ramps with public access was determined to be at least 232 million dollars per year for access to freshwater ramps and at least 788 million dollars per year for access to marine ramps. Taken together, the ramps that are publicly accessible provide benefits to boaters in excess of one billion dollars per year.

The RUM models and a model of future launches per county were used to forecast public launches per county for the years 2010, 2015, 2020, and 2025. Some general trends emerge from the projected launches, with most counties, over most years, experiencing growth in launches. However, some counties are forecasted to experience declines. By 2025, about half the counties are projected to experience growth and about half are projected to experience declines. These forecasted declines are basically due to shifts in the demographic composition of counties. Capacity at the sites was also considered in the forecast of public launches.

Projecting future demand for both salt and freshwater boating access permits one to estimate the likely capital investments that would be needed to accommodate future usage. This can be accomplished by using cost estimates for land acquisition and ramp construction and tying these estimates to projected demand and present ramp infrastructure. Assuming the desire is to maintain access capacity at 2006 levels, then capital investments for fresh and salt water access statewide would fall in the range of $68 million to $111 million over the next 16 years. A web-based survey was developed as part of this project to gather more specific information on capital budgeting needs, projects, and expenditures including identifying specific needs at launch sites, and major problems and concerns related to the adequacy and operations of boat launch sites.

The RUM model has applications beyond identifying preferences in launch sites, water destinations, and per trip value. The model can also be used in real-world situations to help determine whether or not to build a new site, make improvements to an existing site, close an existing site, or take other actions with regard to launch facilities, as is demonstrated in three case studies in Lee County. While each county will likely have its own criteria for how to site a new facility, the Lee County case study shows how the model can be used, in conjunction with siting guidelines, to help weigh the costs and benefits of an action at a single launch site, as well as how it can be used to compare the costs and benefits of

different actions at several launch sites. In the case of public access site closures, the model can be helpful in determining the economic value lost because of the closure.

In addition to knowing the supply of and demand for recreational boating, and the impact of making site specific decisions to add, eliminate, or augment an access facility, this study also examined the overall economic significance of recreational boating in Florida. More specifically, the purpose of this economic analysis was to identify spending and the related direct and indirect sales, employment and wages/salaries, effects (within regions and the state as a whole) stemming from recreational boating activity among Florida's registered boaters. In order to estimate economic significance, it was first necessary to estimate what registered boat owners spent annually on craft related storage, maintenance and operations (e.g., insurance and repairs) and also their spending on trips (e.g., groceries, lodging, etc.). The economic significance analysis employed the IMPLAN model, an input/output model that portrays the flows of economic activity between sectors (e.g., restaurants, lodging establishments, and gas services) within a region, and captures the complex interconnectedness of expenses required to produce goods and services. Ultimately, the IMPLAN model captures direct impacts of boater spending (e.g., the purchase of boat fuel), as well as the indirect effects of boater spending (e.g., the purchase of the cash register used at the fuel station at which the boat fuel was purchased).

The data used in the IMPLAN model was obtained by distributing a monthly customized survey to an online panel of over 8,000 boaters (including owners of power boats, sailboats, personal watercraft, canoes, and kayaks) registered in Florida. The composition of panel members closely represented the demographic characteristics of the population of registered boaters in Florida, and the monthly survey responses were weighted to make them proportionally representative of the fleet of boats registered in Florida. The surveys were designed to gather information on topics including number of boating trips, trip origins, trip destinations, trip durations, trip expenses, size of vessel(s), and annual craft-related expenses.

Results showed that registered boaters, on average, used their boats approximately 30 days per year, with larger power boats and sailboats generally tending to be used more days per year than smaller power boats and sailboats. Scaling the survey results up to the entire registered boating population in Florida, it is estimated that there were 21.7 million boating trips in 2007, 10% of which were overnight trips. Additional analysis of the data indicated differences, by boat size, launch site types (e.g., marina versus boat ramp), frequency of use, and duration of trips.

The total expenses for trips, statewide, was approximately $3.384 billion, with spending on day trips costing $1.8 billion, compared to $1.6 billion on overnight trips. The direct effect of this total spending was estimated at $697 million in labor income, and approximately 26,000 jobs. Including secondary effects, the total contribution rises to $1.08 billion in labor income, and over 38,000 jobs. Total spending on trips was spread out across different types of expenses, with 35% of the total trip spending going toward boat fuel and oil, while restaurant meals and drinks accounted for 14%, groceries 13%, lodging 11%, and auto fuel 11%.

The annual total craft-related (non-trip) expenses were $5.16 billion. These boat repairs, marina services, and other craft-related expenses directly supported over 39,000 jobs. Including secondary effects of craft-related spending raises the number of jobs to almost 59,000.

In addition to providing statewide estimates on the number of trips and the economic impacts of those trips, the study included regional trip numbers and economic impacts, and found that most boating activity and spending takes place within a boater's county and region of residence. Determining economic impacts at the county or facility level were demonstrated through an examination of two

hypothetical facilities in Lee County: a marina with 100 boats, and a boat ramp providing 20,000 launches/year. The analyses yielded the economic impact of these two facilities to the various sectors of the economy. While this level of analysis was only demonstrated for facilities in Lee County, a model was created for other counties to use to determine their boating-related economic impacts at both the county and facility level. That model can be found online at www.floridaboatingeconomics.com.

In addition to the model available to determine county impacts, this study also produced a system of three web-based models which allow users to estimate the economic effects of (1) changes in boat registrations, (2) the loss, reduction or expansion of launch ramps and (3) changes in marina supply including marina conversions to other (non-marina) uses and capacity expansions (e.g., new slips, larger slips) or diminished capacity (e.g., reduced dredging that limits the number of slips or sizes of boats that can be stored). The models can be accessed at www.floridaboatingeconomics.com. Data used to develop the models came from both the Florida Boating Access Inventory, and Economic Analysis of Recreational Boating in Florida.

The models were designed specifically to allow users to simulate spending, income, employment and value added effects of policies elements and management regimes, and for evaluating alternative investments in boating facilities. For example, a user can simulate the effects of closing an existing marina or alternatively building a new marina. They can also be used to assess the effects of an investment in a launch site which expands its launch capacity. The economic impact assessment information produced by the models can, in combination with demand projections, needs analysis and environmental impact assessments, improve decisions relating to investments in boating facilities.

The models are user friendly and were developed so that they do not require sophisticated knowledge of economic impact assessment. The data input requirements are very minimal and the outputs are easy to interpret. For example, the only inputs required to perform and economic impact analysis of an existing or proposed ramp are the number of current or projected launches and the extent the ramp is used by local residents or tourists. The marina economic impact model requires data concerning the type and size boats kept at the marina and the number of transient rental nights.

Taken both as separate pieces – the inventory, the RUM model, and the economic impact models - and as a whole, the deliverables of this project will provide policy makers, resource managers, planners, and others with invaluable tools and information about Florida's existing and future recreational boating industry.

BACKGROUND

This report describes the work program and results of the "Statewide Boating Access Facilities Inventory and Economic Study Including a Pilot Study for Lee County, Florida" commissioned by the Florida Fish and Wildlife Conservation Commission (FWC) in 2005. The study was funded in part by a grant to the FWC from the U.S. Fish and Wildlife Service and by Lee County. The scope and objectives of the study are summarized in the introduction, and the subsequent sections report on the various components of the study.

For many years, Florida has been among the fastest growing states in the nation, which means that its resources, infrastructure, and facilities are continually under pressure. Maintaining the quality of the state's natural resources and access to its waters depends on making informed management decisions using the best scientific data and analyses available. This study was designed to accomplish the following:

1. Provide a comprehensive recreational boating access facilities inventory inclusive of a Pilot Study of Lee County, Florida, to include: marinas, dry storage, mooring sites, boat ramps and docks (including private docks).
2. Provide documentation of the economic significance of registered recreational boating in Florida based on trip and craft spending.
3. Develop a site suitability method for marinas and boat ramps based on environmental/geographic conditions and economics. The emphasis of this approach is on incorporating economic information and data to build on the screening criteria employed through the boat facility siting plan method promulgated by FWC and endorsed by the Department of Community Affairs for preparing countywide facility siting plans.
4. Develop a process based on economic value to guide the planning of new and rebuilt recreational boating infrastructure first for Lee County and then statewide.
    - Provide estimates of economic value for new or rebuilt recreational boating infrastructure (first for Lee County and then statewide) utilizing Random Utility Models and the likely distribution of boating access site use for any policy question that involves the addition, deletion, or improvement of access sites.
    - Develop Case Studies specific to Lee County utilizing Random Utility Models.
5. Provide an estimate of future boating demand.

SUMMARY FINDINGS, OBSERVATIONS AND RECOMMENDATIONS

BOATING ACCESS FACILITIES INVENTORY

Findings

The following overall conclusions are drawn from the experience gained while conducting the boating access facilities inventory and are elaborated upon in and supported by this report.

1. The FWC's objective of compiling a comprehensive statewide inventory of boating access facilities in an electronic database was needed and will serve multiple purposes.

   No other existing single source or a combination of existing sources capture the extent of the boating facilities compiled in this statewide inventory.

2. Since a statewide inventory of this type and magnitude had never been attempted before, the challenges of doing so were not fully appreciated at the outset. For example:
   - The scale of the project was not known; there was no reliable estimate of the number of facilities to be inventoried;
   - There were a very large number of variables to be gathered at each site, covering a wide range of areas from general infrastructure, amenities and occupancy rates to revenues, salary and wage data and property taxes. This made site visits time-consuming. While some data were purely observational, others required interviewing a person on site. Frequently, no one was available to be interviewed or they were busy;
   - The large number of variables and, therefore, the time necessary to garner full responses, negatively affected the willingness of people to respond either online or while being interviewed during a site visit;
   - Some operators felt that some information was proprietary and others simply did not have the necessary information to answer the questions.

3. The methods for conducting an inventory of private docks for this project were revised. Rather than visit each site, a scientific sampling procedure was developed to provide an estimate of the number of private docks. The sampling approach is far more practical and replicable than an inventory, and the results of the model are suitable for the purposes for which the data were collected.

4. The database contains records for over 2,700 boating access facilities. Of these, over 24% are commercial marinas, over 28% are condominiums with boating facilities and almost 13% are hotels/restaurants with an associated boating facility. Additionally, the database contains records for over 3,100 boat ramps of which over 51% are open to the public. The majority of these public ramps are managed by a municipal, county, state or federal entity.

5. The database is very complex and requires training to understand the data collected, the interrelationships among variables, and to design and execute queries that will provide the information desired.

6. Some simple queries show that:
    - Monroe County has the highest number of commercial marinas, followed by Lee and Pinellas counties.
    - On average, there are 64 wetslips (as opposed to broadside berthing) per commercial marina across the state. Dockominium marinas average 66 wetslips, while private clubs have an average of 52 wetslips.
    - Boat ramps are found at over 34% of the commercial marinas that were inventoried.
    - The largest number of publicly accessible boat ramps can be found in Polk and Lake Counties.
    - Over 87% of government-run public boat ramps are in good to excellent condition and the same is true for 77% of the public ramps that were privately-run.

Observations and Recommendations

1. Online survey instrument and its use in future updating of the facility database

    The facility database has been established and designed with a web-based interface to enable public and private boating facility operators to access the database periodically to update their site information. This interface was used as the first step in the Lee County Pilot Study as the initial means to gather information directly from facility operators. That experience revealed a low response rate. Should this method be used to update the database, there is a need for some refinement, such as incorporating incentives.

2. The number of variables and the length of the questionnaire

    The inventory was designed to gather an extensive suite of variables to provide information on the infrastructure, amenities and economic status of boating facilities. The final inventory survey tool was 9-pages long and contained 104 questions. Many of these questions had a number of sub-questions. For example one question asked about the amenities available at a facility. While this was one question, there were 69 possible amenities that could be checked off. Though the survey tool was designed to have a primary form (with key inventory variables) followed by a number of supplemental forms that were only used when relevant, this was still a long survey. Many operators were not willing to spend the time to complete such an extensive survey/interview, suggesting the need for shorter surveys in the future.

3. Observation-based versus interview-based variables.

    The inventory aimed to gather information for an extensive number of variables. Some of these pieces of information were sought to provide details of the infrastructure and amenities associated with a boating facility. These were mainly gathered visually through a site visit or by using remote sources. These were needed for the inventory itself and for the economic models that were based on the amenities and infrastructure (the Random Utility Model in particular).

    Other information could only be gathered by interviewing someone on site (e.g., number of wetslips rented versus sold, occupancy rates) and many operators were unwilling to divulge other information (e.g., service versus sales revenue, salary and wage data). Much of this interview-based information was needed for the economic impact and capital improvement studies.

    It is clear that many variables could be classified as either “observation-based” or “interview-based”. The fundamental difference is that for an inventory and RUM-type modeling, the

"observation-based" variables are needed for as many facilities as possible. However, many of the "interview-based" variables could be gathered for a sample of all facilities, and the economic analysis could scale-up the results to the whole population. Therefore, the length of the field survey could be significantly reduced by focusing field efforts on gathering the "observation-based" variables for all facilities and, as a separate effort, attempt to gather the "interview-based" variables from a sample of facilities using an alternative method.

4. The complex definitions of variables and limited online guidance

   During fieldwork a number of facility operators stated they had completed the survey online prior to site visitation. In these situations, fieldworkers still attempted to gain as much information as possible while on site, particularly on key variables. Upon review of the forms completed online by the facility operators two things were evident. First, the forms were not filled out completely or in as much detail as was accomplished with the site visits due to the length of the survey and the complexity of variables. Second, the information entered online by the facility operators oftentimes disagreed with that obtained by fieldworkers, even when the person interviewed on-site was the same person who completed the form online. It was apparent that facility operators were not interpreting the meaning of some questions in the way intended in the research. This problem was also evident when individuals (other than the principal project staff or trained field staff) provided data. This meant that field visits by trained personnel remained the most reliable method of gathering reliable inventory data and interviews with off-site management personnel (e.g., state, county or municipal government) were only used during the backfilling process.

   The complex definitions of the variables resulted partially from a desire to gather very specific data during the inventory. The complexity of definitions was exacerbated by the fact that the inventory attempted to gather information that could be fed into economic models for analysis. For example, the inventory differentiated between wetslips and broadside berthing and also asked for the total length of boating related docks. It was hoped that the total length of dock could be used when assessing how much had been invested in infrastructure; and wetslips and broadside were separated as they represent different levels of investment. However, many operators did not distinguish between wetslips and broadside berthing and few were able to provide a total dock length.

   Operators found a number of the questions difficult to answer as they did not record information consistent with that manner in which the answers were recorded. For example, the inventory asked for the number of wetslips that were rented and sold in the previous year by boat size. Operators did not have this information at hand. If a sample of facilities was recruited for a separate, shorter economic study, it is possible that operators would be more willing to look back over their records and attempt to extract the necessary information.

5. Updating the data

   A plan for updating and maintaining the data should be adopted and begin immediately. Changes to Florida's boating facilities occur daily. The value of the existing inventory will deteriorate quickly without ongoing efforts to update and maintain the data.

   The website of boating access facilities to be developed by FWC from this inventory provides one efficient means for updating. Operators of facilities included in the website will have an incentive to help maintain the accuracy of the data displayed for their facilities. The website can also serve as the means for facility operators to provide updated information, either through password-

protected access to their record in the database or by providing information to the database manager via the website.

FWC should partner with county and municipal governments to provide periodic updates of the facilities they own and operate or the private facilities they permit. A system might be developed in which licenses fed directly into the database, or where state, county, or municipal staff were trained on data collection and were equipped with hand held devices that would be used to update the database while out in the field.

Updating the data (whether by inventory or sampling) would best be accomplished on an on-going basis, organized by data type or purpose. The number of pieces of data collected should be reduced to improve the participation level, completeness of survey responses and accuracy of survey responses. Every effort should be made to track when changes were made to which fields, and who made the changes.

6. Limitation on GIS data

   The inventory and sampling portions of this project heavily relied on GIS data. The quality, scale, coverage, and date of the data varied depending on the datalayer. While some datalayers were excellent for their proposed uses, others were less complete, and in some cases the data did not exist at the time. For example, while most counties had complete parcel datalayers, some had incomplete coverages, and in a few counties the parcel data had not been digitized. Where data were incomplete or unavailable, attempts were made to find other ways to gather the needed information; however, this was not possible in all cases. For example, parcel data were a required component of the residential sampling method; therefore those counties without electronic parcel data could not be sampled. The on-going efforts to collect data and create or update GIS layers should help simplify future inventory and sampling efforts.

ECONOMIC SIGNIFICANCE OF RECREATIONAL BOATING IN FLORIDA

Findings

1. Results showed that registered boaters, on average, used their boats approximately 30 days per year, with larger power boats and sailboats generally tending to be used more days per year than smaller power boats and sailboats. Scaling the survey results up to the entire registered boating population in Florida, it is estimated that there were 21.7 million boating trips in 2007, 10% of which were overnight trips.
2. The total expenses for trips, statewide, was approximately $3.384 billion, with spending on day trips costing $1.8 billion, compared to $1.6 billion on overnight trips. The direct effect of this total spending was estimated at $697 million in labor income, and approximately 26,000 jobs. Including secondary effects, the total contribution rises to $1.08 billion in labor income, and over 38,000 jobs. Total spending on trips was spread out across different types of expenses, with thirty-five percent of the total trip spending going toward boat fuel and oil, while restaurant meals and drinks accounted for 14%, groceries 13%, lodging 11%, and auto fuel 11%.
3. The annual total craft-related (non-trip) expenses were $5.16 billion. These boat repairs, marina services, and other craft-related expenses directly supported over 39,000 jobs. Including secondary effects of craft-related spending raises the number of jobs to almost 59,000.

ECONOMIC VALUE

Findings

1. The statewide inventory and boating data collected were extensive and complete and sufficient to develop a model of boating choice for trailered boats.
2. Ramps open to public access were used in the modeling effort. The juxtaposition of these ramps was considered important and ramps located within 1.5 miles of each other were lumped together and treated as one ramp.
3. Water site destinations were prepared as polygon clusters of 1 minute grid cells. Each cluster contained at least 30 site specific variables including the presence or absence of salt and/or freshwater, natural and/or artificial reefs, seagrass, navigational aids, manatee protection status and marine protection/conservation status.
4. The boating survey asked detailed last trip information including trip origin, ramp-of-origin and water site destination. There were a total of 3,442 trip observations for marine access ramps and 1,016 trip observations originating from freshwater ramps. Trip information was collected over a period of 12 months.
5. The demand analysis based on the random utility model provided the following results:
    - For the marine site selection the cost of accessing the site (travel related costs) had a negative effect. The site's location (east or west coast), presence of navigational aids, presence of seagrass, presence of artificial reefs and if the site was located in a marine protection areas were all positive and significant contributors to demand on both sides of the state. The site's distance to the shore line was inversely related on the eastern coast.
    - Ramp attributes that contributed to the choice of marine access included: parking lot size, parking lot condition (on the eastern coast), number of launch lanes, degree of launch area development, condition of the launch lane and presence of a marina (east coast)
    - For freshwater access, ramp characteristics were aggregated at the county level and averaged. As before, travel cost had a significant and negative effect on site selection. Number of ramps within a county, parking lot size, site development and presence of a marina all had a sign cant and positive effect on demand.
    - Although ramps were modeled, site resolution for freshwater locations prevented modeling of on-the-water freshwater site selection so on-the-water choices were not modeled at that level.
6. The county level values for access to public ramps averaged $82 per trip for marine ramps and $77 for freshwater ramps.
7. The estimated consumer surplus (value to boaters for access to public ramps above and beyond their expenditures) is at least $232 million per year for freshwater ramps and $788 million per year for marine access ramps. This is a combined benefit of over $1,000,000,000 per year to the boaters of Florida.

Observations and Recommendations

1. Overall the RUM results were reasonable and trip access values well within the range reported in the literature.

   The model suggests that, all things being equal boaters using marine access ramps:

- Preferred closer water destinations over those located further away;
- Prefer site with artificial reefs;
- Chose sites with marine or conservation zones; and
- Preferred sites closer to ramps.

And these results differ by region (East vs. West coast).

2. Behavior of non-resident boaters may be significantly different from that of residents and should be accounted for. To account for differences in non-resident boating, future efforts should collect information on the participation rates and distribution of non-resident boaters. This may be particularly true in the southern region of Florida due to the large number of "snow birds" each winter.
3. The automated geographic location system utilized in the boater survey lacked sufficient detail in many counties to collect reliable site selection information. This was particularly true for the boater's choice of ramp and water destination site. To safeguard against misguided ramp selections, boaters were also asked to provide the name of their ramp. In some counties, significant numbers of boaters were unable to correctly locate their ramp with the geographic system, with an error rate as high as 50%. In future efforts more detail needs to be included with the mapping system including highway numbers and street and ramp names.
4. The estimated economic benefits to boaters of Florida's publicly accessible launch sites were substantial and varied by geographic location and ramps. These values can be weighed against costs when planning for or investing in ramp capacity and facilities.

SITE SUITABILITY

Findings

The following overall conclusions are drawn from the experience gained while conducting the site suitability analysis and are elaborated upon in and supported by this report.

1. Inventory and boating data collected for Lee County were extensive and complete. The data provided were sufficient to develop a model of boating choice for trailered boats using Lee County public access points. This model was a key component to the site suitability analysis.
    - Of the 97 inventoried ramps (both publically and privately owned), 55 were considered not available for public use for a variety of reasons including temporary closure, private or gated facilities and government ramps only open for official use. Nearby ramps were aggregated leaving a total of 35 individual ramp choices.
    - A total of 71 twelve-minute polygons were identified as salt-water accessible and key site attributes recorded. These served as destination sites for the random utility model (RUM).
    - One-hundred and fifty-three boating trips were randomly sampled over 12 months and key demographic and trip specific information collected. These data provided the site choice data needed to construct the RUM.
    - Combining the inventory and water site information with the actual boating trip choices, the RUM estimated the choice probabilities and marginal values for launch sites.
2. Three potential changes to current boating access in Lee County were considered: adding an additional access point, improving an access point by enlarging the parking lot and removing an

access point. Most of the inventory and boating data collected were not necessary for developing the RUMs.

3. Many of the inventory data needed for the RUM analysis were incomplete.

Observations and Recommendations

1. Overall the RUM results were reasonable and trip access values well within the range reported in the literature.

   The model suggests that, all things being equal boaters:

   - Preferred closer water destinations over those located further away;
   - Didn't prefer places with artificial reefs;
   - Chose sites with marine or conservation zones;
   - Avoided manatee zones;
   - Preferred deeper water; and
   - Preferred sites closer to ramps.

   These results will likely differ by county and region and statewide.

2. Behavior of non-resident boaters may be significantly different from that of residents and should be accounted for.

   Generally, actual and predicted visitation rates were reasonable with one notable exception. In the cased of Matlacha Park, the model predicted a higher visitation rate than local resource managers would predict. Local knowledge suggests that the Matlacha area does not receive higher visitation because the waterways there are difficult to maneuver. As such, it is possible that few out-of-state boaters visit this site. To account for differences in non-resident boating, future efforts should collect information on the participation rates and distribution of non-resident boaters.

3. Variables key to the econometric analysis need to be given priority in data collection.

   Even though efforts were made to collect over one-hundred variables at each launch facility, with few exceptions, the collection effort was incomplete. It is important that those developing the RUM identify those variables likely key for a successful model and that these variables be collected on every access point. Incomplete data will result in variables being excluded from consideration and less robust models.

FUTURE DEMAND

Findings

1. Demand for public boat launches per county was forecast in 5 year increments to the year 2025
2. The process combined parameters from the RUM analysis with the projected changes in demographic variables to get the desired forecasts on the future number of public launches by county of trip launch origin.
3. Using the Bureau of Economic and Business Research (BEBR) data projecting future demographic trends the following variables were used in our forecasted demand trends: number of males age

35-65 by white non-Hispanic, black non-Hispanic and Hispanic. These choices were based on the present day boat ownership demographics.

4. The public launches per county were then regressed on the demographic interaction of white, black and Hispanic males aged 35-65. The results indicate most counties will see an increase in boat launches over the time period. However, some counties will experience a decline. These forecasts are basically due to shifts in demographic composition within counties. Typically, declines in white, non-Hispanic males age 35-64 and increases in both black, non-Hispanic males age 35-64 and Hispanic males age 35-64 in some counties will lead to declining launches. Even though Hispanic males age 35-64 are positively associated with launches, the regression parameters suggest that an increase in the number of a Hispanic males age 35-64 that is equally offset by a decline in white, non-Hispanic males age 35-64 will result in a net loss of launches originating in a county.
5. Changing demographics are forecasted to lead to large declines in boat launches in several large metropolitan counties such as Duval and Broward. Other counties, particularly fast growing counties in the southwest and adjacent to metropolitan areas, are forecasted to see increased boat launches.
6. Using county level ratios of boat launches per boat launch lane, a measure of ramp capacity is developed to forecast counties likely to face future congestion.
7. When launch capacity and consumer surplus (value to boaters) are compared across counties, it is possible to identify the best areas to build new launch facilities.

Observations and Recommendations

1. The use of demographics is widely utilized in forecasting demand. One reason for this is that considerable effort is taken by demographers to model demographic trend into the future so these data are considered reliable. There are likely non-demographic variables tied to demand that would make forecasting more accurate, however if these other variables are not forecasted with any degree of precision they are not particularly useful in predicting future demand.
2. As with any forecast, the assumption is made that preferences are static. If there are significant changes in the demographic composition of boaters (e.g., more black non-Hispanics take up boating) the actual trends will vary significantly from those predicted by the model.

CAPITAL COSTS TO MEET CURRENT AND FUTURE DEMAND

Findings

1. Participation in recreational boating is projected to change over the next 16 years and this will require a change in the allocation of boating access investments;
2. In many counties and cities, financing the upkeep and renovation of existing boating access sites will become a greater challenge than the development of new sites;
3. There is significant variation in the type, reliability and validity of information and studies which have been utilized to verify the need and to argue both in support of and in opposition to boating access including marinas;
4. The public [consumer surplus] value of access sites in different counties and even across launch sites in the same county differs significantly indicating the importance of assessing consumer surplus when evaluating proposed launch sites;

5. The public value and economic significance of recreational boating is substantial and wide-spread which makes it even more important that decisions related to future investments in public boat access are analytical and based on economic information;
6. Currently, the public [consumer surplus] value and economic development benefits of public access sites are not adequately incorporated into decisions on the development or financing of boating access;
7. Most counties and cities do not have, and are not required to have, comprehensive public access plans or multi-year capital budgets related to boating access;
8. There is no consistent current information available about boating access-related capital expenditures, needs or pending projects for counties, cities and certainly not for private companies;
9. However, using projected launch demand to the year 2025 and taking the average design/permitting/construction cost per boating access lane to be $100,000 with regionally averaged fresh and salt water real estate costs and land requirement of 1.5 to 2.5 acres, it is possible to roughly estimate future capital costs needed to maintain 2006 supply.
10. Using these assumptions, statewide capital investments between $68 million and $111 million will be needed to maintain present-day levels of capacity.

Observations and Recommendations

1. The results of survey of county and city boating access site and many conversations with boating agencies and industry officials clearly indicate that the State of Florida needs to implement a more comprehensive system for collecting, integrating and analyzing data on boating access that should be linked (required) to the grant process and to the access of monies from boating registration fees. Requiring that counties and cities report various information on an annual basis would be the most cost-effective way to gather information related to boating access capital needs.
2. FWC should consider developing and demonstrating cost-effective methods, which government agencies can utilize, to produce reliable and valid estimates of launch site utilization. These methods might include: (1) sampling schemes, measures and counting methods (e.g., aerial photos, car counts, observing time to launch); (2) approaches for expanding the results for sampling periods; and (3) demonstrations and associated training materials for county and local units of government.
3. FWC should consider requiring better estimates of the utilization of existing launch sites as part of grant applications for new or expanded launch sites. As part of its overall educational/outreach effort to enhance access planning and decision-making, FWC should include training on coming up with valid and reliable utilization estimates.
4. Consider developing a web-based boating access information system where counties, local units of government, FWC units and other state agencies can: (1) update information on the public access sites that they manage (e.g., operating status, expansion, improvements); (2) report annual spending on boating access capital improvements; (3) provide information about maintenance and operations budgets for public access sites; and (4) identify and verify capital improvement/maintenance priorities using tools and information produced by this study. As part of this, FWC should consider undertaking an outreach and educational effort to make members of the boating industry and appropriate state, county, and municipal personnel aware of such tools and provide training in when and how they should be employed.

SECTION 1

1. INTRODUCTION 2

1.1 The Project 2

1.2 Project Team 4

1.3 Lee County Pilot Study 6

1.4 Major Goals and Objectives 7

1. INTRODUCTION

1.1 THE PROJECT

This report presents the process, products and conclusions of a four-year project that included an inventory of boating access facilities and a number of economic studies on recreational boating in the State of Florida.

The work was based on the Request for Proposal: "Boating Access Facilities Inventory and Economic Study Including a Pilot Study for Lee County, Florida" (FWC 04/05-23) issued in October 2004 by FWC. The contract began in May 2005 and work was completed in August 2009. The Request for Proposals (RFP) divided the tasks into three broad phases: a statewide comprehensive boating access facilities inventory, Geographic Information Systems (GIS) data management activities, and economic assessments. The project team was responsible for phases I and III, while the Florida Fish and Wildlife Research Institute's Center for Spatial Analysis performed phase II. The method that was developed for phase I of the project relied heavily on GIS to:

- Develop detailed maps to guide personnel during field visits; and
- To verify the accuracy of the coordinates of facilities.

While FWRI provided invaluable support and help with the development of GIS in phase I, the GIS developed during this phase was distinct from that which was developed by FWRI in phase II. The phase II GIS used the data gathered in phase I as the basis for developing a series of products. The RFP defined phase II as:

> *"GIS COMPONENT*
>
> *The Contractor is not required to perform any services under this phase of the project. This portion of the study will be performed by the Florida Fish and Wildlife Research Institute (FWRI), Center for Spatial Analysis, St. Petersburg, Florida….*
>
> *GIS Data Management Activities:*
>
> 1. *Generate one or more GIS datalayers using ESRI software from the field data collected for the study. At a minimum this will include marinas, dry storage, mooring fields, boat ramps, docks and all attendant attribute data.*
> 2. *Conduct accuracy and consistency tests on the attribute data.*
> 3. *Coordinate with OBW to conduct positional accuracy tests.*
> 4. *Coordinate with OBW to create FGDC-compliant metadata using SMMS software.*
> 5. *Store master GIS files in FWRI's Oracle SDE server.*
> 6. *Serve the GIS layers via FWRI's Internet Map Server. Target audience to be researchers and resource managers.*
> 7. *Provide the facility GIS data along with other relevant GIS data in its holdings, in an appropriate format for inclusion in a user-friendly website that is to be developed by external contractor. Target audience to be researchers and resource managers. A list of all available FWRI GIS data will be sent to OBW.*
> 8. *Funding permitting, FWRI will maintain the GIS data and metadata into the foreseeable future.*

9. FWRI will archive the GIS data as required.

10. FWRI will provide the data via the Internet and portable media to all requestors.

In addition to GIS data management, where appropriate FWRI will support the development of the website aimed at the general public by providing ancillary information such as artificial reef locations, local fish, popular destinations for fishing trips, etc., that would improve the boating experience.

FWRI will not be involved with any data collection activities except to develop and provide the Access database template."

Phases I and III of the project consisted of several distinct but interrelated elements:

Two data collection efforts:

- A comprehensive statewide inventory of coastal and inland boating access facilities; and
- A survey of recreational boaters.

And a number of economic studies that employ the data from the inventory and surveys to:

- Quantify the economic impact of recreational boating to the State of Florida;
- Estimate the present and projected demand for boating facilities;
- Conduct site suitability analyses for potential new or expanded facilities; and
- Estimate capital costs of new or improved boating facilities.

The inventory of recreational boating access facilities includes: boat ramps, marinas, dry storage facilities, moorings, commercial establishments, and large residential developments with dockage in or along the state's coastal and inland waters. Information on a multitude of variables pertaining to each facility's location, type, amenities, and other characteristics was collected.

The Lee County Pilot Study revealed that the success of gathering reliable and extensive data was dependent on both the ability to gain access to a facility and the ability to interview facility personnel. It was also clear during the pilot study that gathering data was extremely difficult at private residential sites (e.g., condominiums, multi-family developments and single family residences). However, for a true picture of the economic affect of recreational boating in Florida, information on private wetslips and docks was needed. The scope of work for the Lee County Pilot Study included tasks to determine a practical method for gathering information on such private residential docks and other residential boating infrastructure. The method was developed by the project team in conjunction with FWC and FWRI personnel with extensive input from FWRI statistician Paul Kubilis. This method was then applied throughout the state to provide estimates of residential boating facilities to be used in the project's economic models.

After the pilot study, the inventory focused on gathering extensive data on non-residential sites that provided facilities available for use by recreational boaters (e.g., marinas, dockominiums, clubs, hotels, restaurants and other commercial facilities). The inventory also included gathering data on boat ramps. Through the pilot study and research in other counties, it became clear that there were numerous types of boat ramps, ranging from official public ramps (either government-run or privately-run), to private ramps in small residential communities, to ramps at private residences, to unofficial dirt ramps that could only accommodate small, hand-launch watercraft. Official information often identified the public ramps, greatly facilitating site visits and data gathering. However, the smaller private, or unofficial ramps, were significantly harder to identify and often did not provide public use. Moreover, these types of facilities often did not actually exist. Based on discussions with FWC and FWRI, and driven by the fact

that the Random Utility Model (RUM) was aimed at publicly accessible boat ramps, it was decided to focus on gathering extensive data at public sites. When field personnel were directed to non-public ramps, they collected information on a less exhaustive list of variables. Therefore, the Database Results and Discussion section of this report (Section 2.5.5) focuses on the comprehensive data gathered at the public boating facilities. It is important to note that the database also contains significant data from facilities that were not the primary focus of this study.

The third phase of this project involved developing economic models necessary to: forecast future boater demand through the year 2020; document the economic impact of recreational boating; report the public and private capital improvement plans for boating facilities; and predict the most economically efficient locations for future boating sites. The economic studies used data from the facilities inventory and from a monthly survey of boaters conducted during 2007.

1.2 PROJECT TEAM

The project was conducted by a team of researchers led by the Urban Harbors Institute (UHI) of the University of Massachusetts Boston, and included the Recreational Marine Research Center (RMRC) at Michigan State University, the Catanese Center for Urban and Environmental Solutions (CUES) at Florida Atlantic University, Bordner Research, Inc. (BRI), the Planning and Zoning Center (PZC) of the Land Policy Institute at Michigan State University, Resource Economics Research, LLC (RER), and Environmental Economics, Inc. (EEI).

Urban Harbors Institute, University of Massachusetts Boston

UHI is a public policy and applied-science research center which focuses its expertise on solutions to problems of urban harbors and the coastal and marine environments. The institute's mission is to increase understanding of the coastal environment, improve management practices, and promote informed decision making at the local, state and national levels. UHI employs a multidisciplinary approach in all of its research and education projects, blending science, policy, and management.

Nearly all of the research and public service projects conducted by UHI are done for and with local, state, or federal government agencies, industry associations, or nonprofit organizations for the purpose of improving management of coastal and ocean areas.

UHI staff and associates are specialists in:

- Federal, state and local laws and regulations governing waterfront development and coastal resource protection;
- The industries that depend on the waterfront and marine resources;
- The infrastructure needed to support water-dependent industries;
- Coastal sciences, planning and management; and
- Facilitation and public participation.

Jack Wiggin (Project Leader), Dan Hellin, Kristin Uiterwyk, Kim Starbuck, Chantal Lefebvre, Lisa Bowen, Lisa Greber, Dennis Leigh and Seth Sheldon.

Recreational Marine Research Center, Michigan State University

The RMRC conducts original boating industry research, prepares specialized studies such as market analysis and economic impact assessments, analyzes data, and publishes reports for recreational boating agencies, organizations and marine businesses.

Among the types of studies recently conducted by RMRC are the economic impact of boating, wage and salary study of Michigan marine businesses, attitudes toward required wear of life preservers by adults in all boats that are underway, boat owner annual spending, trips spending profiles for different size boats and, the impacts of fuel prices on boaters.

RMRC conducts quarterly surveys of marine business leaders from different sectors to gauge performance (e.g., sales, inventories). It focuses on collecting data across the broad spectrum of the recreational marine industry and supplying information to facilitate informed decision making.

RMRC maintains and regularly surveys a nationwide survey panel of more than 10,000 frequent boaters (owners and non-owners) to monitor consumer patterns. The panel data help identify trends in boater preferences, levels of involvement, spending, life cycles of ownership and related behaviors.

Edward Mahoney, Ph.D., Daniel Stynes, Ph.D., Yue Cui, Sung Hee Park, Carla Barbieri and Teresa Herbowicz.

Bordner Research, Inc.

BRI was founded in 1987 to meet the demand for a quality research firm located in the Tampa Bay Area. The primary purpose of the firm is to provide the public sector and business community with quality market research and data collection services. The basic philosophy of BRI is to provide its clients with quality action-oriented data that can be used confidently in decision making.

BRI personnel are highly experienced in market research. The principal owner, Dr. Diane C. Bordner, has been engaged in market research for over thirty-four years, having conducted numerous research and marketing projects for both public agencies and private businesses. Many of these projects required person-to-person interviews and on-site data collection over wide geographical areas. BRI is a one-hundred percent female-owned business and is certified as a minority business enterprise in the State of Florida.

Diane Bordner, Ph.D. and Joan Lange.

Catanese Center for Urban and Environmental Solutions, Florida Atlantic University

Since 1972, CUES at Florida Atlantic University has been dedicated to helping communities and decision makers resolve urban and environmental issues through partnerships, education, and research.

CUES's mission is to work with policy-makers and the public in their pursuit of options for managing growth while preserving natural systems, promoting a strong economy and planning livable communities. Local governments, state agencies, civic and business groups, academics, and professionals are part of the broad constituency that supports, motivates, and benefits from our activities.

CUES achieves its mission through a combination of applied research, academic support, and community outreach. The research staff is multi-disciplinary with expertise in planning, public policy, economics, and the social sciences. CUES also relies on partnerships with other entities within and outside Florida Atlantic University to maximize their resources and enhance their ability to serve the needs of a growing South Florida.

Lenore Alpert, Ph.D., M.J. Matthews, Christina Bryk, Michael Green, Louis Mercado, Chris Lohr, Camille O'Brien, Lindie Chandler, Derek Reeves, Christopher Dillaha and Brian Johnson.

Environmental Economics, Inc.

EEI has over 25 years of experience in the field of natural resource management and research; and for the past 10 years has focused its applied research on resource issues related to Florida. In the mid-90's, the Florida Department of Environmental Protection (DEP) contracted Drs. Thomas (principal of EEI) and Tomasi (formally with Michigan State University) to apply a RUM in estimating the recreational value lost to beach users during the 1993 Tampa Bay oil spill. In 1997, EEI staff adapted the Tampa Bay method to address the potential economic losses to users of public access boat ramps that would result from imposing manatee speed zones in Lee County Florida. In 2002, EEI staff applied the same model again to assist FWC in preparing their SERC for recent changes in the Brevard County manatee rule. In 2001, EEI staff worked with the FWC to estimate the economic impact and value of all Florida public boat ramps and piers. Their efforts were the first to document economic value and impact of boat ramps in Florida at such a large scale. The study included a model that can predict the economic value of adding additional ramps, their likely levels of use and even the potential economic impact to the local economy.

Michael Thomas, Ph.D.

Resource Economics Research, LLC

The principal of RER is a natural resource and environmental economist whose research, teaching, and outreach address the economics of fisheries, wildlife, and ecosystem management. RER serves as the economist in the Partnership for Ecosystem Research and Management, a collaborative effort between scientists at Michigan State University and fish and wildlife management agencies in the Great Lakes Region. Additionally, RER serves on the Committee on Endangered and Threatened Species of the Platte River Basin of the National Academies of Science's National Research Council. RER's applied research has addressed the economics and human dimensions of recreational activities with a focus on demand modeling and valuation of recreational behavior. RER staff are widely recognized for their expertise on random utility choice models.

Frank Lupi, Ph.D., and Michael Kaplowitz, Ph.D.

Planning and Zoning Center, Michigan State University

The PZC at Michigan State University is a program of the Land Policy Institute at Michigan State University. PZC is a multi-disciplinary team of professionals devoted to research, education and consultation on best practices for community planning and development control. PZC focuses research and engages in outreach designed to improve land use decisions by and coordination between governmental entities. PZC also maintains online information resources, develops decision support systems and serves as an information/data clearinghouse to enhance city, county, regional and state planning efforts. Helping planning bodies understand their options, and arrive at optimal solutions within the policy context they operate in, is a key component of the PZC's research and outreach work.

John Warbach, Ph.D.

1.3 LEE COUNTY PILOT STUDY

The Lee County Pilot Study provided an important opportunity to test and evaluate all aspects of data collection and facility survey methods, and to make adjustments to improve inventory efficiency before extending the effort statewide. The complete process and method for the inventory conducted in Lee County is detailed in the *Report on the Lee County Pilot Study* prepared as a separate document.

1.4 MAJOR GOALS AND OBJECTIVES

Statewide Comprehensive Inventory of Boating Access Facilities

The goals of the boating facilities inventory were to:

- Prepare a comprehensive inventory of recreational boating access facilities in Lee County as a pilot project for the statewide inventory of recreational boating access facilities.
- Compile a comprehensive statewide inventory of recreational boating access facilities, including ramps, marinas, clubs, hotels and restaurants in all salt, fresh and brackish waters.
- Determine the feasibility of and a method for obtaining information about private residential boating infrastructure.

The objectives of the boating facility inventory were to:

- Compile, in a single comprehensive electronic database, information and data on the state's boating access facilities that will serve as the foundation of a resource for boaters and decision makers.
- Compile all available attribute data for the facilities including the type, ownership, location, size, accessibility, services and amenities to support various analyses of existing boating access and to provide a baseline for monitoring change.
- Provide a format and the interfaces necessary for viewing, querying and updating the information in the database and for incorporating the data into GIS maps and a website for the general public.

The comprehensive database of boating access facilities will be used:

- As an information resource for public agencies, the private sector, and the boating public.
- By FWC to create a statewide map of existing recreational boating facilities, and to make this information available to the public over the web.
- To provide input for analyses of the economic impact of recreational boating; for models to determine optimum locations for new and expanded boating facilities; and to inform planning and decision making on capital investments by both the public and private sectors.

Economic Impact

- To identify expenditure, revenue, and employment flows, along with employment in a particular region and the state attributed to recreational boating. The economic impact analysis illustrates the economic contributions made to regional, local or state economies by expenditures related to recreational boating.

Economic Value

- To develop a set of random utility models that will estimate the marginal change in social benefit resulting in the addition and/or improvement of boating access facilities at the county or regional level. The results will include both coastal and fresh/inland waters. Specifically the model(s) will permit policy reviews of:
    1. Changes in site characteristics;
    2. Changes in peak capacity;

3. The addition of a new access site; and
4. Elimination of an existing access site.

Additionally, the RUM analysis will provide the basis for estimating boating access demand for the next 16 years in Florida.

Method for Site Suitability Analysis

- Develop and demonstrate a method for conducting site suitability analyses that augments the assessment of environmental and physical factors with the use of random utility modeling.

Capital Improvements

- Develop a framework for identifying and prioritizing the current and future adequacy of different types of recreational boating facilities.
- Provide data and analysis of the amount and costs of boating facility capital improvements planned for the next 1 – 5 years and 5 - plus years.

SECTION 2

2. BOATING ACCESS FACILITIES INVENTORY 11

2.1 Goals and Objectives 11

2.2 Terminology 11

2.3 Database Development Method 13

2.4 Lee County Pilot Study 14

2.4.1 Introduction 14

2.4.2 Development and Features of the Online Survey of Boating Facilities 14

2.4.3 Development and Refinement of Field Survey and Manual 15

Field Survey 15

Training Manual 15

2.4.4 Experiences 15

2.4.5 Conclusions and Recommendations 16

Online Data Access for Boating Facility Managers/Owners 16

Single Family Inventory 16

Accessing Residential Properties 20

Variables and the Field Inventory Method 20

2.5 Statewide Boating Access Facilities Inventory 20

2.5.1 Method 20

2.5.2 Online Survey of Marinas and Other Boating Facilities 20

2.5.3 Field Forms 21

2.5.4 Map and Spreadsheet Development 22

Overview of the Process 22

Research Prior to Field Visits 22

GIS and Other Resources 23

2.5.5 Database Results and Discussion 41

Boating Facility Findings 42

Ramp Findings 53

2.6 Residential Sampling 59

2.6.1 Background 59

2.6.2 Justification 59

2.6.3 Method 61

Map Development 61

Residential Sampling Procedures.....63
2.6.4 Statistical Analysis.....65
2.6.5 Results.....67

Section Authors

Jack Wiggin, Dan Hellin, Kristin Uiterwyk, Diane Bordner, Edward Mahoney, Yue Cui, Paul Kubilis, Lenore Alpert and MJ Mathews.

2. BOATING ACCESS FACILITIES INVENTORY

2.1 GOALS AND OBJECTIVES

The goals of the boating access facilities inventory were to:

- Prepare a comprehensive inventory of recreational boating access facilities in Lee County as a pilot project for the statewide inventory of recreational boating access facilities.
- Compile a comprehensive statewide inventory of recreational boating access facilities, including ramps, marinas, clubs, hotels and restaurants in all salt, fresh and brackish waters.
- Based on the Lee County Pilot, determine the feasibility of, and a method for obtaining information about private residential boating infrastructure throughout Florida.

The objectives of the boating facility inventory were to:

- Compile, in a single comprehensive electronic database, information and data on the state's boating access facilities that will serve as the foundation of a resource for boaters and decision makers.
- Compile all available attribute data for the facilities including the type, ownership, location, size, accessibility, services and amenities in order to support various analyses of existing boating access and to provide a baseline for monitoring change.
- Provide a format and the interfaces necessary for viewing, querying and updating information in the database and for incorporating those data into both GIS maps and a website for the general public.

The comprehensive database of boating access facilities will be used:

- As an information resource for public agencies, the private sector, and the boating public.
- By FWC to create a statewide map of existing recreational boating facilities, and to make this information available to the public over the web.
- To provide input for analyses of the economic impact of recreational boating; for models to determine optimum locations for new and expanded boating facilities; and to inform planning and decision making on capital investments by both the public and private sectors.

2.2 TERMINOLOGY

The inventory phase of the project focused on obtaining information on a number of different types of boating facilities. Given that there were a variety of ways in which a description of a type of facility might be interpreted, it was essential that field personnel used the same definitions (provided directly below). The uses of these definitions hold true throughout the remainder of the report. It is important to note that some facilities may have fit the definition for multiple types of facilities, in these cases all types were noted in the facility's record:

- Commercial marina – A boating facility of any size, at which any boater can rent space for their boat - if space is available.
- Dockominium marina – A specific type of marina in which spaces are privately owned. Owners might pay a monthly fee for upkeep, but do not pay a monthly rental fee. These facilities do not include condominium housing with an associated boating facility unless berthing/storage is purchased independently from the condo unit.
- Private club – A facility for which a membership is required in order to make use of the boating infrastructure. Generally, transients, or boaters who are members of a club in another location

may be permitted to use an affiliated private club. Clubs may be part of larger facilities, but they do not include condo complexes in which living in the complex is the only prerequisite for having access to the boating facility.

- Condominium housing – A condominium development with an associated docking component available for use with the purchase of a condo. Condominium housing does not include situations in which the berthing must be purchased independently from the condo unit.
- Publicly owned and privately operated – A boating facility owned by a government entity, but with a private management company.
- Publicly owned and operated – A boating facility owned by a government entity, with the management staff on the government's payroll.
- Hotel/motel – A hotel or motel with an associated boating component. Hotel/motel does not include multi-family developments in which units are rented seasonally.
- Restaurant – An eating and/or drinking establishment with an associated berthing/docking component.
- Multi-family/Apartment building – A housing situation, other than condominium housing, with multiple residential units under one roof or in a compound having an associated boating component. This includes multi-family arrangements where units are rented seasonally.
- Boat sales/services – A boat sales or service company with boating infrastructure.
- Commercial business – A commercial business with boating infrastructure.
- Mobile home park/campground – A property with multiple mobile homes. This includes both residential communities where the mobile homes are more-or-less permanent homes (either rented or sold), and properties where mobile homes are transient recreational vehicles towed to a site for a short period of time. Note: While there are often significant differences between a permanent mobile home park and a campground/RV park, the type of boating infrastructure found at these normally consists of communal docks, individual docks, or a combination of the two. While the distinction between the two land use types (permanent residential community versus transient visitor accommodation) is not made in the database, detailed information on the types of boating infrastructure and how they are managed (e.g., whether berthing is rented, sold or available for transient boaters) is captured.
- Docks only – Boat docks not affiliated with any shoreside facility.
- Government only – Boating facility available for government use only.
- Vacant – An otherwise vacant property with associated boating infrastructure.
- Unknown – Boating infrastructure associated with an unknown shoreside facility.
- Other residential – A residential property such as a single-family residence where boating infrastructure is available.
- Other – Boating infrastructure associated with a type of facility not described above. (Field personnel were asked to provide a description of the facility type).
- Hand-launch only – A ramp not designed for launching a boat on a trailer. Often these are for canoes and kayaks only.
- Stand-alone boat ramp – A ramp that is not part of a facility listed above.

2.3 DATABASE DEVELOPMENT METHOD

Two databases were used in this study, one for ramps, and one for other types of boating facilities. This was due to (1) the high number of variables, and (2) the fact that the researchers at Michigan State University were already running a national online marina survey. It was possible to adapt that database structure to meet the needs of this study. This became the *Florida Marina Monitoring and Tracking* database (the "marina database"), and was designed to contain data about marinas and other boating facilities (e.g., hotels, restaurants and residential facilities that rented wetslips etc.).

The second database was specifically developed to capture the variables associated with boat ramps, and became the *Florida Boat Launch Ramp* database (the "ramp database"). The data required for ramps were mostly observational in nature, and many ramps were not associated with a facility.

The databases were developed so that each facility could be given a unique identification code. When a boat ramp was located within a boating facility, a record was created in both databases and each was given the same unique ID.

The researchers involved in this study, based in various locations, needed to be able to access the databases remotely. Furthermore, as discussed in the Lee County Pilot Study section of this report, the initial design of the project called for boating facility operators to enter information online and populate the database directly. Therefore, it was decided that a secure web-based interface to the databases provided the most efficient means of access, allowing researchers to enter, retrieve, or manipulate the data. This structure also allowed boating facility operators to enter data wherever they were located – as long as they had internet access. Additionally, the online interfaces to the databases were developed to accommodate multiple users simultaneously, eliminating the need for duplicate copies that would need to be merged back together. Finally, the databases were designed to be maintained primarily by one group, ensuring consistency of oversight.

This web-based system was built on an Active Server Page (ASP) with a supporting MySQL database. Both the web and database servers were hosted by RMRC. Project members were able to remotely enter and edit the inventory data through two interfaces: www.prr.msu.edu/fl2005 and www.prr.msu.edu/ramp. These two interfaces were closed after the inventory data was verified and all the data cleaning and editing was completed.

In terms of data structure, all the data that was entered on the HTML ramp entry page was captured and stored in the ramp database. The ramp database consisted of 228 variables representing the attributes and characteristics describing the ramps. The boating facility (marina) database consisted of eleven tables matching the 472 variables collected though the eleven HTML entry pages.

After all the inventory data was entered the ramp and marina databases were exported from the MySQL databases into SPSS files. Variable and value syntax was developed and new variables were created, variables were recoded and data cleaning analyses were performed using SPSS. Frequencies and crosstabs were then performed on all variables for the purpose of identifying missing and obviously inconsistent and out-of-range data. Based on these analyses the inventory data was checked, supplemented and in some instances corrected. Then the SPSS file was converted to an ACCESS database along with supporting data dictionaries that described the structure of the database and variable values.

2.4 LEE COUNTY PILOT STUDY

2.4.1 Introduction

The Lee County Pilot Study provided an important opportunity to test and evaluate all aspects of data collection and facility survey methods and make adjustments to improve inventory efficiency before extending the effort statewide. The complete process and method for the inventory conducted in Lee County is detailed in the *Report on the Lee County Pilot Study* prepared as a separate document.

The scope of the boating facility inventory conducted for this project was more ambitious than any other effort undertaken in the United States. The objective was to collect and compile information on all recreational boating access facilities in the State of Florida, both coastal and inland, including boat ramps, public and private recreational boating facilities and private recreational docks. Data were sought on an expansive array of variables for each facility that would portray its physical and economic characteristics. The variety of data required ranged from observational data that could be gathered remotely, observational data that could only be gathered on site and data that required an interview to be conducted with management personnel for the facility. All of the collected information was entered into a database.

The databases had two primary purposes. The first was of direct benefit to boaters -data and information gathered through the inventory will be mapped and cataloged by FWRI and made available to the public through a boating access website. The second purpose was to provide data for a variety of economic studies and models that will assist public officials in evaluating policy options and inform decision making on public and private capital investments. However, the situation in Florida is changing rapidly with new facilities opening, and others changing hands, closing or being converted to some other use. While an inventory provides a "snap shot" of the situation, it cannot capture the changes that are occurring within the boating industry. These changes are of critical importance to the future of boating in the state and are of economic significance.

To this end, it was initially felt that the final database be developed so that it could be readily updated by state, county and municipal officials as well as facility operators. The capability to readily update information reduces the chances that the database would become out-of-date.

As discussed in Section 2.4.2, it was decided to develop a database with web-based access. The database was developed with two separate data entry URLs, one URL for use by facility operators, and the other developed to streamline the process of transferring data from field forms into the database. Both URLs fed into the same database which was used to complete the economic analysis.

Accessing the information for a specific site required a unique identifier. Additionally, any confidential or sensitive information could be security protected or made unavailable online in order to protect proprietary information.

2.4.2 Development and Features of the Online Survey of Boating Facilities

The facility inventory utilized an online survey instrument for commercial and publicly owned facilities, which served several purposes and had a number of short- and long-term advantages for the project. The online database access was designed to:

- Be a convenient way for boating facility operators to provide survey responses;
- Serve as the means for field survey data to be entered directly into the central database; and
- Be used as a final step to secure additional data and to confirm data obtained through the field visits and/or from existing sources.

Advantages:

- Relatively inexpensive way to conduct a survey of commercial boating facilities;
- Responses are automatically entered directly into the central database; and
- Can be used in subsequent years to update data with minimal expense and effort.

2.4.3 Development and Refinement of Field Survey and Manual

Field Survey

Initially, BRI used a printed version of the online survey to conduct field visits. After several field tests, it was determined that, while useful as an online tool, the form was difficult to use in the field because of its length and the order in which questions were asked. As a result of the field testing, a new field survey was developed.

The new field survey tool consisted of eight forms (Appendix A) – one general form (the "primary form") and seven supplements specific to different elements a facility may have (e.g., drystack storage, wetslips, boat ramp, etc.).

This system reduced the number of pieces of paper required to complete a site visit, allowed the field researcher to gather information in a logical order, and streamlined the field process by identifying the questions that applied to each facility while eliminating questions that were irrelevant.

The primary form was used to gather basic, largely observational information about a facility such as the name, address, type of facility, operating status of the facility, total linear feet of dockage and number of parking spaces. The primary form also served to identify facilities that had wetslips, transient space, broadside space, moorings, drystack storage, outside (non-drystack) storage, boat ramps and amenities. If a facility had any of the aforementioned attributes, then the field researcher completed a related supplemental form specific to that attribute. Much of the information that was required for the supplemental forms could only be gathered through a successful interview.

Field testing also identified the need to adjust the wording of some questions that allowed for multiple interpretations and/or yielded answers that did not truly reflect the purpose of the question. BRI and UHI spent a great deal of time re-working the language of the questions, ultimately developing survey forms and a training manual that clearly identified and addressed the true purpose of each question.

Training Manual

The comprehensive training manual was developed to guide field personnel through each inventory. The changes in the field survey process necessitated changes to the manual. Questions were re-organized and re-worded to reflect the format of the new field survey forms. Furthermore, the instructions in the manual were re-worked to address specific issues and points of confusion that arose as a result of the field visits. A glossary, an index and several graphics were also added to make the manual user-friendly. The development and field testing of the training manual led to a strict method being developed so that all field personnel gathered information in the same manner. This was particularly important when estimates had to be made (e.g., parking area).

2.4.4 Experiences

The pre-field research identified 1,207 potential boating facilities in Lee County. These included everything apart from those boating facilities associated with single family residential properties. Inventories were attempted at all but 10 facilities. Nine of these are only accessible by boat.

It is clear that the field visits were generally successful with over 84% of sites being visited. However, it is important to note that the "success" of the inventories varied (Table 2.1). At boat ramps and private

sites, where there was frequently nobody to interview, the only data gathered were observational. This highlights the fact that gathering a full suite of key variables required a combination of observational information (both remote and on site) and a successful interview with a knowledgeable person on site. Even when this was possible, some data were frequently unavailable either because the interviewee did not know the answer or felt that the information was proprietary. Where access was not possible, little to no data were gathered.

Inventories were not conducted at 193 of the listed facilities. The majority of these were not recreational boating facilities. These misclassifications were probably due to limitations in the ability to accurately identify some facilities in the pre-field research. All researchers were inclusive when it came to classifying a facility as boating-related and relevant to this study. More specifically, sometimes it was not possible to accurately determine a facility type and the rule was: "If in doubt, keep it in". Additionally, due to the dynamic nature of the boating industry, the types of facilities may have changed.

Of those facilities that were inventoried, over 70% were multi-family or condominium properties. An additional 7% were single family residences. While the pre-field research aimed to exclude single family residential properties, these sites may have been classified as something else in the parcel data.

Table 2.1: Results of site visits as a percentage of the total number of sites identified in the pre-field research.

Situation	% of Sites Identified	n
Inventory completed	84.01	1,014
Non-recreational	7.29	88
No Access	2.82	34
Part of another facility	2.4	29
Closed	2.24	27
Boat access required	0.75	9
Refused to participate	0.33	4
Duplicate ID	0.08	1
Unable to locate	0.08	1

2.4.5 Conclusions and Recommendations

A number of conclusions from the Lee County pilot study shaped the inventory process that was conducted throughout the rest of the state.

Online Data Access for Boating Facility Managers/Owners

There was a low response rate to the request that facility operators access the online survey and fill in the data. Those that accessed the site frequently did not complete the survey. In these cases it was necessary for BRI to send field personnel to the facility and sometimes the information entered did not match that which was gathered by the field personnel. This may have been due to the particular way in which some variables were defined. For example, the inventory differentiated between broadside berthing and wetslips. However, when asked how many wetslips they have, many operators do not distinguish between the two. It was therefore decided that the cost and time necessary to contact all facilities and seek their participation was not warranted.

Single Family Inventory

There were a number of problems associated with undertaking an inventory of residential properties, and in particular single family residential properties. The first and most obvious issue was one of

logistics. During the Lee County pilot study, field personnel successfully visited 380 waterfront multi-family properties and 337 condominiums. These accounted for over 70% of the "successful" site visits.

A recent estimate puts the number of waterfront single family residential properties in Lee County at approximately 14,000. These alone were more than 10 times the total number of facilities that the field personnel were asked to visit in Lee County. This number did not include those properties classified as "vacant residential" in the appraiser's parcel data. Analysis of the orthophotographs of Lee County showed that many of these "vacant" properties either had residences on them or had docks. However, the 14,000 were not waterfront single family residential properties with boating facilities because many properties in Lee County are on canals in Cape Coral. These canals have bulkheads and it takes little time or investment to convert a bulkhead into a berth for a boat. As can be seen in Figure 2.1, if the owners of any of the highlighted properties added a couple of cleats and some fenders, their waterfronts would become single family residential boating facilities. Additionally, such an investment could occur almost overnight so that a property may have no berths one day and a boat alongside the next.

Figure 2.1: Single family residential properties on canals in Lee County. As there are bulkheads, even those properties without an apparent dock could be used for berthing.

If an inventory were to include site visits to all potential single family boating facilities, the number of sites that field personnel would have to visit would be unfeasible. Figure 2.2 shows the sites visited in part of Lee County. Figure 2.3 shows the necessary site visits if single family docks were inventoried.

Lee County maintains an electronic database of permits issued for docks and waterfront structures. The Lee County Division of Natural Resources, Marine Services Program provided this database of "Dock and Shoreline" building permits issued between January 1, 2000 and September 18, 2006. The excel file contained 3,185 permit records for docks and davits, and included information on the type of permit, type of waterbody, number of units (boats that could be accommodated), parcel number, and type of land use (residential or commercial).

The project team was able to join these data with the parcel data to map the database. This was quite useful but it was clear that there were many more private residential docks than existed in the permit

database. Discussions with officials also suggested that the quality of permit data varied significantly across the state and that it was unlikely that the existing data would be of great use in this study.

Figure 2.2: An area of Lee County with locations of boating facilities other than those possibly located at single family residences.

Figure 2.3: An area of Lee County showing locations of boating facilities and possible locations at single family residences.

Figures 2.4 and 2.5 show the same information as the previous two figures but for the whole of Lee County.

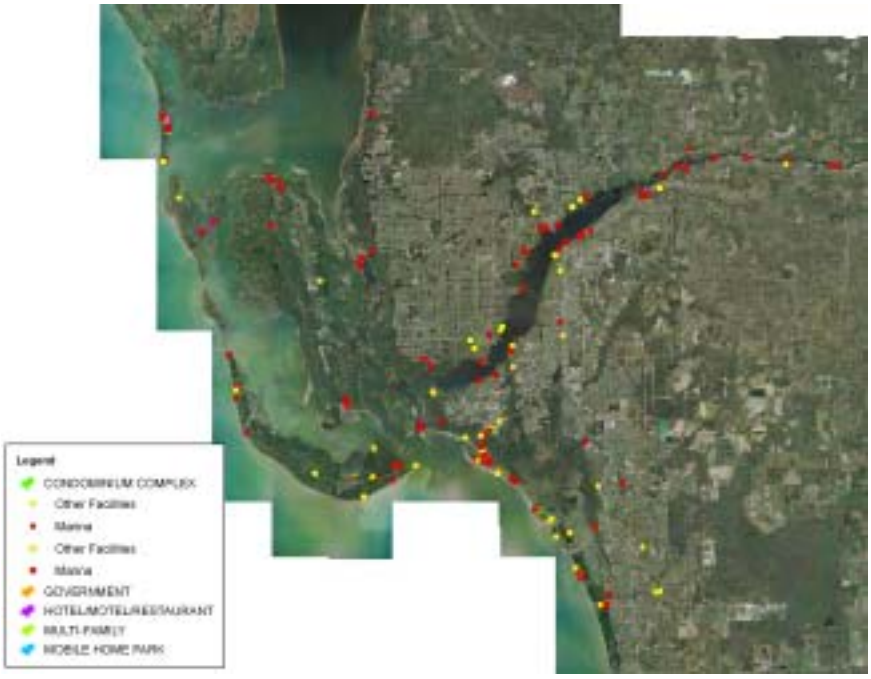


Figure 2.4: Lee County showing the locations of boating facilities other than those potentially located at single family residences.

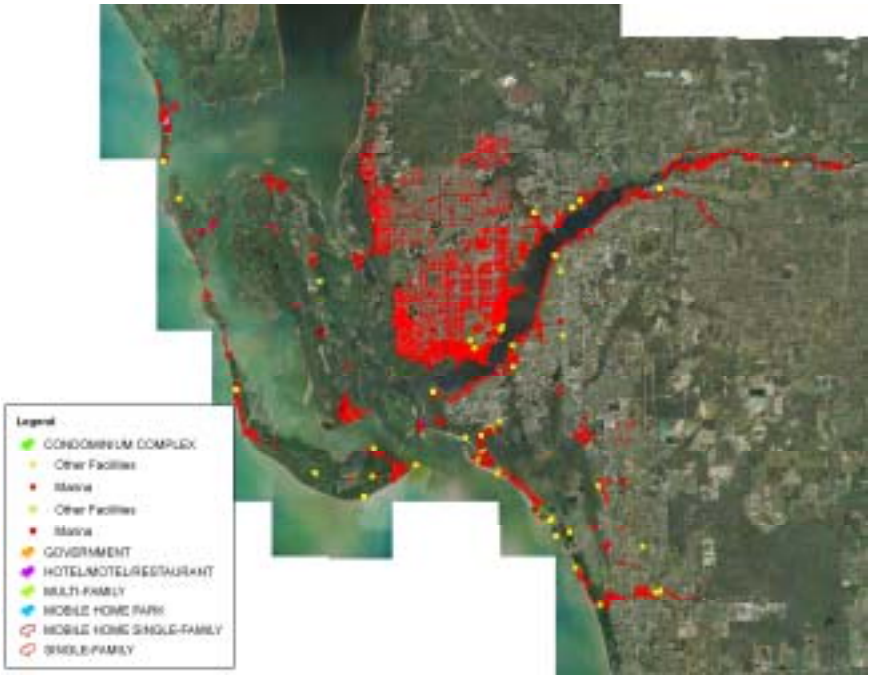


Figure 2.5: Lee County showing the locations of boating facilities and possible locations at single family residences.

Accessing Residential Properties

As discussed above, the number of single family residential properties made conducting site visits unfeasible. A second issue that is true for all residential properties, but more so for the smaller ones, is that the situation is so dynamic. Properties are being developed at a high rate in Florida and as such, any count of boating infrastructure at small residential properties will rapidly become out-of-date. The problem is exacerbated by the fact that the cost and effort involved in constructing a small private dock are not highly significant, and so this type of dock construction is likely to occur frequently. However, these docks tend to be for a small number of boats (one or two) and are generally only for private use.

An additional problem with surveying residential properties was that even when a site was accessed, there was nobody in charge who could be interviewed. As a result, much of the information gathered was purely observational, and there was no way to ascertain if the facility was open to the public.

Variables and the Field Inventory Method

The degree to which inventories were successful varied significantly even when access to the site was possible. The extensive suite of variables meant that some data could be gathered using remote observational methods, while others required access to a site and yet more could only be determined through an interview with management personnel. No single method allowed for all key variables to be gathered. The specificity of some of the variables and the need to train field personnel to adhere to a strict method also meant estimates made by untrained personnel were circumspect – less so when interviews were conducted on site and the field personnel could explain the variables as necessary. An example of where data from field personnel and a site manager might vary is the parking area. Field personnel counted designated parking spaces. If there were no designated spaces, they were trained to pace out the parking area and provide an estimate of the area in square feet. Site managers will generally estimate the number of parking spaces based on their experience. While this is valuable information, it is not derived from the agreed method and is not necessarily comparable to the data gathered by the trained field personnel.

It was clear from Lee County field work that the greatest success would be achieved by a site visit where the field personnel could gather observational data and could conduct an interview with a knowledgeable site manager. At boat ramps, much of the key data were observational therefore an interview was less critical than successfully accessing the site. At other boating facilities a larger amount of key data could only be gathered through a successful interview. Therefore, due to access limitations and the ability to successfully conduct interviews, the success of inventories was expected to continue to vary.

2.5 STATEWIDE BOATING ACCESS FACILITIES INVENTORY

2.5.1 Method

The method for conducting the inventory was outlined in the RFP, refined in the research proposal, and adjusted in response to lessons learned from the Lee County Pilot Study. The FWC anticipated the need for an adaptive approach to the inventory, stating the uniqueness and magnitude of this effort in the RFP.

2.5.2 Online Survey of Marinas and Other Boating Facilities

Development and Features

The facility inventory consisted of an online survey instrument developed to serve several purposes. The online survey had a number of short- and long-term advantages for the project.

The online survey initially aimed to:

- Provide a convenient way for marinas to provide survey responses;
- Serve as the data entry interface, allowing survey data to be entered directly into the central database;
- Allow researchers at different locations to simultaneously and remotely access the online website and enter data directly into the database without creating multiple copies; and
- Be used as a final step to secure additional data and to confirm data obtained through the field visits and/or from existing sources.

Advantages of the online survey:

- It provided a relatively inexpensive way to conduct a survey of commercial boating facilities;
- Responses were entered directly into the central database; and,
- It could be used in subsequent years to update data with minimal expense and effort.

The online survey allowed boating facility owners/managers to provide data using an easy-to-follow questionnaire on their computers. The online survey was designed to move the respondent efficiently through the series of questions. It was programmed to skip over questions that were not relevant to the facility based on prior responses. When the respondents hit "submit," the data were transmitted directly into the centralized database. The facility owner could complete the survey on his/her own schedule and in multiple sessions, if necessary.

Through the initial identification of boating access facilities using existing data sources, potential commercial marinas were identified in Lee County. Contact names and mailing addresses were obtained and an introductory letter was sent to each of these facilities. The letter, signed by Kenneth Haddad, Executive Director of FWC, briefly described the project and asked the facility owner/manager to participate in the survey by logging on to the online survey. The letter provided the site's URL and a unique identification code that enabled the recipient to access the website. The identification codes were randomly assigned so that one marina could not easily access the information of another (see Section 2.5.4, Map and Spreadsheet Development below).

Initial Responses

In the weeks following the mailing of that letter, about six facility owners/managers entered some data into the database through the online survey. Only one facility's responses included financial information. Four weeks after the initial mailing, a reminder letter was sent to those who had not responded, again asking for their participation. Enclosed with the letter was a one-page brief on the project. The reminder letter generated some data from two additional facilities. Mailings continued with a number of other counties but response rates remained low. Due to the low response rate and to the fact that field personnel were still attempting to visit all sites, mailings were stopped. The cover letter was modified and used by field personnel as a way to introduce and explain the purpose of the study. The online survey instrument continued to be used as a data entry tool and was used extensively during the backfilling and data cleaning processes.

2.5.3 Field Forms

As discussed in Section 2.3, the project team developed two online surveys - one for ramps, and one for other boating facilities – in order to gather data about the variables mentioned in the RFP. The pilot in Lee showed that survey response rates were too low to make the online surveys the primary method of gathering data and, as a result, it was decided that the field team would need to visit each site identified by researchers.

This shift in method necessitated the development of survey forms that were more user-friendly for field personnel. Working closely with BRI, researchers from UHI re-formatted the questions from the online surveys into a primary form, a ramp form, and a series of six supplemental forms.

The primary form was used to gather the most basic information about a site, such as facility name, facility address and whether or not the facility was open. In order to address the fact that researchers were not always able to speak with someone on site, the primary form also captured information that was observational in nature. Finally, a series of questions at the end of the primary form gathered information about what types – if any – of boating infrastructure were present, such as wetslips, drystack storage, moorings and amenities. When possible, a primary form was pre-populated for each site (stand-alone boat ramps excluded) with a facility's unique ID, name and address to help field researchers locate the site.

If a researcher found that a facility had wetslips, moorings, broadside berthing, drystacks, outside boat storage, a public boat ramp or transient space, he/she was instructed to fill out the corresponding supplemental form(s). In addition, researchers filled out an amenities form for each site. When a researcher was able to talk to a facility manager, he/she also filled out another supplemental form about the site's employment and financial history.

In those cases where field personnel were visiting stand-alone ramps, they only had to fill out the ramp form. Again, when possible, ramp forms were pre-populated with the site's unique ID, name, and address to help researchers locate the site.

Restructuring the field forms improved the efficiency of site visits – for both the field team members and those they interviewed – and also drastically cut down on the number of pages required for each site visit.

Restructuring the forms made them more useful; but the process was very time-consuming and detail-oriented. Initial field tests Identified areas where the original survey could be improved to increase its usability and efficiency. Though such an in-depth examination of each question resulted in initial delays with field work, the end products were well-tested tools that clearly stated questions and collected data as intended.

See Appendix A for copies of these field forms.

2.5.4 Map and Spreadsheet Development

Overview of the Process

The method for acquiring information on boating access facilities in Florida relied on existing sources of data and on the acquisition of data directly from the facilities. There were two steps in the process: determining the existence and location of all boating access facilities; and, obtaining accurate, reliable and current data on each facility.

A summary of the process for developing the comprehensive list of boating access facilities, pre-populating the field survey forms and creating the field survey maps is depicted in the red box in flow chart (Figure 2.11) later in this section. The full method utilized numerous available data sources and involved over 100 steps for each county.

Research Prior to Field Visits

Developing a List of Facilities and their Addresses

The method that was developed relied heavily on GIS. This was largely due to the fact that many of the available sources of information existed in GIS format. Additionally, it was clear that the field personnel required detailed maps of the location of facilities. Such maps allowed them to determine whether they

were at the correct location and also assisted them in planning the most practical route to follow during the inventory. It is important to note that the GIS developed during phase I of the project was distinct from that which was developed by FWRI in phase II. The phase II GIS used the data gathered in phase I as the basis for developing a series of products.

The initial step of developing the list of facilities focused on two marine facility datasets: the FWRI's Florida Marine Facilities GIS data and the DEP's Marinas GIS data (details about the GIS datalayers used in this project are described in greater detail below). The data for each county were extracted and overlaid over orthophotographs in ArcGIS 9.0. When available, the digital parcel data were added. The attribute tables of both the FWRI and DEP layers were examined and irrelevant points (such as beach access points and fishing docks) were deleted. The point data were then edited so that each point was located on a facility and duplicate points were deleted. The parcels identified by the point data were edited to include the name, address and any other data readily available for the facility. If parcel data were not available, either the point data were used or polygons were manually created to represent a facility, depending on what data were available and contained the most information. As the aim was to provide the best guidance to the field personnel, either point data or polygon data were acceptable.

Parcel data can be slow to work with in GIS due to the file size; therefore, non-waterfront parcels were deleted to make the program run faster. Once complete, other datasets (such as the FWRI boat ramp layers) were added, then the parcel data were searched to find any land use codes of interest such as marinas, hotels and mobile home parks. If a visual inspection of the orthophotographs revealed a boating facility, then the parcel data were edited accordingly. Visual inspections were also carried out on other datasets to verify that they actually identified facilities. If a facility was obscured in the orthophotograph then Google Earth was used to verify details.

All readily available sources of information were checked to try to ensure that facilities were not missed. This included state, county and municipal websites; county comprehensive plans; wildlife area maps; fishing guide maps; and internet searches (e.g., for the county name and "ramp" or the county name and "marina"). Additionally, the *Florida Atlas and Gazetteer* and the Maptech Embassy Guide to Florida were checked for other facilities. As other facilities were found, the parcels or point data were edited to identify them as boating facilities.

Once these steps were completed, the waterfront of each county was visually scanned to ensure that facilities had not been missed. The rule during this step was "if in doubt, keep it in" so that anything that appeared to be a potential facility was included.

Once researchers had completed these steps, they then had to try to obtain the name and address of the facility. It was quickly ascertained that ensuring the correct name of a facility was going to be a difficult task. Much of the available information (e.g., websites) had no dates, and researchers would sometimes find several names for the same facility with no way of knowing the current name. Exact addresses were difficult to verify as well. Some parcel data included addresses, but because these were appraiser's databases, the addresses were generally the addresses of the owners of the properties. These were often, but not always, the address of the parcels. Thus it was evident that the initial confirmation of an exact address or name was of less importance than having the location clearly mapped on an orthophotograph. Once a field researcher visited the site, he/she could obtain the exact address and name.

GIS and Other Resources

As the above processes indicate, initial facility identification and map development, as well as backfilling required multiple resources. This section describes those resources in greater detail.

Florida Marine Facilities GIS Data

The Florida Marine Facilities is a GIS layer (called Mar_Fac) containing point data indicating the approximate location of marine facilities throughout Florida. The shapefile was developed by FWRI in 2000 and aimed to represent the marine facilities in the state of Florida, along with their street addresses and physical locations. The GIS dataset contains point data including the names and addresses of a variety of marine facilities, including marinas, boat ramps and some yacht clubs and condominiums.

Limitations:

- The data are from 2000 and there have been a number of changes since the information was collected;
- The data include fishing piers, bridges and beach access points (which were not relevant to this project);
- The data contain little information about the amenities and attributes of each facility;
- The data are not comprehensive; and
- The scale at which the data were collected means that the points do not necessarily fall within parcel boundaries.

Marinas GIS Data

The Marinas GIS Data is a GIS layer (called GC_Marina) containing point data indicating the approximate location of marine facilities throughout Florida. The shapefile was developed by the University of Florida's GeoPlan Center in 2003 using data from the Florida DEP on marina facility information for the State of Florida. The aim of developing this dataset was to serve as base information for use in GIS systems for a variety of planning and analytical purposes. The GIS dataset contains point data that include the names and addresses of a variety of marine facilities. These include marinas and other marine facilities. There are additional data regarding the amenities associated with some of the marinas.

Limitations:

- The data are from 2003 and there have been a number of changes since the information was collected;
- While the attribute table has columns for data on marina amenities, much of this is blank;
- The data are not comprehensive;
- The scale at which the data were collected means that the points do not necessarily fall within parcel boundaries; and
- The points were generated by geocoding. This generates points based on the street addresses and means that the points frequently lie on the street and not on the parcel or the facility.

Digital Orthophotographs

Orthophotographs are aerial photographs that have been geometrically corrected so the scale of the photograph is uniform. As a result of this process, such images can be used as base maps in GIS applications and true distances can be measured from them.

Orthophotographs were an essential tool in developing the comprehensive database of marine facilities, and were used as the base map on which facilities were overlaid to guide the field personnel during site visits.

The value of orthophotographs varies considerably based on a number of factors. These include:

- Year;
- Resolution; and,
- Type of orthophotograph (i.e., black and white, infra-red or color).

A number of different sources of orthophotographs were used. Those provided by Lee County were of the highest resolution (1 pixel = ½ foot) and were produced in 2005. Orthophotographs of this resolution are generally not widely available and, while the resolution makes them a valuable tool, they are slow to use in GIS applications, especially when viewing complete counties.

An alternative source of orthophotographs is AirPhoto USA. They provide color orthophotograph coverage for a large percentage of Florida. The company also developed an extension for Arc GIS that allows for the rapid loading and tiling of orthophotograph images. Their coverage of Florida is contained in fifteen sub-regions and all of these were purchased for this study. Nine of the sub-regions were photographed in 2005, three are from 2004, two are from 2003 and one set is from 2002. Most of the images are at a scale of 1 pixel = 2 feet (although in some areas 1 pixel = 1 foot).

Figure 2.6 compares the Lee County orthophotographs with a resolution of 1 pixel = ½ foot (top) to AirPhoto USA orthophotographs of the same apartment complex and dock at a resolution of 1 pixel = 2 feet (bottom). While the detail in the Lee County images is much greater, the higher resolution made these orthophotographs slower to work with. Consequently, the AirPhoto USA images were most frequently used.

The Department of Revenue also has high resolution orthophotographs available. These orthophotographs were not obtained however, as the faster AirPhoto USA orthophotographs proved more than adequate to guide the field personnel to the correct facilities.

An alternative, freely available source of orthophotographs is the Florida DEP's Bureau of Survey and Mapping. Through their Land Boundary Information System (LABINS) it is possible to download orthophotographs that cover the whole of the state. These are from 2004 and most are at 1 pixel = 2 foot resolution. LABINS orthophotographs were used when AirPhoto USA images were not available or were dated (Figure 2.7).

While various sources of orthophotographs were used during several stages of this project, the images available through Google Earth were also frequently used to verify details.

County Parcel Data

Over the last few years the Florida Department of Revenue's Property Tax Administration has funded the Digital Map Conversion Grant Program. This is a cost sharing program aimed at assisting with the costs of digitally converting the county property appraiser's cadastral maps throughout the state. This effort has also meant that land use codes have been standardized across the state. Parcel data are useful for facility identification for two reasons. Firstly, the attribute data often contain land use codes including one for "airports, commercial or private, bus terminals, marine terminals, piers, marinas". Secondly, parcel data clearly define the parcel boundaries. This is particularly useful when a number of marine facilities are located side-by-side along the waterfront. The Department of Revenue kindly provided the researchers with all of the available county parcel data. In 2005, all but five counties had largely completed the digitization of their parcel data, however, the quality of the data varied. Some counties still lacked complete coverage, and others had limited data associated with the GIS layers (Figure 2.8). One particular problem was that many counties only recorded the owner's address when, for the purpose of field visits, a physical address would have been more helpful.

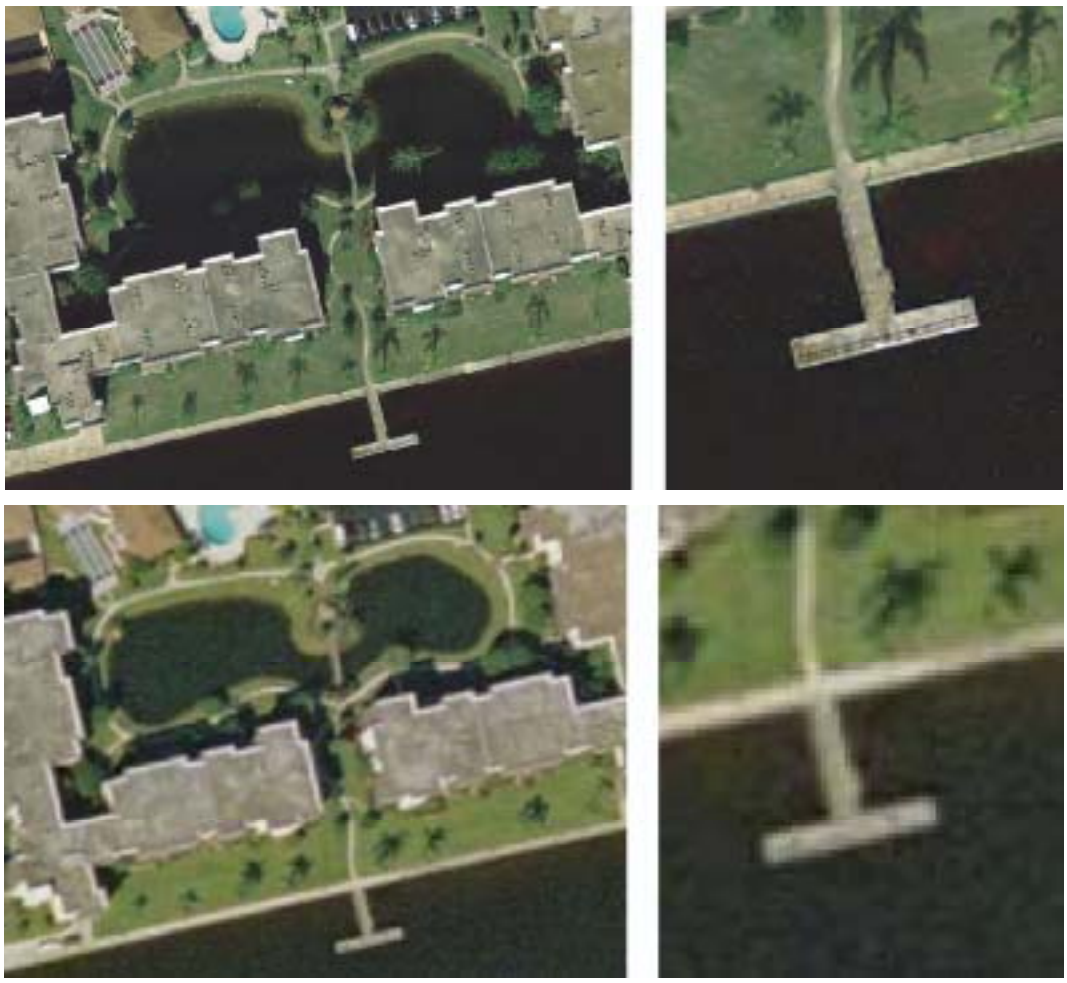


Figure 2.6: Comparison of Lee County orthophotographs (top) and those from AirPhoto USA (bottom).

Despite certain limitations with the data available at the time, the GIS parcel data were critical during many of the analytical steps used during this study.

County Property Appraiser's Online Data

Where available, the county appraiser's data also proved to be useful to supplement the digital parcel data. Many websites contained physical addresses and some also included photographs of the property – greatly assisting with facility identification. However, some counties had no information available online and a number of other sites were found to be slow to use and frequently "crashed".

FWC Photo Ramps and Potential Ramps GIS Data

In 2006, FWRI made two GIS layers available. The first, called "photo ramps" contained facilities that FWRI staff had recently visited to obtain photographs for a web-based GIS program. This file contains descriptive information for 443 ramps mostly located along the coastal regions of the state. While largely focused on coastal counties, the data also included information on ramps on a number of the larger river systems. Many of the photo ramp sites were listed in other places. Quite a few new sites were observed, and all of these sites were confirmed operational as of the inspection date contained within the records.

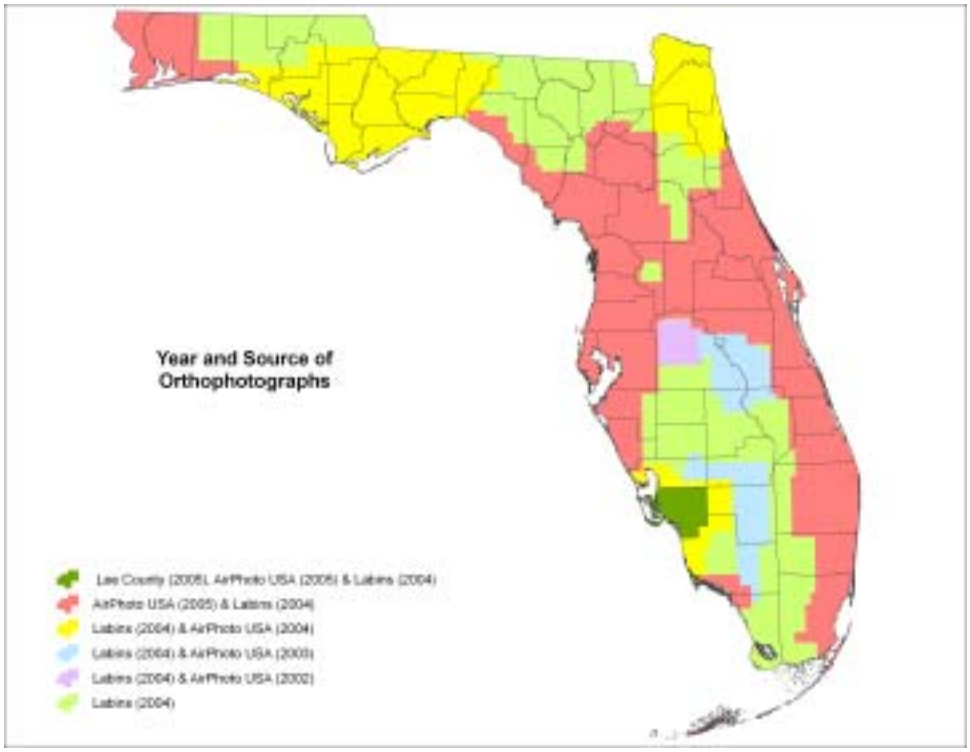


Figure 2.7: Orthophotograph sources showing their coverages and the year they were produced.

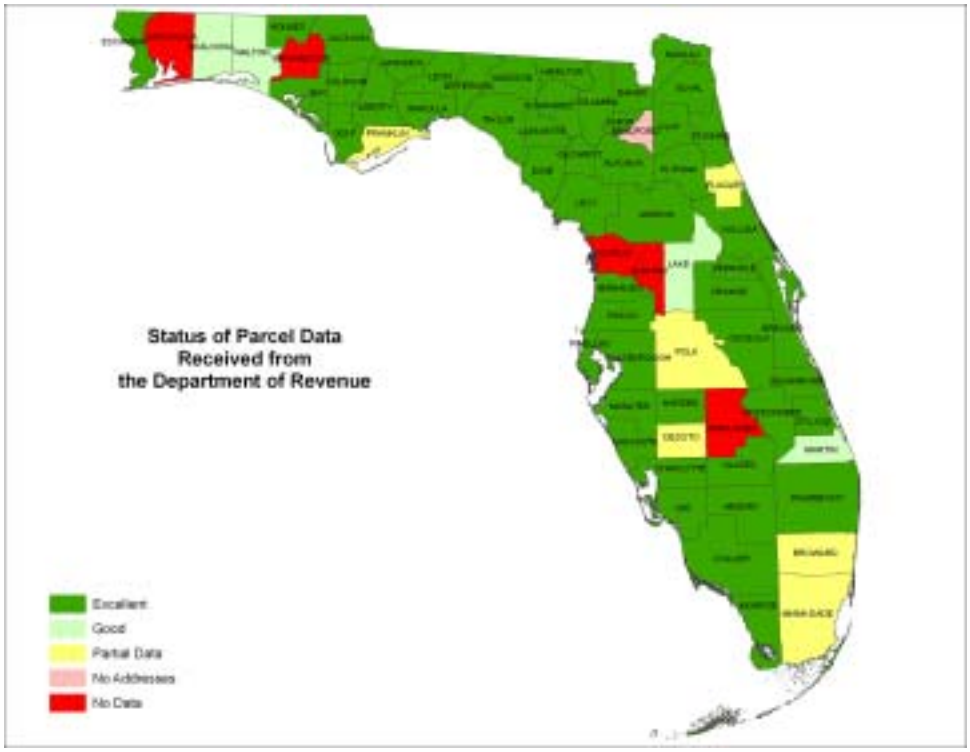


Figure 2.8: Parcel data received from the Department of Revenue.

The second file, called “potential ramps”, includes sites that FWRI staff observed in aerial photographs or during other surveys. This file contained 395 data points appearing to be active ramps. None of these ramps had been inspected or verified. An updated “potential ramp” file was provided in early 2007 that contained 685 records. In early 2008, FWRI provided the latest “potential ramp” datasets.

The boating access facilities method incorporated these two datasets and also identified other potential ramps from the orthophotographs.

Florida Geographic Data Library GIS Layers

A number of important layers from the Florida Geographic Data Library (FGDL) were used for this project. FGDL is a mechanism for distributing GIS data, and is warehoused and maintained at the University of Florida's GeoPlan Center.

Important layers included the county boundaries, parks (from the Florida Natural Areas Inventory), major roads (from the Florida Department of Transportation), towns (from the 1970 National Atlas of the United States) – all of which were used to help guide the field personnel to the boating facilities that were identified. Additional sets of critical GIS data were a waterbodies layer (from the National Hydrography Dataset), county-level hydrography from the Unites States Geological Survey (USGS) at a scale of 1:24,000, and a navigable water layer (derived from the National Waterway Network). A combination of these layers was used to identify those parcels deemed to be “waterfront”. This was particularly important when developing the residential sampling method (see Section 2.6.3).

Other State, County or Municipal GIS Data

The availability of county and municipal data varied significantly and the quality had to be assessed on a case-by-case basis. While some of the available data appeared at first glance to be of great value, further analysis revealed that it was not always reliable. For example, one county had an available GIS layer called “marinas” that contained a number of the attributes needed for this study. However, once the boating access facilities method was implemented, it was found that the county layer was not comprehensive. While such layers often did not contain comprehensive information, they remained a useful secondary source of information.

Florida Atlas and Gazetteer

A particularly valuable resource used to assist in the identification of boat ramp locations was the 2006 edition of the *Florida Atlas and Gazetteer* published by DeLorme. This publication contains 103 quadrangular maps covering the whole of Florida. Each map is at a scale of 1:150,000. While the maps show the location of boat ramps, it is clearly stated that a boat ramp symbol does not imply that it is a public ramp, and that the ramps may be seasonal or have a fee associated with their use. Additionally, it was unclear whether the use of the ramps was restricted to certain types of boats (e.g., kayaks and canoes only, or no gas powered engines). While not comprehensive, the locations of those ramps shown in the atlas were found to be generally accurate and the maps contained sufficient detail to allow for the ramps’ locations to be identified using the orthophotographs. The atlas was particularly useful for locating ramps in rural areas where the available directions to ramps were often vague. While the majority of the ramps shown in the atlas were successfully identified and field visited, a few were found not to exist when the locations were visited.

Other Data

There were many other sources of data used during this study; and during the project, new and more reliable sources continued to become available. While data from the internet are notoriously variable in quality, a number of key online resources were of significant assistance. Most notable of these was

Google Earth which allowed for rapid verification of information. The "Street View" function of Google Earth was also useful as, when available, it allowed researchers to view a site from street level. This sometimes facilitated site identification.

Other online map sites such as MapQuest, Google Maps and Expedia Maps were also extensively used. Expedia Maps was particularly useful in rural areas where determining the local town or zip code for a site could be challenging. When unsure of these details, Expedia Maps allowed users to enter a road name and would provide a list of roads with that name in Florida. From this information, the town and zip code could be determined.

Other essential online resources included marine industry association listings, websites dedicated to a particular facility, as well as state, county and municipal websites. When little information was available, internet searches were executed to identify other sources of information. These other sources sometimes included realtor listings for properties for rent or sale in condominiums with boating facilities. Such sites often contained photographs that helped identify the location of facilities. Such searches also uncovered fishing guides which frequently mapped more remote or rural boat ramps that were difficult to locate through other resources. However, apart from certain trusted sites, the information available on the internet was very difficult to verify and notoriously variable in quality; therefore many sites were simply used for secondary verification.

Another important data source was the 2003 Maptech *Embassy Boating Guide*; however, data in the guide often contradicted information on a facility's dedicated website and so was not viewed as 100 percent reliable. The online site Marinas.com has developed significantly over the duration of this study. It is particularly useful in that it provides aerial photographs from various angles that greatly assist with site identification. Some data contradicted other sources, and the information on Marinas.com was not dated; however, the value of this resource should continue to increase as more marina operators fill in their details.

Manatee Plan Data

A number of counties have completed manatee protection plans that provide data on boat numbers and where they are stored. Many of these plans are now dated and only limited data were available in GIS format. Lee County provided the GIS data from their manatee protection plan. The data were gathered between 1999 and 2001 to identify boats that were berthed on or adjacent to marine waters. Data were collected using a boat and a Global Positioning System (GPS).

While the hope was that these data would be of use for this project, it was found that very little of the data in the attribute table were relevant to this study. Additionally, the data contained a classification of the type of facility where boats were berthed (marina, multi-family, single family, etc.); however, this appeared to correlate poorly with other data from the two statewide databases and the county parcel data.

Additionally, few manatee plans are available electronically, and many existing plans are dated; therefore manatee plan data were only used for secondary verification.

Permit Data

Lee County provided building permit data from the beginning of 2000 to 18 September 2006. The excel file contained 3,185 permit records for davits and docks. For each record, the database included the type of permit, the type of waterbody, the number of units, the STRAP/parcel number and whether the site was commercial or residential.

The building permit database was joined with the GIS parcel data. A significant limitation with the Lee County dataset was that it was only available from 2000. Therefore, any structures permitted before

that time would not be included. Additionally, the permit data covered davits and docks but appeared not to include simple broadside berthing. Especially along canals, berthing may not be associated with a dock or davits but may simply consist of a couple of cleats along the waterfront. If these are not permitted, then permit data can only be used for secondary verification. Another issue is that permit data vary from county to county. Some counties suggested that their data exist only in hard copy format which greatly limits how they may be used.

Creating the Field Maps and Pre-Populated Forms

In order to be able to link the databases, it was necessary to give each facility a unique ID. These were designed not only to allow for the county in which the facility was located to be clearly identified, but to ensure that one facility operator could not "guess" the ID for a rival facility. Therefore, each facility was allocated a unique ID that consisted of two letters identifying the county, followed by a five digit number, and ending with a random combination of two letters (e.g., LE12345AB). These IDs were created in Excel and then pasted into the attribute table of the facilities GIS layer. It was therefore possible to label each facility with its unique ID on the maps used to guide the field personnel to the sites (Figure 2.9).

To facilitate field visits and make useable maps, a series of "frames" were created in the GIS application that encompassed only a small number of facilities. These frames allowed researchers to select a frame and zoom in to it, making a close-up map of those facilities. While the scale of the fame varied, it was designed to contain enough information to successfully guide the field personnel to the facility. Normally, each frame filled the layout on a letter size map at a scale of approximately 1:6,000. Additional data were added including the GIS layer "major roads". The frames were repositioned so that they captured a named road, and where possible, an intersection. If a named road was not located near to the facility, Google Earth and other online mapping websites were used to identify a nearby road and the map was edited to create the unmarked road. Despite these efforts, it was not uncommon to have a boat ramp located at "the end of Unknown Dirt Road, off Unknown Road". In worst-case scenarios, notes were added to the map to aid in locating the facility.

Once everything else was completed, a series of field maps were produced (Figure 2.9). These maps varied from a couple of maps for a less developed county to almost 200 maps to capture all the facilities in a county with a high number of facilities. These field maps were accompanied by locus maps (Figure 2.10) so that fieldwork could be coordinated by BRI. The locus maps also allowed field personnel to plan their journeys to be as efficient as possible. In addition, the GIS attribute tables for the facilities were exported to create an administrative form and a series of field forms (Appendix A). These contained the unique ID, map region, map number, name, address and whether the facility was a stand-alone boat ramp or a marina-like facility.

In order to minimize the chance of transcription errors, the forms that the field personnel were to use during their site visits were pre-populated with data from the administrative excel file. By conducting a mail merge in Microsoft Word, a "primary form" or "boat ramp form" was pre-populated with each facility's map region, map number, unique ID, name, address, county and zip code. These forms were then collated with the relevant maps and shipped to BRI.

As it was necessary for field personnel to site visit all facilities, the materials that they were given to guide them to the facilities in question had to be as complete as possible. In order to ensure that the information was as comprehensive as possible, multiple steps were taken to prepare each county. It is estimated that preparing the field materials for a county with relatively few facilities took about 20 hours; however, a more complex county with a high number of facilities could take upward of 120 hours to prepare. A simplified method is shown in the flow chart below (Figure 2.11).

Figure 2.9: Field map used by personnel to locate potential boating facilities in Escambia County.

Pre-populating the Online Databases

Once facility identification in a county was complete, researchers developed an excel spreadsheet listing stand-alone ramps, and another spreadsheet listing all other types of boating facilities. Each spreadsheet contained the site's unique ID, name (if available), address, city, and zip code. The spreadsheets used column headings and formats consistent with those in the databases, allowing staff at RMRC to create records in the databases simultaneously. This system of performing "data dumps" saved the data entry personnel many hours and reduced the chances of typographical errors. This latter advantage of the system was especially important for the unique ID field, which had to be entered correctly in order to access a record.

Training Manual

Initial site visits with the research team and further site visits by the field personnel confirmed the need for a training manual that provided field team members with definitions and detailed instructions on how each piece of information should be gathered. Developed in conjunction with the field forms, the manual's format matches the structure and flow of the field forms. As with the field forms, the training manual was extensively tested and revised to meet the needs of the field personnel for both training and actual field work purposes.

See Appendix B for a copy of the training manual.

Fieldwork

Experienced interviewers employed by Bordner Research attempted to conduct on-site visits at all boating facilities identified in Florida's 67 counties. Any boating facilities discovered by interviewers in the course of their fieldwork were added to the appropriate database.

As discussed in the Lee County Pilot Study section above, the experiences of fieldworkers in the September 2006 pilot study necessitated revisions to the field forms to render them more clear and field-friendly. Fieldwork for the remaining counties began in late October 2006 and was completed in August 2007.

Figure 2.10: Locus map for the south of Escambia County. Numbered boxes identify individual field maps.

Training

Prior to beginning fieldwork in each county, fieldworkers completed a one-day training session on the purpose, requirements and procedures of the project. This training included both classroom and on-site instruction. Classroom instruction included discussion of the background/purposes of the research, benefits to participating facilities, terminology, definitions, general procedures for handling variable situations, and an in-depth review of each survey form. All fieldworkers were given the training manual (see Appendix B) covering all relevant topics for reference during data collection.

Upon completion of the classroom instruction, fieldworkers were taken to several marinas and several ramp locations for hands-on training. Each interviewer was required to complete the appropriate survey form(s) on their own prior to group discussion. Using these procedures BRI was able to resolve many fieldworker questions and confirm fieldworker understanding of the requirements of the study as well as the accuracy of measurements/recordings.

Quality Control

In addition to extensive mandatory initial training, quality control during the data collection process was established in the following ways:

1. Review of first day's work: Fieldworkers were required to send in their first day's work and wait for a review response from BRI senior staff before they were allowed to proceed with more surveys;
2. Ongoing review and timely response to completed work: Interviewers continuously mailed in small amounts (usually 10 to 15 sites) of their completed work which was reviewed and responded to (if necessary) by senior staff within two days of receipt;
3. Site re-visitation: Approximately six percent of the sites surveyed were revisited by a different fieldworker or BRI senior staff to validate accuracy of recordings;
4. Staff available seven days a week: Senior staff were available 24 hours per day during fieldwork to answer questions and/or resolve field problems that might arise; and
5. On-going fieldworker evaluations: Any fieldworker whose completed work was found to be substandard by BRI senior staff was immediately removed from the project and their work was re-fielded.

Challenges

A number of challenges presented themselves during the data collection process. First, site location was difficult in some instances. In some counties the most current available aerial photographs used to identify sites were several years old (Figure 2.7). The age of the photographs, combined with the rapid pace of growth in many counties resulted in the discovery of several changes in land use and/or addresses while researchers were in the field. Oftentimes the facility name and/or specific address of a selected site was not provided to BRI due to limitations that researchers experienced with the lack of accurate data available for making maps. Many sites in rural locations were listed as being located on an "unnamed dirt road". In more urban areas many sites were difficult to find because they were located on multi-lane, high-traffic, high-speed streets that had no facility names or addresses listed on buildings. By using the following techniques, BRI was able to keep the number of un-located sites to a minimum:

- Senior staff reviewed maps/spreadsheets for completeness and legibility prior to fielding;
- Used maps from other sources to aide in specific site location;
- Had conversations with "locals" including police, firemen, postmen, municipal employees, convenience store clerks, cable employees, Federal Express drivers and residents;
- Extensively trained fieldworkers in the types and characteristics of sites targeted for inclusion in the research;
- Deployed two fieldworkers (instead of the typical one) per site to locate sites in large, high-traffic urban areas (in particular, Miami-Dade and Broward counties).

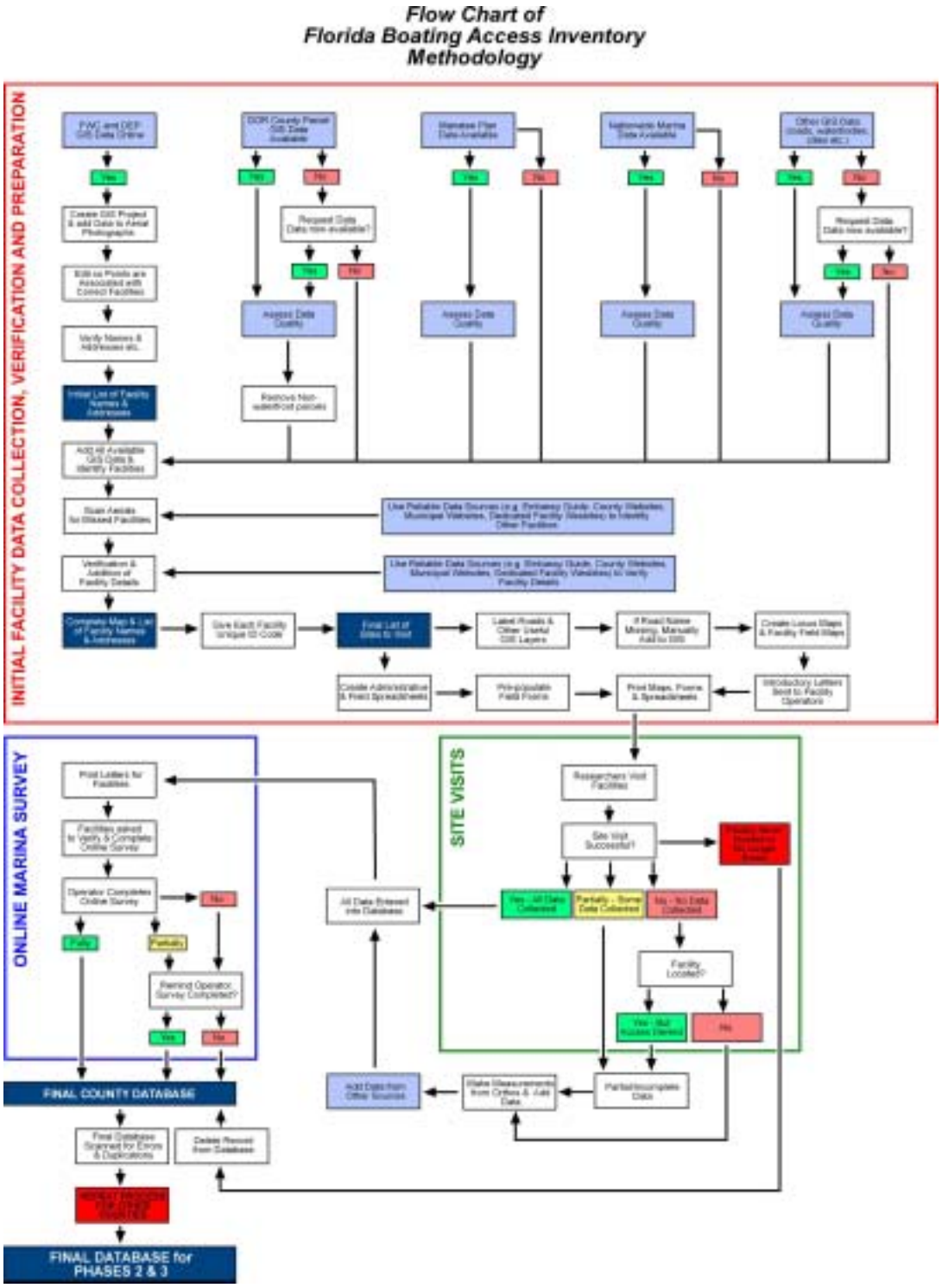


Figure 2.11: Flow chart illustrating the inventory process.

Second, physical access to some sites was problematic. Many sites (particularly condominium and other residential complexes with boating facilities) were gated and locked with keycard entry only. In these cases, field personnel made every reasonable attempt to gain access. If direct access was not possible,

fieldworkers would make whatever observations they could from an adjacent property. Not only was access to entire sites sometimes difficult, in some cases, physical access to relevant portions of sites was limited. At many sites the docks or ramps themselves were locked and gated. In these situations fieldworkers either talked their way in or obtained whatever information they could through observation outside the barrier.

A number of other challenges in the data collection process revolved around communication. Much of the data called for in the marina inventory required actually speaking with someone to obtain the information. The major obstacles to communication and the solutions employed to overcome them are:

Obstacle	Solutions
1. Limited availability of appropriate/knowledgeable person on-site at time of visit	a. Talk with anyone you could to get as much accurate information as possible b. If not able to speak to someone in official capacity, record information only if verified by a second person
2. General skepticism of surveys and how the data are used (fear of how information affect permits, licenses and taxes)	a. Spend time building rapport b. Show introductory letter to legitimize c. Explain benefits to participating facilities d. Explain purpose of study (multiple data uses) e. Inform respondent that he\she will have the ability to go online after study completion to check the information recorded and correct any inaccurate data
3. Poor reception to the length of the survey and detail sought	a. Obtain response to the key data on the Primary Form b. Obtain as much additional information as possible c. Interview multiple respondents at site d. Telephone follow-up for key data not obtained while on site e. Reiterate purposes of study and importance of participation
4. Refusal to answer certain questions, especially those related to service, rental rates and linear feet of dock	a. Assure respondent that answers to proprietary questions will be used as appropriate for internal research purposes and never identified with an individual facility b. Reiterate purposes of study as well importance of complete and accurate data
5. Understanding of terminology used in questions	a. When asking questions, include definitions to ensure respondents know specifically what is being asked b. Explain definitions of linear feet of dock, wetslips and wetslip types

Finally, there were two forces of nature which affected the data collection effort and delayed completion of Phase I: wildfires and drought. During much of the fieldwork many Florida counties experienced wildfires which delayed site visitation because of poor air quality and blocked-off roads in hazardous areas.

The drought conditions made many primitive ramp sites unidentifiable and raised questions about whether a given facility should be considered “open” or “closed”. In general, sites were classified as

open even if they were temporarily unusable, and a note on low water conditions was made in the Comments section of the online inventory form(s).

Data Entry

Prior to online data entry by BRI senior staff, the completed forms for each site were reviewed and the wording for open-ended responses, as well as additional comments, was determined. Attention was paid to making the open-ended responses as consistent as possible throughout all sites. To assure the quality of input, data were re-entered by a second person on a random selection of approximately 10 percent of the sites. Using this process, both the accuracy of data input and the consistency of data entry patterns were validated. Upon completion of data entry for each county, BRI prepared a list of sites that should be deleted from the databases. Recommended deletions included sites found not to be facilities at the time of visitation (e.g., no recreational boating use, single family homes, commercial businesses with no ramp, small condo sites under 10 units, sites that no longer exist and have not been replaced by another boating facility, etc.), sites that were part of another visited facility, and ramps that were exclusively for canoe/kayak use.

Data entry itself proved to be extremely time consuming due to the number of variables that had been collected and needed to be entered. To meet this challenge and to ensure as much consistency in the data as possible, BRI developed guidelines for data entry where necessary. For example, when multiple varying rental rates were provided, the following guidelines were used:

1. When two rental rates for the same item were provided, record the most common rate if it can be determined;
2. If the most common rate cannot be determined, record the highest rate;
3. If rental rates on an item are highly complex, do not record a specific rate but include as much information as possible in the Comments section.

To further ensure consistency, all data entry was completed by two individuals at Bordner Research, with each individual checking the other's work for errors.

Feedback from Field Visits

When Bordner Research was supplied with field maps and pre-populated inventory forms, they were also provided with an "administrative" spreadsheet. This contained basic information on all facilities and boat ramps that had been identified through the site identification process. The spreadsheet also identified which facilities were stand-alone boat ramps, and which were thought to be marina-like boating facilities. As the field personnel completed their work, they reported back to Bordner Research who edited the spreadsheets as necessary. If a site was visited and found not to be a recreational boating facility, it was identified as a record to be deleted from the databases. As each county was completed and the data entered by Bordner Research, the final administrative version was sent to UHI, and the highlighted records were manually deleted from the databases.

Facilities that could not be located or facilities where access was denied remained in the databases. Where limited data had been obtained in the field, efforts were made to supplement the data through the backfilling process.

Backfilling

Despite the success of the field visits, it was necessary to backfill some missing information when it was available. There were a number of reasons why the field personnel may have been unable to collect certain information. These included:

- The field personnel may have been refused access;
- There may not have been anyone on site to interview;
- The interviewee did not know the answers to all of the questions;
- The interviewee was too busy to complete the whole interview;
- The interviewee felt that the information was proprietary;
- The interviewee did not want to provide state and local agencies with any information; or
- The site could not be located.

Additionally, when the field personnel had identified new facilities, it was necessary to backfill the coordinates and any other information that had not been recorded in the field.

Where significant amounts of data were missing from a government-run, public ramp, attempts were made to contact the relevant management agency or department via both e-mail and telephone in an attempt to backfill the information. This had limited success as reaching the necessary person was not always possible and many of the required key variables were extremely specific and could not be readily gathered through a telephone interview. Additionally, field personnel had been trained to adhere to a strict method when gathering these data, making the inclusion of estimates provided by an untrained person questionable.

In many cases interviews were not possible. Therefore, in such situations, the backfilling focused on those pieces of information readily available through reliable sources. Additionally, the facility survey had been designed so that the more critical pieces of information were collected using the primary form. The online Florida Marina Monitoring & Tracking Survey was also designed so that the most important and most easily collectible data were entered on the first form. With both the field forms and the online data entry design, if certain questions received a positive response, this triggered a secondary form (or forms) for asking to gather more specific details.

The backfilling efforts focused on those pieces of information contained in the primary form and entered into the online General Marina Information section.

Resources

As was true with the initial identification of facilities, the reliability of data that can be used for backfilling was an issue. While the internet provided a wealth of information, only data contained on official state, county, or municipal websites and sites dedicated to a specific facility were assumed to be correct. Information contained on more general websites was not used due to the fact that its accuracy could not be verified and that there was often no way to assess if the information was current. Additionally, it was assumed that data collected during field visits were the most accurate; therefore backfilling only occurred where data were missing.

The specific resources used during the backfilling process included:

- Marine facility GIS layers developed during the site identification process;
- Orthophotographs;
- County parcel data;
- Google Earth;
- State, county and municipal websites;
- Dedicated facility websites; and
- Online mapping websites.

Method

Using the online access to the databases, the record for each site was opened and key pieces of information were checked for completeness. For boating facilities, the key information and possible sources of data for backfilling included:

- Facility name, address and contact details – state, county, municipal and dedicated websites;
- Coordinates – Google Earth and dedicated websites;
- Type of facility – county parcel data and dedicated websites;
- Type of waterbody on which the facility is located – Google Earth, orthophotographs, state, county, municipal and dedicated websites;
- If the facility has docks and length of docks – Google Earth, orthophotographs and dedicated websites;
- Maximum LOA and minimum depth at dock – dedicated websites;
- Number of parking spaces and surface materials – Google Earth, orthophotographs and dedicated websites;
- If the facility has wetslips and how many – Google Earth, orthophotographs and dedicated websites;
- If the facility rents wetslips, broadside berthing space, moorings, drystack, outside boat storage or has transient berthing (plus fees if information is available) – dedicated websites;
- If the facility has a ramp – Google Earth, orthophotographs and dedicated websites;
- If the facility is designated as a clean marina – state and dedicated websites;
- If the facility has amenities associated with it – dedicated websites; and
- Other specific site details – dedicated websites.

The method for backfilling ramps was almost identical but included a few details that were not needed for boating facilities. Additionally, backfilling efforts were focused on those ramps that could be used by the public. Fewer details were backfilled for ramps that were private.

Key ramp information and possible sources of data for backfilling included:

- Site ownership – state, county, municipal and dedicated websites;
- Access road type – Google Earth, orthophotographs, state, county, municipal and dedicated websites;
- Hours and fees – state, county, municipal and dedicated websites;
- Launch ramp details – Google Earth, orthophotographs, state, county, municipal and dedicated websites; and
- Types of docks associated with the ramp – Google Earth, orthophotographs and dedicated websites.

A number of additional facilities had been identified by the field personnel, and therefore the records did not include coordinates. Using a combination of online mapping sites, internet searches, and Google Earth, the locations of these sites were identified and the coordinates recorded. In a few instances it was not possible to find the exact location of the site that had been found by the field personnel. In these cases approximate coordinates were recorded and the words “Approx. Coordinates” were entered into the address field of the database.

Based on a review of the database in March 2008, it was determined that further backfilling efforts were needed to ensure that all available data sources, including GIS datalayers, were used in the initial facility identification process. To do this backfilling, the GC_Marina and Mar_Fac data layers were added to a

map, along with the photo ramps layer and potential ramp layers from 2006, 2007, and 2008 provided by FWC. It should be noted that the potential ramps layer from 2008 was not available for the first phase of inventorying, and that the 2007 potential ramp layer was not available during the inventorying of the first few counties completed.

The facilities/potential facilities contained in these datalayers were compared to the facilities that had been identified for the site visits – including those facilities that had been deleted per BRI's field visit comments (facilities that were out of business, facilities that did not have ramps or were not used for recreational boating, etc.). Researchers added any facilities that had been missed in the GC_Marina, Mar_Fac and the potential and photo_ramp GIS layers. Using paper maps and GIS layers from the state, researchers also inspected for missed ramps in Wildlife Management Areas. Finally, researchers double-checked to make sure that all facilities from state, county, and city websites, as well as all ramps contained in the *DeLorme Atlas and Gazetteer*, were included.

Researchers used county-specific spreadsheets to capture information about any ramps and other facilities that had been missed during the initial inventory. Using Google Earth, the facility coordinates were added for each site. Researchers also added facility names and addresses to the best of their ability. Other key attribute information was entered if available. For ramps, these attributes addressed:

- Access status of the ramp (public or private);
- Location of the ramp (in a park, marina, other);
- Ramp management entity;
- Type of waterbody the ramps was on (and its name if available);
- Hours of operation;
- Fees;
- Parking size/number of spaces;
- Number of lanes;
- Ramp surface(s);
- Ramp condition;
- Staging and service docks;
- Restroom availability and type;
- Picnic tables;
- Fish cleaning stations;
- Gas;
- Convenience store; and
- Bait.

For facilities other than stand-alone ramps, researchers gathered basic information about the infrastructure and operations (did it have wetslips, a ramp, drystack storage, etc.?). The focus on gathering only basic information for these types of facilities was related to (1) the fact that the more specific information (e.g., rates for moorings) was not available on most of the reliable websites; and (2) researchers only had access to backfill the first section of the marina database, which contained only basic information. The later sections of the database contained the more specific variables pertaining to rates, measurements, etc.

Once all existing sources of information had been checked, and any missed facilities had been added to the spreadsheets, researchers then did a visual scan of each county to make sure that no other facilities were missing. This scan was conducted primarily using (1) Google Earth and (2) GIS layers of the existing

ramps and boating facilities imported into Google Earth as .kml files. The functionality of Google Earth was enhanced through a GIS extension that allows users to export a GIS layer (or selected records from a layer) to Google Earth. Google Earth then zoomed in to the features, thus greatly reducing the time needed to identify geographic features and zoom in manually. Again, if a new marina or ramp was found, researchers updated their spreadsheets accordingly.

Once a county was complete, the data in the spreadsheets were imported into GIS, projected and overlaid on a base map of Florida showing the county boundaries so that the coordinates could be double-checked. Any significant errors were corrected and the data were then pasted directly into the relevant database. This method helped minimize data entry errors directly into the final version of the database.

In addition to this step of adding new facilities into the database, a number of field visits were also made to check the accuracy and quality of existing data. FWC staff visited ramps in Brevard, Escambia, Hillsborough, Lake, Lee, Leon, Liberty, Manatee, Pinellas, Sarasota and Wakulla counties as part of their effort to check the existing data and to acquire new/updated data for the ramp database.

FWC staff developed a ramp form for their field personnel largely based on the original ramp form; however, they also aimed to capture other variables not related to the inventory being conducted as part of this project. Many of the variables were similar to those collected initially in this study but with some slight changes so that the data would be compatible with the FWRI photo_ramps data. Those additional variables collected by FWC include:

- Phone number (that information was not collected for ramps);
- Type of management entity;
- Restrictions;
- Number of ramp structures;
- Presence of a paved ramp;
    - If paved, the type of pavement (pave blocks, limestone, dirt and/or mud);
- Ramp usability; and
- Suitability for use by boats over 20 feet.

These new field forms were pre-populated with data from the database. These pre-populated forms enabled FWC staff to verify, correct, or update existing data for key variables and obtain missing data. FWC staff also completed new field forms when facilities were not in the database. A number of these were hand-launch only facilities or single family residential sites. These would not have been inventoried initially or may have been deleted from the databases based on information from BRI.

FWC made the completed field forms available to UHI. UHI then went through the forms and updated the database with new information. To the extent possible, data were entered in a manner consistent with the original data collection method. For example, when researchers from Bordner, Inc. visited a private facility, they only gathered information pertaining to the name and location of the facility, the number of lanes, and the number of parking spaces/size of parking area. When FWC staff visited a private facility, they gathered as much information as possible. When UHI updated the database for a private facility, only the original variables were addressed.

During backfilling, FWC also asked that only duplicate facilities be removed from the database. This would allow FWC staff to know where they had already visited, thus preventing unnecessary visits to sites in the future. Accordingly, all non-ramps and hand-launch facilities identified after the initial site identification and survey remain in the database. This procedure is in contrast to the original method designed to develop a database of verified ramps. The result is a database that includes verified ramps,

but also includes some hand-launches and non-ramp sites visited by FWC after initial site visits by BRI had concluded.

The backfilling process was completed in September of 2008.

Cleaning the Databases

A number of steps were taken to identify possible errors or gaps in the data and to verify the accuracy of any apparent anomalies. These steps included:

- Running searches to identify occasions where, for example, the database contained information on the number of wetslips at a facility, but no answer had been entered for the previous question that asked if the facility had wetslips. Illogical answers were corrected, and if necessary, the answers were verified using Google Earth or internet searches.
- Identifying any particularly high response. For example, if a ramp had been reported as having eleven lanes, this record would be flagged and the data verified.

The coordinates for the facilities and boat ramps are of particular importance as the FWRI will use these to generate point data for use in GIS applications. In order to try to minimize errors, three cleanup methods were utilized:

1. The database information was exported to Excel and sorted by the latitude and then by the longitude. Any records that had coordinates outside the expected ranges or over 60 degrees, minutes or seconds were flagged. The correct coordinates were then determined using Google Earth.
2. The coordinates (in degrees, minutes and seconds) were converted to decimal degrees and these were used to create a GIS layer with points representing each facility. These points were then overlaid on the county boundaries. Points that were clearly incorrect (e.g., appearing in the sea) or were not located in the correct county were flagged. The correct coordinates were then determined using Google Earth.
3. For each county, the point data were placed over the original GIS layer developed during the site identification phase of the study. The counties were then scanned to ensure that the location of the points and the initial facility identification parcels corresponded. When a facility was found without a point, it was first determined if this represented a deletion identified by the field personnel. If it was not a deletion then the correct point was found and moved. Its coordinates were then determined and the databases were edited accordingly.

2.5.5 Database Results and Discussion

For analysis and discussion purposes, the following section is divided into two parts. The first part discusses boating facilities other than boat ramps, with particular focus on marinas, dockominiums, clubs, hotels and restaurants. The second part focuses on boat ramps, with an emphasis on those ramps that are open to the public.

The findings presented below are based on the data contained in the final databases that were provided to FWC on June 2, 2009 in Microsoft Access format.

Boating Facility Findings

It is important to note that, other than the number of recreational boating facilities, all data analysis is for those facilities where data were gathered. For example, if a county had 10 boating facilities, it might be that field personnel could only access 5 facilities, and only 3 of those facilities had wetslips. In this situation, one can say that 3 facilities had wetslips, 2 facilities did not have wetslips, and the presence of wetslips is unknown for 5 facilities. This by no means should be used to discredit the project. To the contrary this should point out the enormity of the undertaking, the difficulty of gaining access to each facility, the dynamic nature of many facilities and the fact that while the data are about as good as they can be, they do not perfectly reflect current conditions.

The database contains 2,756 recreational boating facilities (other than stand-alone boat ramps). These include a number of different types of facilities, and have been identified as at least one of the following:

- Commercial marina – A boating facility of any size, at which any boater can rent space for his/her boat - if space is available;
- Dockominium marina – A specific type of marina in which spaces are privately owned. Owners might pay a monthly fee for upkeep, but do not pay a monthly rental fee. These facilities do not include condominium housing with an associated boating facility unless berthing/storage is purchased independently from the condo unit;
- Private club – A facility for which a membership is required in order to make use of the boating infrastructure. Generally, transients, or boaters who are members of a club in another location may be permitted to use an affiliated private club. Clubs may be part of larger facilities, but they do not include condo complexes in which living in the complex is the only prerequisite for having access to the boating facility;
- Hotel/Restaurant;
- Condominium housing – Condominium housing does not include situations in which the berthing must be purchased independently from the condo unit;
- Other residential – A residential property such as a multi-family complex, an apartment, or single family residence where boating infrastructure is available;
- Boat sales/Services;
- Commercial business;
- Mobile home park/campground – A property with multiple mobile homes. This includes both residential communities where the mobile homes are more-or-less permanent homes (either rented or sold), and properties where mobile homes are transient recreational vehicles towed to a site for a short period of time. Note: While there are often significant differences between a permanent mobile home park and a campground/RV park, the type of boating infrastructure found at these normally consists of communal docks, individual docks, or a combination of the two. While the distinction between the two land use types (permanent residential community versus transient visitor accommodation) is not made in the database, detailed information on the types of boating infrastructure and how it is managed (e.g., whether berthing is rented, sold or available for transient boaters) is captured;
- Docks only – Boat docks not affiliated with any shoreside facility;
- Government only – Boating facility available for government use only;
- Vacant – An otherwise vacant property with associated boating infrastructure;
- Unknown – Boating infrastructure associated with an unknown shoreside facility; and
- Other – Boating infrastructure associated with a type of facility not described above. Field

personnel were asked to provide a description of the facility type.

Though a facility could be identified as more than one type, the following analysis is based on a modified version of the data in which each site was assigned to only one type of facility according to a hierarchy reflecting the priorities identified in FWC's request for proposal. That hierarchy is shown by the order of facility types in the list above.

The focus of this analysis is on facilities that can be used by the general public, even if there is a fee associated with such use. Fees might include renting a slip or berth at a marina, buying a slip at a dockominium, paying for a membership to a yacht club, staying at a hotel, or having a meal at a waterfront restaurant. For this analysis, facilities that are only available to a select group of people (e.g., owners of a condominium, members of a housing association or military personnel and their families) are not deemed to be open to the general public. While data were gathered when such facilities were visited, they are not part of the analysis presented below. This decision was partly based on the fact that the field personnel were sometimes asked to leave or managers were not available to be interviewed even when access was possible. Therefore, the data are less comprehensive for non-public facilities.

Field personnel were often able to gather the key variables and the more detailed but observational information about wetslips, broadside berthing, and drystacks; however obtaining some pieces of data, such as number of rented wetslips and number of moorings, required speaking to a knowledgeable person. Even if someone was willing to be interviewed about a facility, very few interviewees provided employment and financial information. Some people felt that the information was proprietary in nature, while others simply did not have the information at hand. Given these factors, very little financial and employment data exist in the database.

As mentioned at the beginning of this section, there are 2,756 recreational boating facilities (other than stand-alone boat ramps) in the database; however, not all facilities were successfully inventoried, as shown in Table 2.2. There were a number of reasons that site visits were not successful including where access was denied or not possible, where sites were closed or where the facility could not be located. Even when access to a site was not possible, observational data were still frequently gathered. In total, 86.07% of facilities in the database were visited by field personnel; and of the 384 that were not visited, access was either denied or not possible at 308 of them. Public boating facilities, particularly marinas, were the primary focus of the inventory, and visits were successful at the majority (96.7%) of this type of facility. Of the other facilities of primary interest, site visits were successful at 98% of hotels/restaurants, at over 96% of dockominiums and at 86% of clubs. Overall, of the 1,206 facilities types of primary interest (marinas, dockominiums, clubs and hotels/restaurants) almost 96% were successfully inventoried by field personnel.

Condominiums were the most numerous type of facility in the marina database (28.4% of facilities), however only 80.6% of visits to condominiums were successful, largely because of the private and often gated nature of condominium developments (99.3% of condominiums that were not surveyed were sites where access was denied or not possible). Even when access was possible, the amount of information that could be gathered was limited, often because no management entity associated with the boating infrastructure was on site to answer questions.

It is important to note that the analysis of the boating facilities presented below is based on all the facilities in the database. This includes data from facilities where full access was not possible, but some information was gathered and entered into the database (either observational data, information from a facility's website or from other reliable sources). For example, the data show that 27.7% of the 669 marinas in the database have drystack. As only 96.7% of these marinas were classified as having been

successfully visited, this is clearly an estimate rather than an absolute number. However, as the level of "successful" site visits was high, it can be assumed that these are reliable estimates.

It is also important to note that unsuccessful site visits and variable degrees of completeness in inventories simply reflect the enormity of this project (both in terms of its geographic scale and the number of variables that field personnel were attempting to record). Other factors to consider are the difficulty of gaining access to each facility – particularly private facilities, and the dynamic nature of many facilities. This dynamic nature of boating facilities, and the fact that initial data gathering started in September of 2006 and continued through August of 2007 means that the current data represent a comprehensive baseline of information on public boating infrastructure in Florida; but for these data to remain useful, a coordinated effort must continue to keep them up to date.

Of the 669 marinas in the database, 647 were visited and surveyed and 58 were closed. Even when a facility was closed, field personnel gathered whatever data they could if they were able to determine that the closure was not permanent. Access was denied at 14 marinas. An additional 4 facilities were added during the backfilling process, after field visits had been completed. Though access was denied at a few facilities, field personnel were sometimes able to gather information visually from off-site.

Monroe County has the highest number of facilities of interest with 75 marinas, 12 dockominiums, 9 clubs and 99 hotels/restaurants in the database (Figure 2.12), totaling 195 facilities. The next highest county is Lee, with 132 facilities (61 of which were marinas) followed by Pinellas with 108 facilities and 57 marinas.

Figure 2.13 shows the mean number of wetslips at marinas by county. It is important to note that these represent wetslips as defined in the training manual (Appendix B), and do not include broadside berthing. While Santa Rosa only has a small number of marinas (Figure 2.12), the average number of wetslips is over 200 per marina. Almost all other counties have average slip numbers below 100 per marina.

Across the state, dockominiums average 66 wetslips (not including broadside berthing) per facility, marinas average 64 wetslips, followed by clubs with 52 wetslips and hotels/restaurants average 15 wetslips (Table 2.3). It is not surprising that marinas generally rent wetslips (78.1%) as opposed to selling them (1.6%) while the pattern is reversed with dockominiums (2.1% rent wetslips and 91.7% sell wetslips). Broadside berthing (rather than wetslips) is clearly less common with 33.8% of marinas offering this but only 8.9% of dockominiums offering it and a similar percentage (9.7%) of hotels/restaurants offering it. Around 28% of marinas and dockominiums have drystack but very few facilities rent moorings – the highest being 2.2% of marinas. In general, the information on moorings may be low because it was often difficult to attribute moorings to a specific facility without speaking to someone on site.

Boat ramps can be found at over a third of marinas but at only a fifth of dockominiums. Between 19.3% (marinas) and 25.6% (clubs) of facilities report that they sell fuel. The numbers of facilities offering pumpout services is also quite low with only 16.8% of marinas offering this. Dockominiums have the lowest rate (13.9%) while hotels/restaurants have the highest percentage (19.3%). This may be because they are largely catering to a transient boating community who are more likely to require such services.

Table 2.2: The number and status of boating facilities in the database and the success of the inventory.

Facility Type	In Database		Facility Status					
	n	%	n Open	n Closed	n Unknown	% Open	% Closed	% Unknown
Marina	669	**24.3**	607	58	4	**90.7**	**8.7**	**0.6**
Dockominium	56	**2.0**	48	8	0	**85.7**	**14.3**	**0.0**
Private Club	129	**4.7**	107	6	16	**82.9**	**4.7**	**12.4**
Hotel / Restaurant	352	**12.8**	282	66	4	**80.1**	**18.8**	**1.1**
Condominium	783	**28.4**	586	80	117	**74.8**	**10.2**	**14.9**
Other Residential	128	**4.6**	103	5	20	**80.5**	**3.9**	**15.6**
Boat Sales / Service	121	**4.4**	115	3	3	**95.0**	**2.5**	**2.5**
Commercial Business	33	**1.2**	26	7	0	**78.8**	**21.2**	**0.0**
Mobile Home Park / Campground	183	**6.6**	158	23	2	**86.3**	**12.6**	**1.1**
Docks only	26	**0.9**	23	3	0	**88.5**	**11.5**	**0.0**
Government only	10	**0.4**	9	0	1	**90.0**	**0.0**	**10.0**
Vacant	54	**2.0**	0	54	0	**0.0**	**100.0**	**0.0**
Unknown	211	**7.7**	46	40	125	**21.8**	**19.0**	**59.2**
Other	1	**0.0**	1	0	0	**100.0**	**0.0**	**0.0**
TOTAL	**2756**		**2111**	**353**	**292**			

Facility Type	Survey Success by Facility Type				Reason for Unsuccessful Survey by Facility Type					
	n Yes	n No	% Yes	% No	n No Access	n Could Not Locate	n Other	% No Access	% Could Not Locate	% Other
Marina	647	22	**96.7**	**3.3**	14	0	8	**63.6**	**0.0**	**36.4**
Dockominium	54	2	**96.4**	**3.6**	2	0	0	**100.0**	**0.0**	**0.0**
Private Club	111	18	**86.0**	**14.0**	18	0	0	**100.0**	**0.0**	**0.0**
Hotel / Restaurant	345	7	**98.0**	**2.0**	4	3	0	**57.1**	**42.9**	**0.0**
Condominium	631	152	**80.6**	**19.4**	151	1	0	**99.3**	**0.7**	**0.0**
Other Residential	108	20	**84.4**	**15.6**	18	2	0	**90.0**	**10.0**	**0.0**
Boat Sales / Service	119	2	**98.3**	**1.7**	1	0	1	**50.0**	**0.0**	**50.0**
Commercial Business	33	0	**100.0**	**0.0**	0	0	0	**0.0**	**0.0**	**0.0**
Mobile Home Park / Campground	183	0	**100.0**	**0.0**	0	0	0	**0.0**	**0.0**	**0.0**
Docks only	26	0	**100.0**	**0.0**	0	0	0	**0.0**	**0.0**	**0.0**
Government only	10	0	**100.0**	**0.0**	0	0	0	**0.0**	**0.0**	**0.0**
Vacant	54	0	**100.0**	**0.0**	0	0	0	**0.0**	**0.0**	**0.0**
Unknown	50	161	**23.7**	**76.3**	100	41	20	**62.1**	**25.5**	**12.4**
Other	1	0	**100.0**	**0.0**	0	0	0	**0.0**	**0.0**	**0.0**
TOTAL	**2372**	**384**			**308**	**47**	**29**			

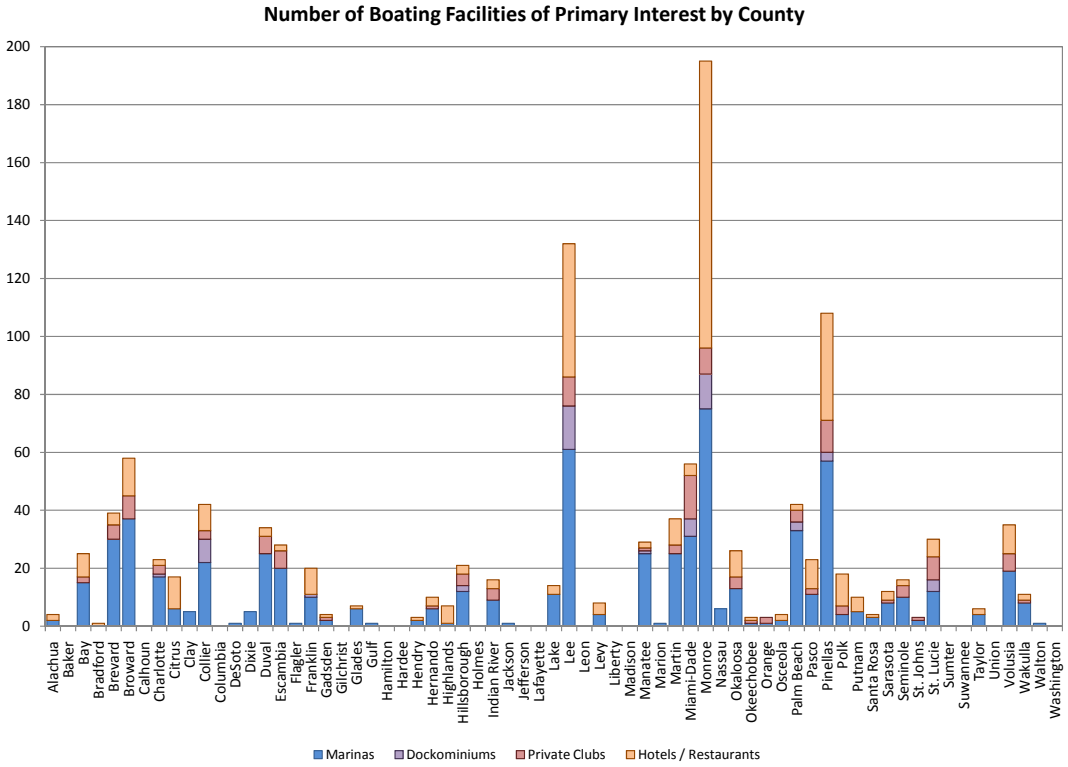


Figure 2.12 Number of marinas, dockominiums, private clubs and hotels/restaurants in the database.

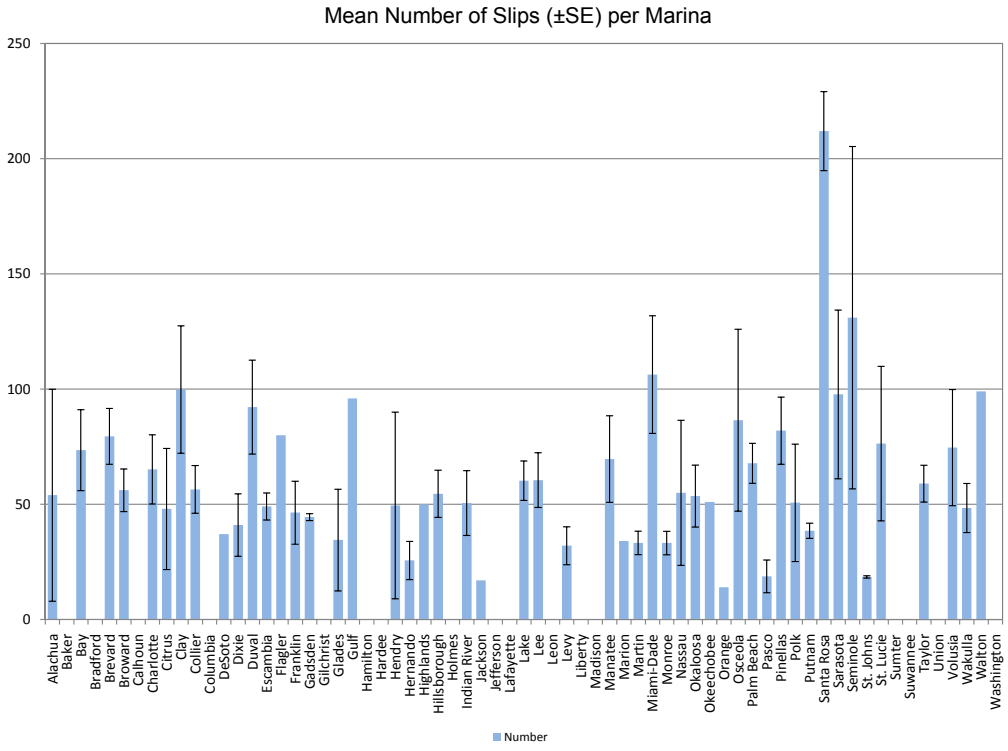


Figure 2.13: The mean number of wetslips (±SE) at marinas by county.

Figure 2.14 shows the number of rented and sold wetslips at facilities by county. Pinellas has the highest number of wetslips, with the majority being rental wetslips. In general, rental wetslips are the most common kind across the state. After Pinellas, the other counties with the highest number of wetslips are Lee, Miami-Dade, Monroe, Brevard and Broward County.

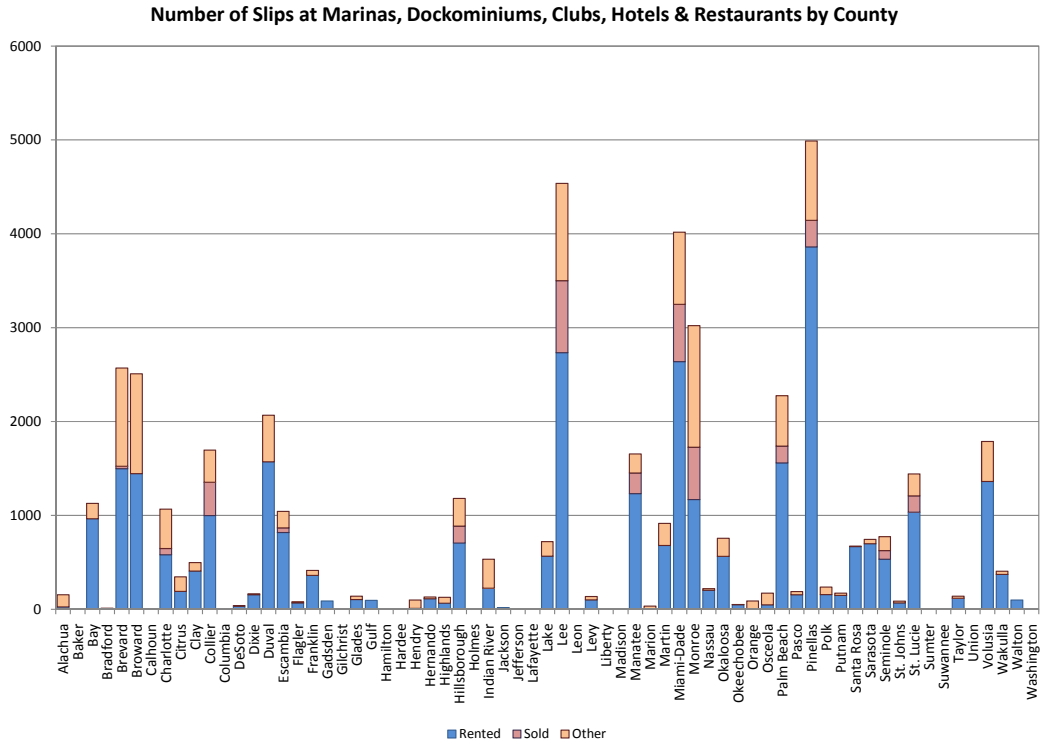


Figure 2.14: Number of wetslips at marinas, dockominiums, clubs, and hotels/restaurants in the database by county.

Marinas most commonly offer dedicated transient berths or wetslips (46.5%). Clubs have the second highest number with 23.3% - this probably represents "guest" slips. While it may be expected that the number of transient slips at hotels/restaurants would have been higher, the field personnel were specifically asking about designated berthing for transient boaters, and so may not have captured detailed information on general dockage that is available on a "stop and go" basis, at no charge, for boaters who want to have a meal or a cocktail.

Figures 2.15 to 2.24 aim to illustrate the types of basic information that can be extracted from the databases. It is also possible to create much more complex, customized queries to answer specific questions researchers may have; however, it is not possible to predict what these queries might be for the basis of this report. It is important to note that the figures show both absolute numbers as well as the percentage of facilities by county. For example, Figure 2.15 shows that of facilities that provided information on amenities, Monroe County had the highest number of marinas that offered pumpout services. However, this only represents 13.5% of the marinas in the county. While the absolute number of marinas offering pumpout services was lower, 50% of marinas in Hernando, Santa Rosa and St. John's County offered this service. Similarly, Figure 2.16 shows that Miami-Dade has the highest number of clubs offering pumpout services, but this represents only 40% of the clubs in the county. All of the clubs in Hernando, Martin and Polk counties report offering pumpout services.

Table 2.3: Summary of inventory data for marinas, dockominiums, clubs and hotels/restaurants.

Facility Details	Marinas	Dockominiums	Private Clubs	Hotels / Restaurants
# of facilities	669	56	129	352
% that have slips	82.7%	85.7%	84.5%	49.1%
Mean # of slips	64	66	52	15
±SE	38.2	38.1	16.4	6.8
% that rent slips [1]	78.1%	2.1%	51.4%	26.6%
% that sell slips [1]	1.6%	91.7%	1.8%	0.6%
% that rent broadside berthing	33.8%	8.9%	23.3%	9.7%
% that rent moorings	2.2%	0.0%	0.8%	0.0%
% with designated transient space	46.5%	16.1%	23.3%	16.5%
% with drystack	27.7%	28.6%	6.2%	0.3%
% with boat ramp	34.1%	19.6%	28.7%	23.6%
% that report selling fuel [2]	19.3%	19.4%	25.6%	24.8%
% that report pumpout services [2]	16.8%	13.9%	17.9%	19.3%
% that broker/sell boats [2]	10.5%	8.3%	10.3%	14.7%

[1] Percent only of those facilities that had slips

[2] Percent only of those facilities that provided information on amenities

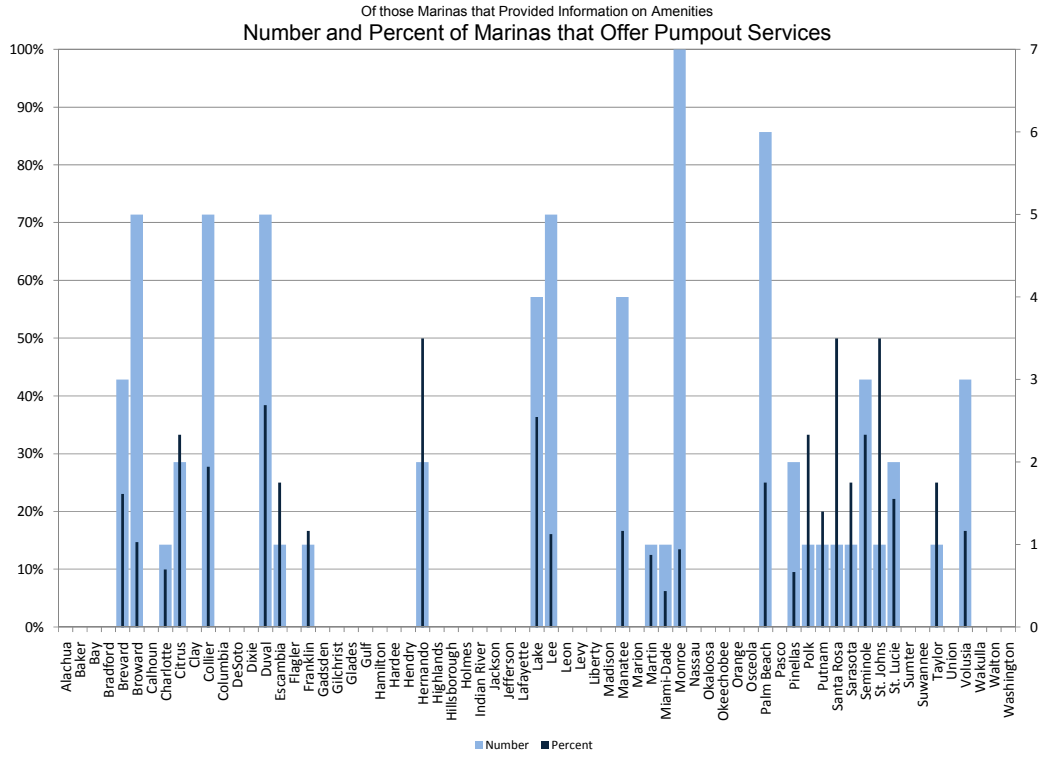


Figure 2.15: The number and percent of marinas offering pumpout services.

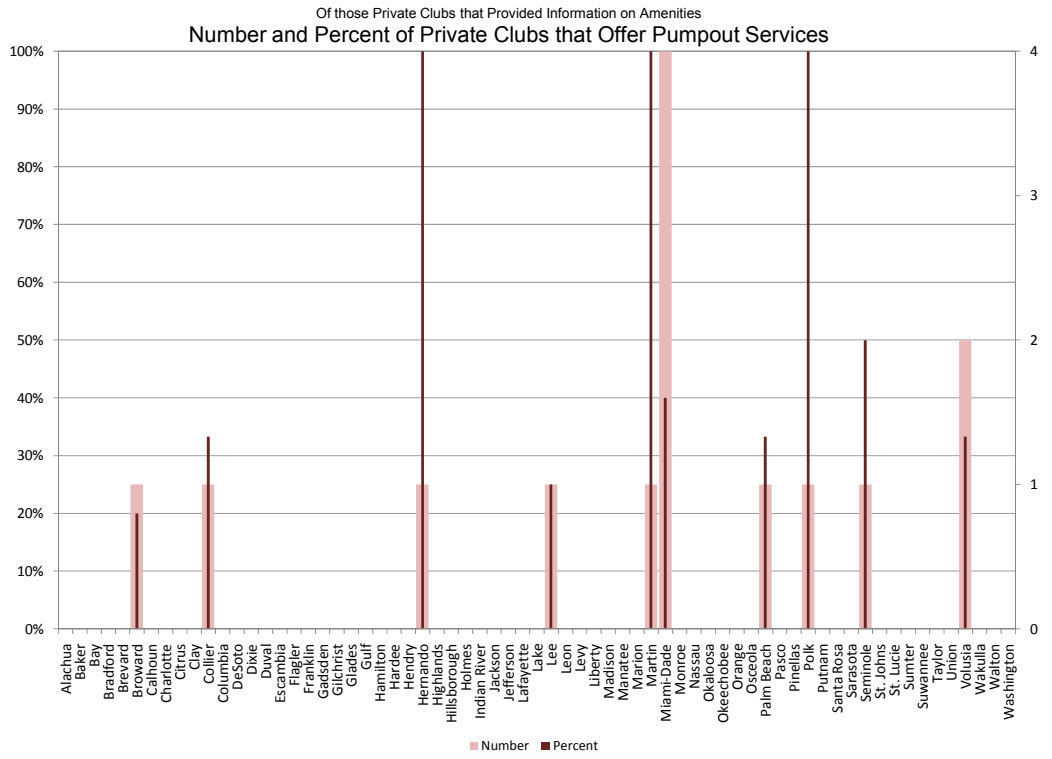


Figure 2.16: The number and percent of clubs offering pumpout services.

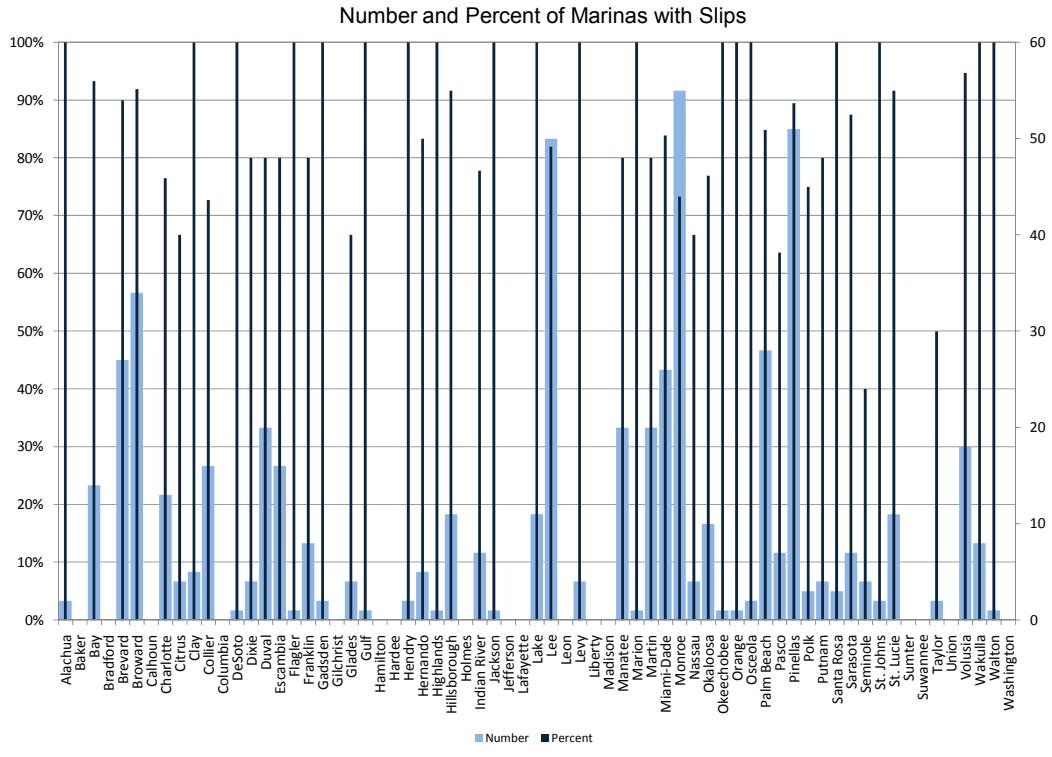


Figure 2.17: The number and percent of marinas with wetslips.

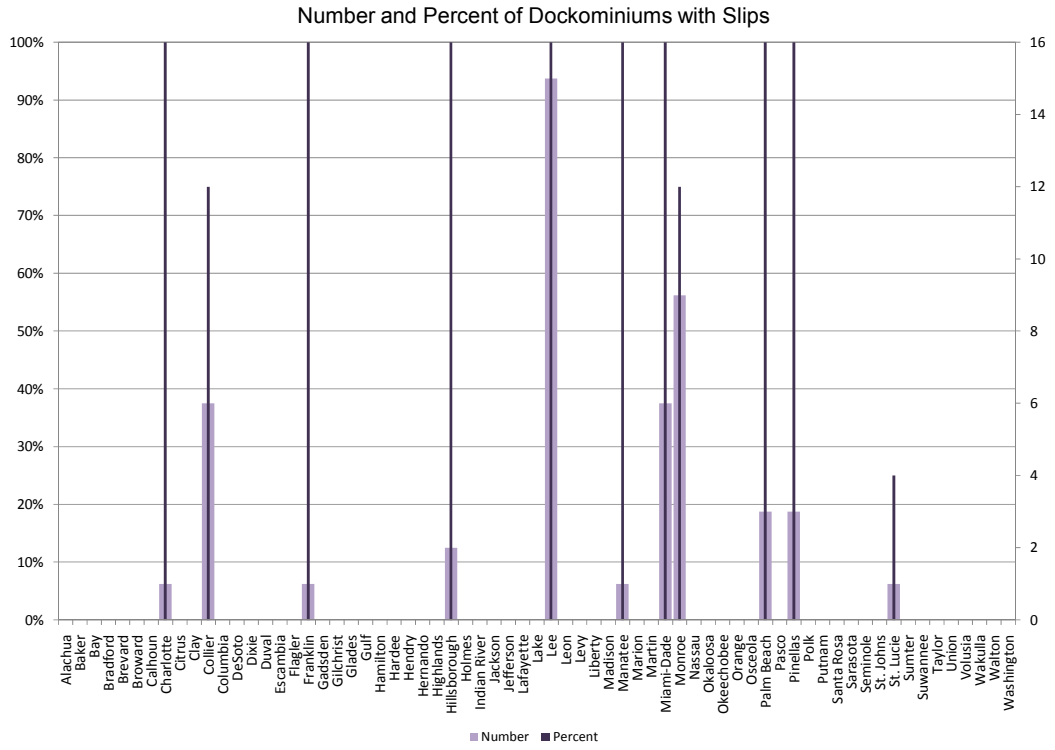


Figure 2.18: The number and percent of dockominiums with wetslips.

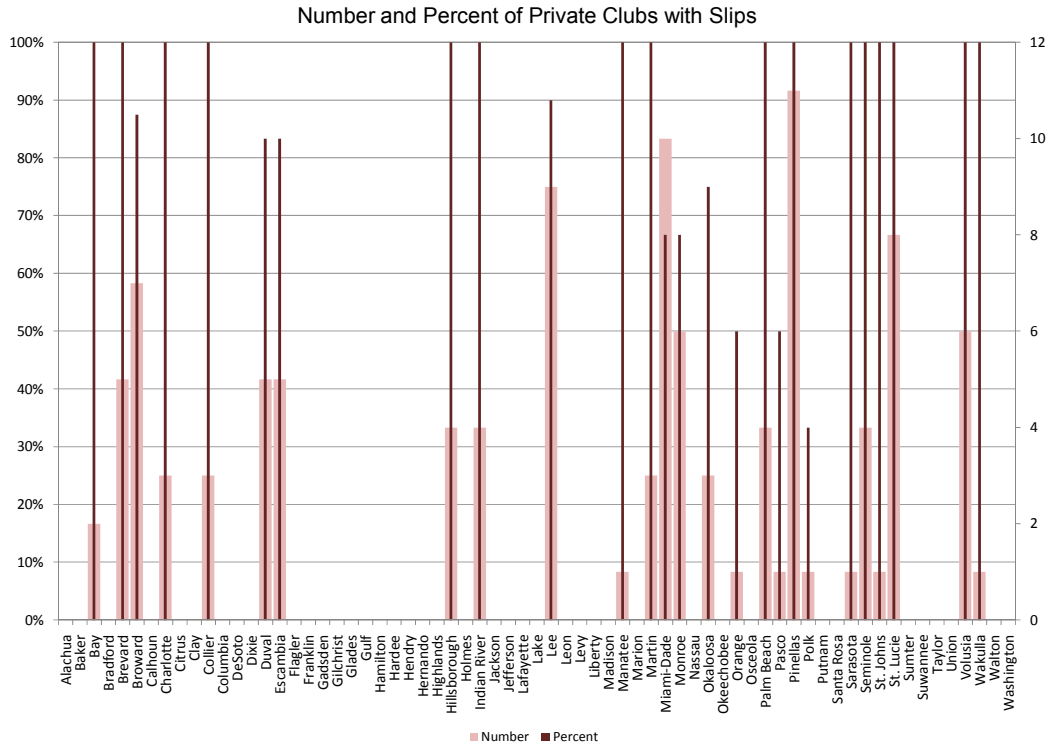


Figure 2.19: The number and percent of clubs with wetslips.

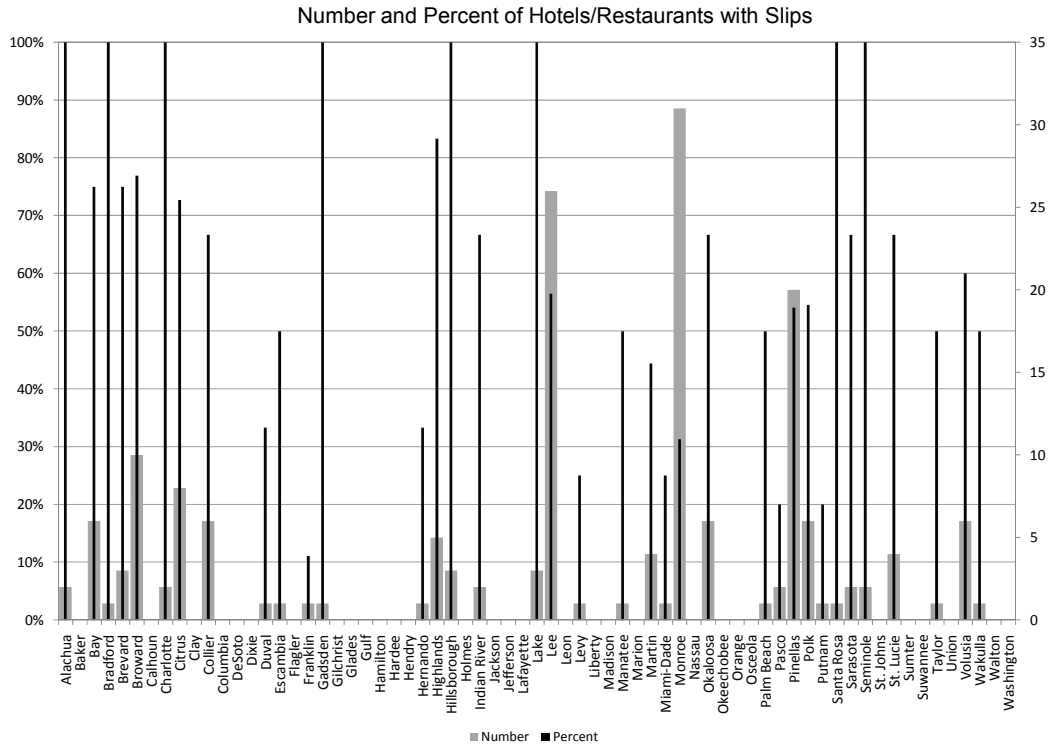


Figure 2.20: The number and percent of hotels/restaurants with wetslips.

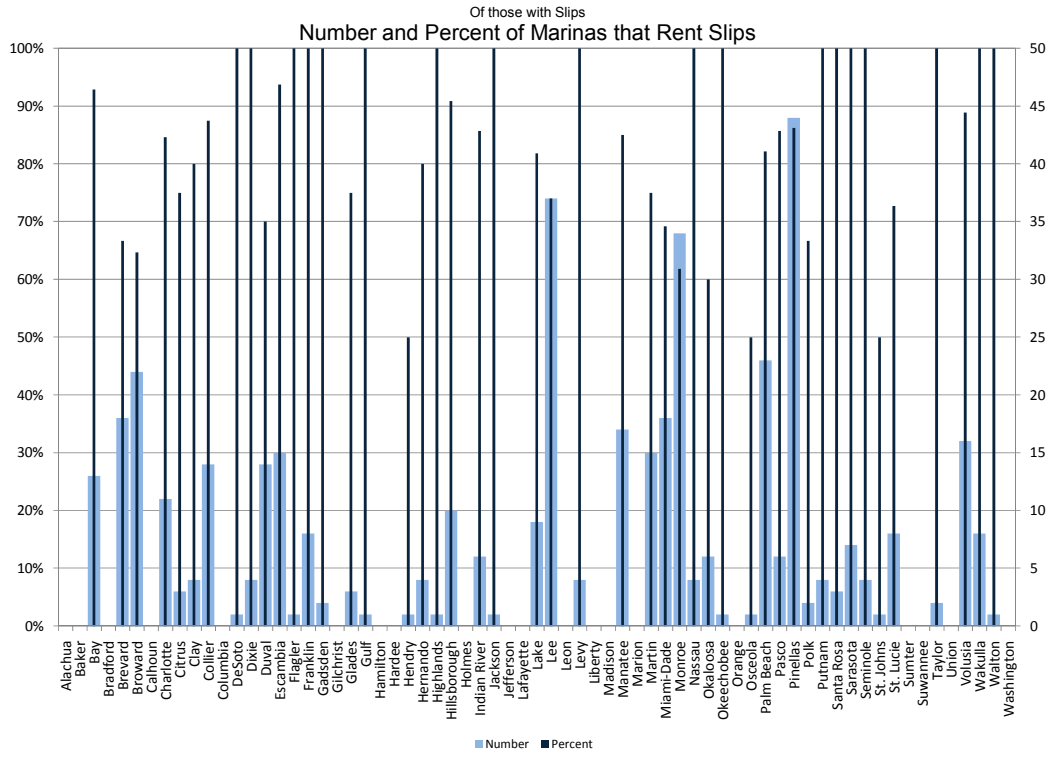


Figure 2.21: The number and percent of marinas that rent wetslips.

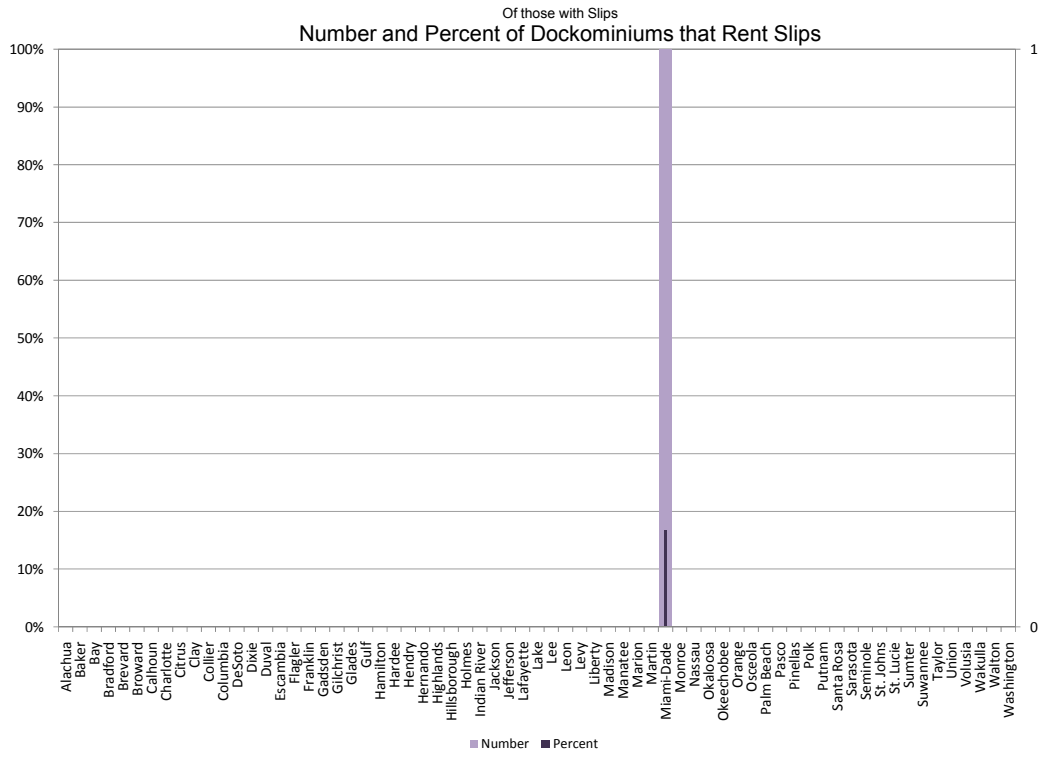


Figure 2.22: The number and percent of dockominiums that rent wetslips.

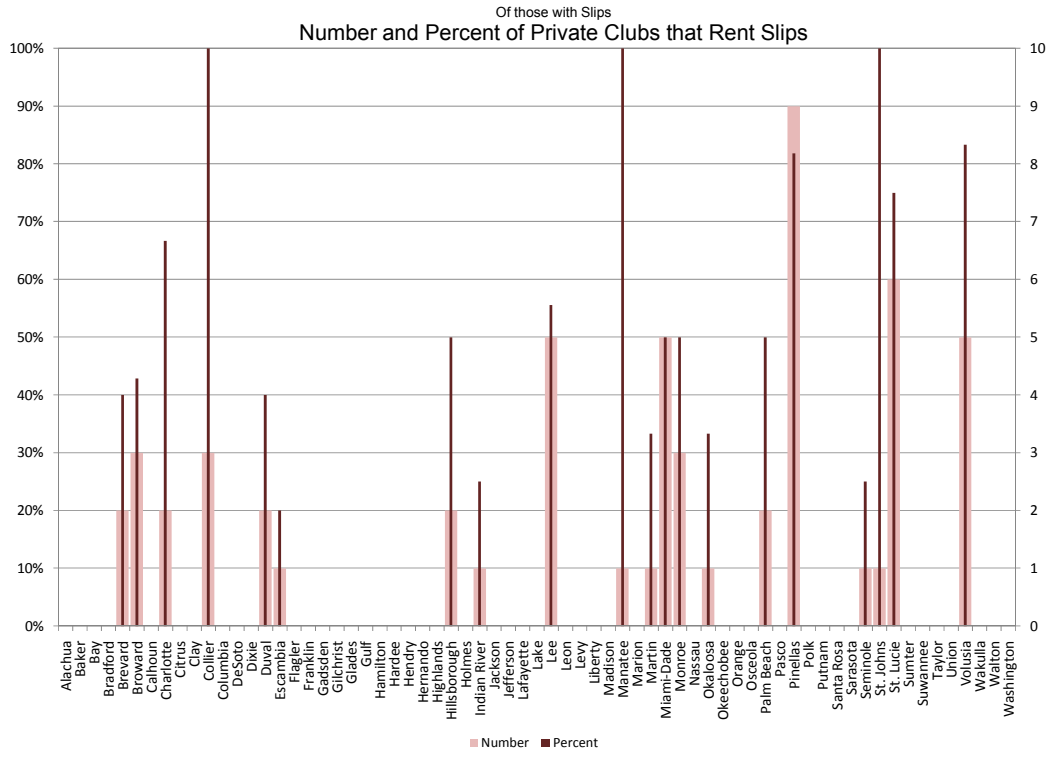


Figure 2.23: The number and percent of clubs that rent wetslips.

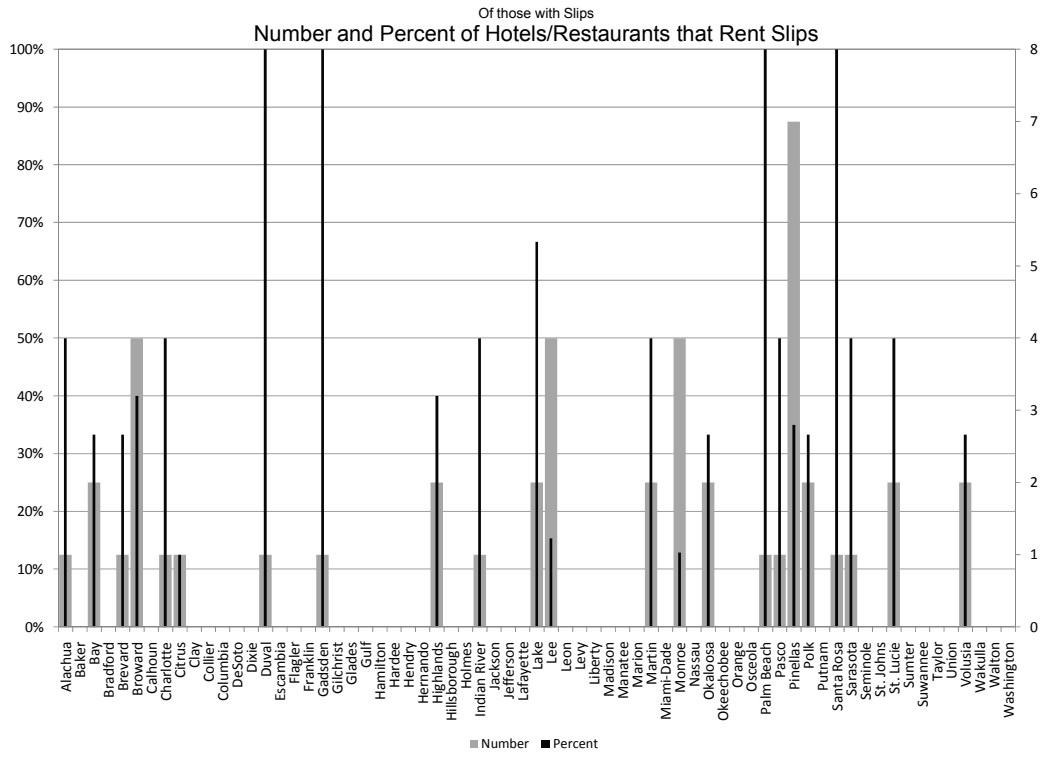


Figure 2.24: The number and percent of hotels/restaurants that rent wetslips.

Ramp Findings

It is important to note that, other than the number of ramps, all data analysis is for those public ramps where data were gathered. This by no means should be used to discredit the project; to the contrary this should point out the enormity of the undertaking, the difficulty of gaining access to each facility, the dynamic nature of many facilities and the fact that while the data are about as good as they can be, they do not perfectly reflect current conditions.

The database is intended to contain a comprehensive listing of all ramps available for public use; however, the database also includes a partial listing of ramps and potential access sites either not available for public use or not available for use by trailered craft. During the course of the inventory, the project team located many non-public use ramps that might be of interest to FWC for a variety of purposes outside the scope of this project; therefore the project team agreed to a change in method so that ramps or potential ramps identified during the project would be left in the database. Examples of such facilities include ramps owned by government agencies for government use only; privately-owned ramps for private use only, but which might be accessible to government agencies during responses to emergencies on the water; and facilities which are available only for hand-launching of small watercraft. These extraneous facilities also include some private single family residence ramps and locations that were identified through aerial photography or ancillary means as potential ramps, but were later, through field visits, found not to be ramps. A comprehensive effort to catalog these types of non-public use ramps is beyond the scope of this project. These locations are simply maintained in the GIS database so the information is accessible to FWC for other projects, and to facilitate future updates to the inventory. This change in the method only applied to facilities found after the agreement had been made to change the method; therefore this database does not include those facilities that had been deleted per the original method. These non-public ramps, hand-launch only sites, and non-access sites

are clearly flagged in the database to facilitate their identification. These facilities are not used in any of the following analyses.

Over 50% of the ramps in the database are available for public use. These include public ramps that are privately owned (314 sites) and government-owned ramps (1,305) where members of the public could launch a boat (Table 2.4). Initially, sites available for hand-launch only were excluded from the inventory; however, some hand-launch only sites were added to the database later in the project as methods changed. As a result, one will find some public hand-launch only facilities in this database; but it should be understood that this is not a comprehensive database of public hand-launch facilities, as many of those were deleted early in the project. All hand-launch only ramps are clearly flagged in the database to facilitate their identification.

In addition to publicly accessible boat ramps, the database contains information about privately-owned ramps available for private use only (719 sites), as well as government-owned ramps for government use only (50 sites). While not the primary focus of this study, these ramps were included as part of an effort to identify ramps suitable for use by emergency personnel. Data collected on private ramps were limited to the name and location, the number of lanes, and the number of parking spaces/size of parking area. While attempts were made to exclude very small, clearly private residential ramps (e.g., those at single family residences) from the privately-owned for private use category, some such sites remain in the database to accommodate requests by FWC not to delete sites that were visited, regardless of their status.

Of the government-run public ramps, just fewer than 90% were successfully surveyed, and almost 94% of the privately-run public ramps were successfully surveyed. Of the private-ramps that are not open to the public, only 76.9% were successfully surveyed with “access denied” as the most common reason for not being surveyed. The success rate at ramps exclusively for government use was low as many were located in restricted areas.

In addition to the four types of ramps mentioned above (government-owned ramps for public use, private ramps for public use, private ramps for private use, and government ramps for government use), the database also contains 773 ramps whose access type was undetermined. Though it was sometimes impossible to determine access type while on-site, access type was also undetermined in cases where surveys were never completed because:

- Access was denied (42 sites);
- The facility was closed at the time of visit (1 site);
- The facility could not be located (35 sites); or
- Other reasons prevented researchers from obtaining access type (504 sites). Of those 504 sites, 92% (463 sites) were added during the backfilling process after the field visits were complete. These were frequently small, private, residential ramps that had not been added initially. As such, no one has visited the site to determine the access type. Future visits to some of these sites might show that the “ramp” does not exist.

Table 2.4: The number and status of boat ramps in the database and the success of the inventory.

Ramp Type	In Database		Survey Success			Of Those Not Surveyed							
	n	%	n Surveyed	n Not Surveyed	% Surveyed	n Access Denied / Gated	n Closed	n Could Not Locate / Does Not Exist	n Other	% Access Denied / Gated	% Closed	% Could Not Locate / Does Not Exist	% Other
Government for Public Use	1305	**41.3**	1171	134	**89.7**	12	1	1	120	**9.0**	**0.7**	**0.7**	**89.6**
Private for Public Use	314	**9.9**	295	19	**93.9**	7	2	0	10	**36.8**	**10.5**	**0.0**	**52.6**
Private for Private Use	719	**22.7**	553	166	**76.9**	95	1	1	69	**57.2**	**0.6**	**0.6**	**41.6**
Government for Government Use	50	**1.6**	15	35	**30.0**	16	0	0	19	**45.7**	**0.0**	**0.0**	**54.3**
Undetermined	773	**24.5**	191	582	**24.7**	42	1	35	504	**7.2**	**0.2**	**6.0**	**86.6**
TOTAL	**3161**		**2225**	**936**		**172**	**5**	**37**	**722**				

Ramp Type	n					%				
	Sites Open	Sites Closed	Being Renovated	Not Applicable	Status Unknown	Open	Closed	Being Renovated	Not Applicable	Status Unknown
Government for Public Use	999	5	19	0	282	**31.6**	**0.2**	**0.6**	**0.0**	**8.9**
Private for Public Use	244	0	5	1	64	**7.7**	**0.0**	**0.2**	**0.0**	**2.0**
Private for Private Use	15	16	2	2	684	**0.5**	**0.5**	**0.1**	**0.1**	**21.6**
Government for Government Use	1	1	0	1	47	**0.0**	**0.0**	**0.0**	**0.0**	**1.5**
Undetermined	132	30	5	0	606	**4.2**	**0.9**	**0.2**	**0.0**	**19.2**
TOTAL	**1391**	**52**	**31**	**4**	**1683**					

Understanding that the primary purpose of the inventory was to develop a database of recreational boating facilities and public ramps, the following analysis focuses on facilities confirmed to be private for public use or government for public use. It is important to note that, other than the number of ramps, all data analysis is for those ramps where data were gathered. So, for example, if a county had 10 public ramps, it might be that ramp condition data were only gathered for 5 ramps, and only 3 of those ramps were in good condition. In this situation, one can say that 3 ramps were in good condition, 2 ramps were in poor condition, and the condition is unknown for 5 ramps. No attempt has been made to "scale up" the data to account for ramps where there are no data.

The database contains 1,619 ramps known to be publicly accessible, with 1,305 sites owned or managed by a municipal, county, state, or federal government entity. The remaining 314 public ramps are privately owned.

In general, when a site was accessed, the field personnel were able to gather fairly complete sets of observational data. The data on revenue and site usage, however, were more difficult to obtain because they required speaking to someone who would have access to that information.

Every county in Florida offers some type of pubic ramp (Figure 2.25). Based on the results of the site visits, Polk County has the most public ramps (96 ramps) of which 80 are government-run. Lake has the second highest number of public ramps (67).

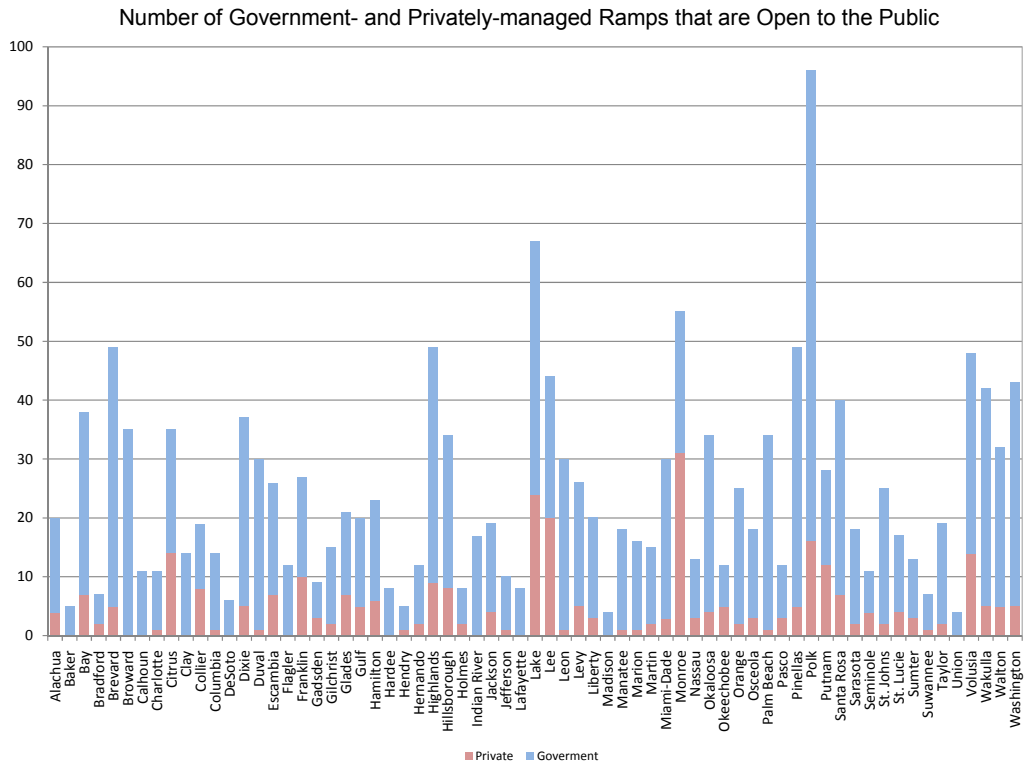


Figure 2.25: The number of government- and privately-managed ramps in the database that are open to the public by county.

Across the state, the mean number of launch lanes at a boat ramp is 1.56. Miami-Dade has the most launch lanes per site (mean = 3.64) with Hendry averaging 3 launch lanes per site (Figure 2.26) although the total number of sites in Hendry County is low.

Field personnel were given guidance on how to assess the condition of a ramp. According to the field training manual, "The ramp is in good condition if there are no major cracks (small cracks are normal), if pre-cast slabs or blocks are properly aligned and there are no wash-outs at the end of the ramp or where the ramp is sand or gravel…. A ramp is in need of repair if the surface is broken, pavement pieces or pre-cast slabs are out of alignment or there are wash-outs" (Appendix B).

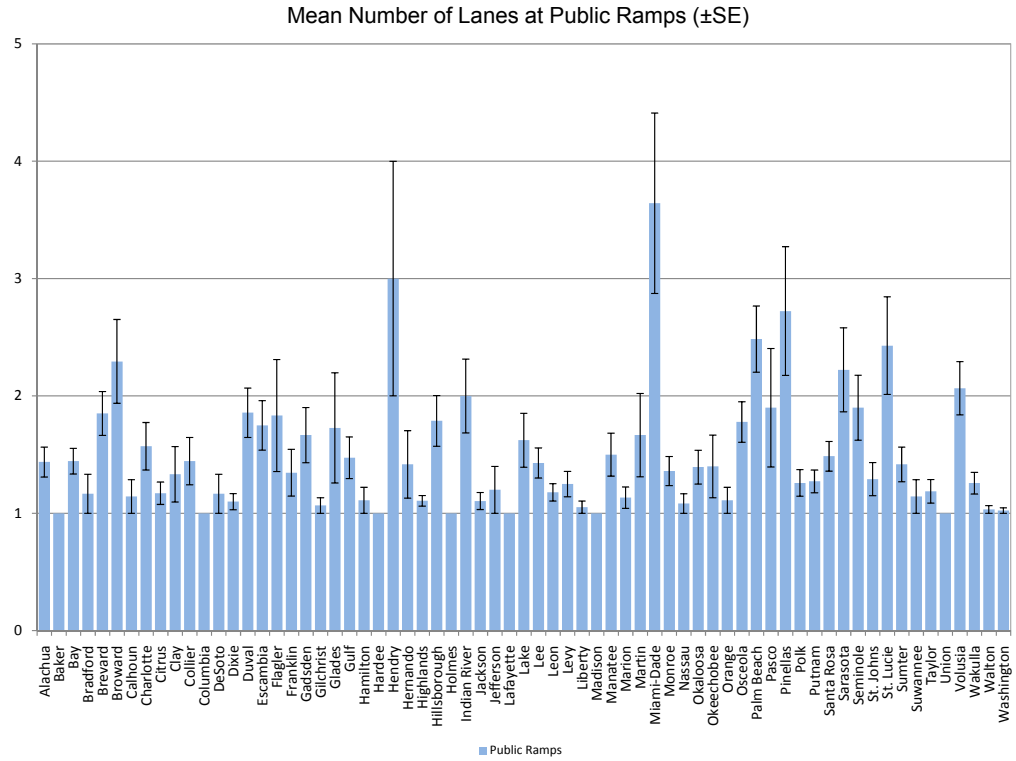


Figure 2.26: The mean number of launch lanes (±SE) at public boat ramps by county.

Based on these criteria 87.4% of government-run ramps and almost 77% of privately-run ramps were classified as being in good to excellent condition. Overall, the data suggest that ramps visited during the course of this project were generally in good to excellent condition in Florida (Table 2.5). Most ramps also have hard surfaces (83.9% of government-run and 85.1% of privately-run ramps).

A higher percentage of privately-run ramps have restrooms when compared with government-run ramps (63.7% versus 44.9%). However, those government-run ramps that have restrooms are more likely to have ones that are handicap accessible (66.0% versus 40.4%).

On a statewide basis, the database shows, not surprisingly, that a privately owned ramp for public use is much more likely to charge a use fee than a government owned ramp for public use. Use fees could be a launch or retrieval fee but could also include entry fees or parking fees. More specifically, almost 70% of privately-run ramps have some sort of fee associated with their use but less than 15% of government-run ramps charge fees. This can also be seen on a county by county basis (Figures 2.27 and 2.28). Clearly it is more common for privately-run ramps to have a fee associated with their use. In 20 counties, all privately-run public ramps charge some sort of fee.

Table 2.5: Summary of data on government- and privately-run ramps in the database.

Ramp Details	Government-run	Privately-run
Total # of ramp sites	1305	314
Total # surveyed	1171	295
% surveyed	89.7%	93.9%
% ramp in good to excellent condition [1]	87.4%	76.9%
% with restrooms [1]	44.9%	63.7%
% with handicap restrooms [2]	66.0%	40.4%
% fees charged [1]	14.6%	69.8%
% with designated parking [1]	92.9%	80.7%
% parking in good to excellent condition [3]	84.0%	84.5%
% with designated handicap parking [3]	39.2%	14.7%
% ramp has hard surface [1]	83.9%	85.1%
% with picnic tables [1]	52.9%	49.5%
% with grills [1]	27.4%	22.4%

[1] Percent of surveyed ramps

[2] Percent of surveyed ramps with restrooms

[3] Percent of surveyed ramps with parking

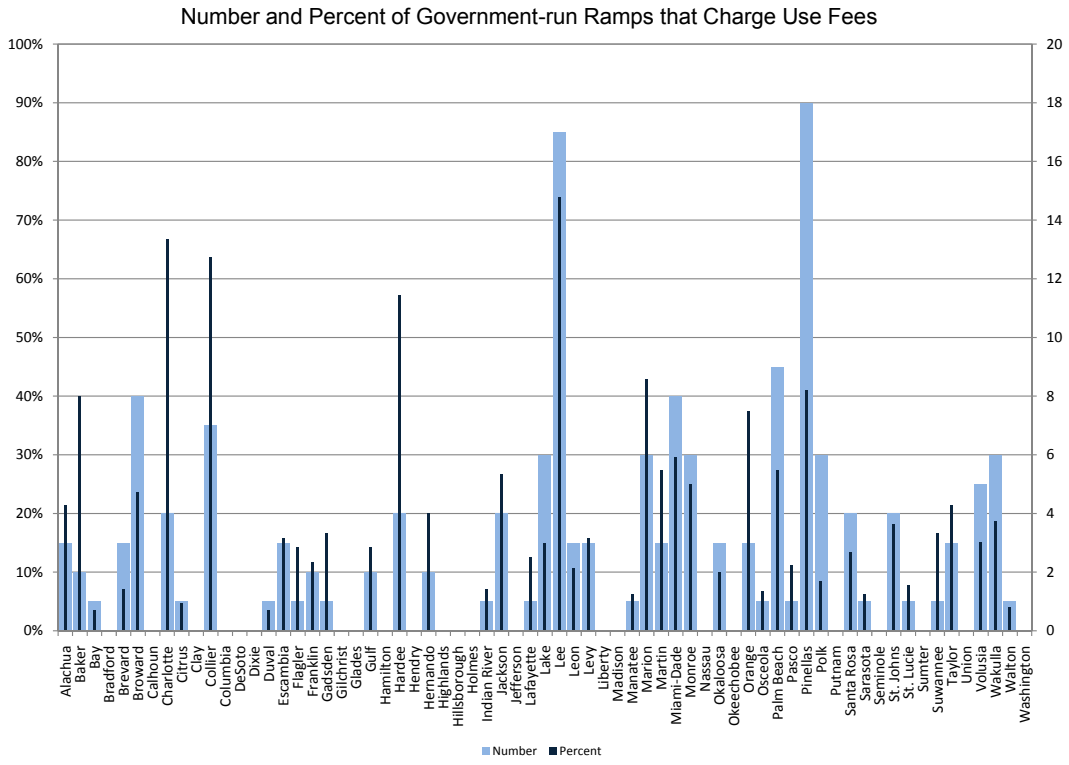


Figure 2.27: The number and percent of government-run ramps that charge use fees by county.

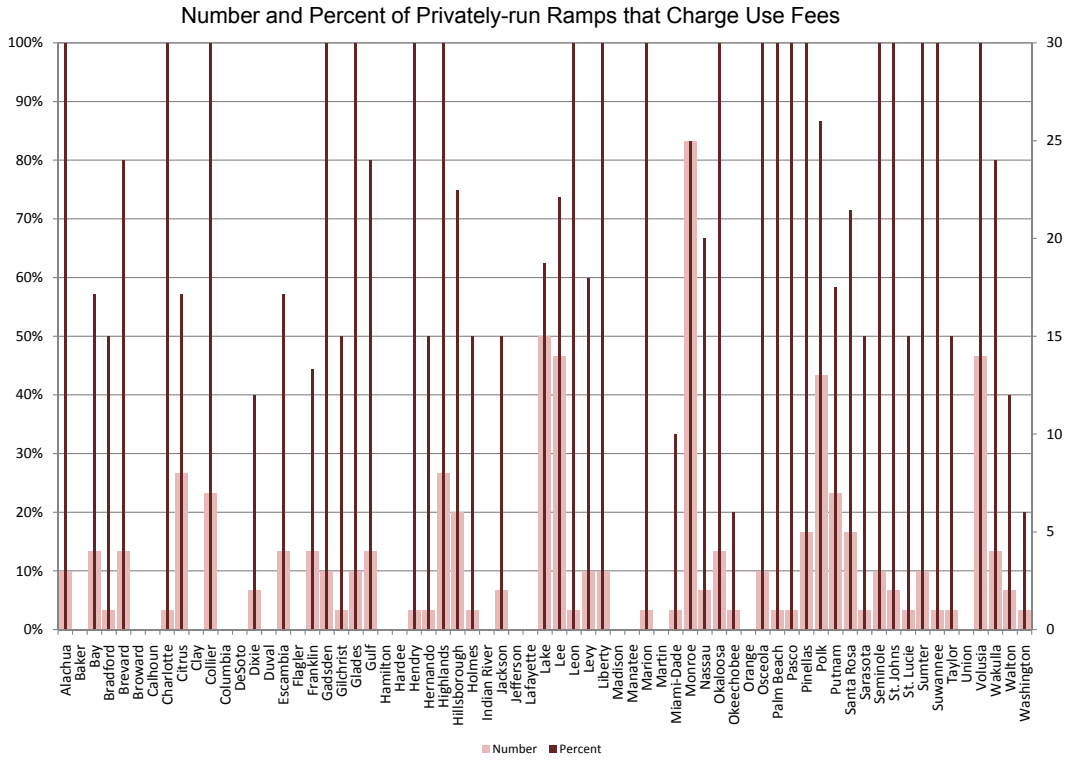


Figure 2.28: The number and percent of privately-run ramps that charge use fees by county.

2.6 RESIDENTIAL SAMPLING

2.6.1 Background

Many small private waterfront residences in Florida only meet the boating needs of the residents, and do not provide any public boating opportunities. While these facilities were not central to the purpose of the boating inventory, it was important to get a sense of the number of docks and wetslips at private waterfront residences in order to run the economic models dealing with recreational boating supply and demand. Rather than conduct an inventory of these small waterfront residential properties, a sampling method was developed to estimate the boating supply provided at these facilities.

2.6.2 Justification

The original RFP called for the inventory to include recreational boating infrastructure at various types of properties, including all residential properties. It became clear, however, that determining which properties did or did not have boating infrastructure was not as simple as first expected. For example, in Lee County, there were many residential properties along bulkheaded canals. These bulkheads could quickly become berthing space with the addition of cleats and fenders. Also, in the event that a property had a dock associated with it, one might assume that the dock was suitable for berthing; however it may be that the dock was for sunning or fishing instead. The only way to ascertain that the dock or bulkhead was for berthing was to visit the site.

In Lee County, several tens of thousands of waterfront single family residences with potential berthing capabilities were identified, making it unrealistic to send a fieldworker to each and every site to determine if berthing opportunities were indeed present.

Having concluded that it was not feasible to site visit every waterfront single family home that might have berthing, the site identification in Lee included all waterfront residential properties, apart from single family residences, that appeared to have or potentially had recreational boating associated with them. This included properties on canals, even where no infrastructure could be seen. The *entire* site identification process in Lee County (not limited to residential properties) yielded a list of 1,207 properties, 1,014 of which were visited and surveyed. (The majority of the sites that were not surveyed were either parts of other facilities that had been surveyed, or they were not recreational boating facilities.) Basic data were gathered on all 789 residential properties; and the results show that none of the residential properties offered any public boating infrastructure. In fact, many of those properties did not offer any boating infrastructure at all.

During the site visits in Lee County, field personnel frequently had difficulty gaining access to residential properties. Security at gated communities refused to grant access, and homeowners were suspicious of researchers, often declining to let anyone on their property. Field personnel were discouraged from trespassing on small residential properties if no one was on site to grant access. In these situations, field personnel tried to record what information they could from a remote location, such as from across the road or from a nearby bridge; however such vantage points were uncommon.

The field personnel had better success accessing larger residential facilities without security by simply walking on to the site. Even when a site was accessed though, it was rare to find a manager or other appropriate person to interview. In these situations, the field personnel would gather whatever visual information they could (e.g., the number of wetslips/length of dock, etc.) but it was often impossible to determine whether or not the public had any access to the boating infrastructure.

The public/private nature of large residential facilities and the inability to determine the access type complicated the study. For example, if a 100-unit condominium had one slip available exclusively to each unit owner it would be very similar to 100 single family residential properties, each with a slip. In some situations however, not all owners use their wetslips. Often the management company will have a system by which these wetslips can be rented to the public, with a percentage of the rent retained by the management company. In these situations, those rented wetslips are public, and make part of the facility akin to a commercial marina.

A prime conclusion from the Lee pilot was that the data obtained from residential sampling were extremely variable in quality and completeness due to the access limitations and the frequent lack of an on-site contact. These findings led to the decision that, as with single family properties, site visits were not the most viable and practical way to assess the amount of boating infrastructure associated with most residences.

Generally, Bordner Research found that very few small facilities had any official system in place to offer berthing to the public, and that most boating infrastructure was only for residents. Some large residential facilities did offer a limited amount of publicly accessible boating (normally berthing) in a formalized system.

Based on the experiences in Lee County, it was agreed that two methods would be employed for the rest of the study. First, to assess publicly accessible boating, larger residential properties with significant boating infrastructure would be retained as part of the “marina” inventory and would continue to be site visited and fully inventoried by Bordner Research. Second, to estimate the number of private wetslips available in a county, a sampling protocol would be developed to alleviate the need for expensive and time-consuming field visits yielding little or no useful information. To this end, UHI worked closely with FWC’s statistician, Paul Kubilis, to develop a residential sampling plan. This sampling yielded information about boating infrastructure and capacity at residential sites which was used as a foundation for the economic analysis portion of this project.

2.6.3 Method

In order to be consistent, the project team developed, tested, adjusted, and adhered to a method that will enable others to replicate the process if desired.

Map Development

As with the identification of larger facilities for the site visits, this process relied heavily on orthophotographs and parcel data. Orthophotographs from Airphoto USA and LABINS formed the base of all residential sampling maps. Google Earth was used as a supplementary resource when images were unavailable or of a quality which made it difficult for the researchers to interpret.

While the water was often visible in the orthophotographs and Google Earth images, GIS layers were overlaid onto the orthophotographs to assist with "waterfront" parcel identification. (It is important to note that the term "waterfront" does not mean that a parcel abuts a navigable waterway. More detail about this can be found in the next section.) These water layers included the Navigable Waterways (btsww) layer developed by the Bureau of Transportation Statistics; the National Hydrography Dataset – Waterbodies (NHDWB) layer developed by the USGS; and county hydrography lines developed by USGS. Together, these datalayers captured many different types of water features; however each layer had its limitations. The btsww layer did not capture all "boatable" waters (such as some of the lakes, stretches of rivers and canals, etc.), so it could not be used without the other water layers. Those other water layers however, were too inclusive for our purposes. Adjustments were made to the hydrography lines layer so that it only captured waters that could potentially accommodate recreational boating (specifically, water features classified as "ditches or canals", "left bank", "manmade shoreline", "right bank", "shoreline", and "stream"). Additional adjustments were made to the NHDWB layer to remove swamps and marshes, leaving only those features that could potentially accommodate boating.

Another issue was that the GIS layers had been developed at various scales. Frequently the shoreline in the GIS layers did not match the shoreline in the orthophotographs or in the parcel data (Figure 2.29). To resolve this issue of scale, each of these three water layers was buffered by a distance of 75 feet. The 75-foot buffer was chosen after tests were run with smaller and larger buffers (100-foot and 50-foot buffers). A 50-foot buffer frequently failed to capture many of the truly waterfront parcels, while the 100-foot buffer captured too many non-waterfront parcels. The 75-foot buffer was found to be the most effective (Figure 2.30). These three buffered water layers were then "unioned" to create one large, buffered water layer.

Finally, county boundaries and parcel data provided by the Department of Revenue were overlaid on the map to identify waterfront residential properties. The parcel data from the Department of Revenue contained all types of land use, so they first had to be pared down to only show residential parcels categorized as:

- Single family residence ("old use code" 1);
- Mobile homes ("old use code" 2);
- Cooperatives ("old use code" 5);
- Multi-family less than 10 ("old use code" 8);
- Mobile home park ("old use code" 28);
- Multi-family greater than 10 ("old use code" 3); and
- Condominiums ("old use code" 4).

The "old use codes" provided in the parcel data were used instead of the "new use codes" because most counties had not yet converted from the old codes to the new codes.

Once these categories of residential parcels were identified, a “select by location” was performed to select all residential parcels that intersected the unioned, buffered water layer. This function provided researchers with their lists of waterfront residential facilities. Upon examination of a random sample of these parcels, researchers would note if the parcel was indeed waterfront. In this way, a statistical analysis was able to approximate the number of truly waterfront parcels, correcting for the over-selection of parcels that were not waterfront (further details are presented in the next section).

Parcel data were crucial in the residential sampling process; therefore, those counties without parcel data (Citrus, Highlands, and Sumter counties) and those counties whose parcel data lacked land use codes (Martin County) could not be sampled.

Figure 2.29: The edges of waterbodies do not always match the parcel data or orthophotographs.

Figure 2.30: Buffering the water boundaries creates the ability to select parcels that intersect the buffered water layer.

Residential Sampling Procedures

Based on data from two counties with varied levels of residential developments and water features (Lee and Levy counties), the statistician determined that some residential land use codes could be looked at in combination with others because the nature of the land uses were comparable (see below for more information). For example, mobile homes, single family residences, and cooperatives often had parcel lines around each individual dwelling, and typically each dwelling had its own dock or slip if recreational boating was present. For these reasons, researchers looked at single family residences, mobile homes, and cooperatives as one type of residence. Mobile home parks and multi-family dwellings with more than 10 units were also analyzed jointly because each parcel typically represented more than 10 residences that often had shared boating infrastructure when boating infrastructure was present. Multi-family dwellings with less than 10 units were analyzed as their own stratum, as were condominiums. This grouping of parcels by land use codes resulted in the development of four separate sampling strata, labeled as: "single family", "multi-family more than 10", "multi-family less than 10", and "condominiums" (Figure 2.31).

Figure 2.31: An example of residential land use in Lee County.

For each of these four stratum, researchers analyzed a random sample of parcels and gathered information about whether or not the parcel was actually waterfront, the number of wetslips (if any), the number of boats (if any), the estimated length (in feet) of broadside berthing dockage (if any), and the presence or absence of a ramp. It is important to note that dock space appropriate for berthing was left to the discretion of the researcher. In some cases, it was clear from the images that the water was too shallow for boating, or that a length of dock was too short to safely berth a boat. In these situations, researchers only measured the dock footage that did seem able to accommodate berthing.

Figure 2.32 shows an example of an image used to determine that there are 14 boats, 22 wetslips and approximately 47 feet of broadside berthing at the end of the dock at this condominium complex. Researchers would also record that the parcel is waterfront and there are no ramps.

A preliminary statistical analysis, using data from Lee and Levy counties, suggested that the suitable sample size within each stratum would be 300 parcels. In some cases, a particular stratum in a county would have fewer than 300 parcels, in which case, an inventory of all parcels in that stratum was completed. In those strata with more than 300 parcels, the random sampling feature of Hawths Analysis Tools was used to randomly select the parcels to be examined. Taking into consideration that there were likely to be some non-waterfront parcels in the random selection, researchers used the sampling program to randomly select between 325-400 parcels to examine. If necessary, researchers would randomly select additional parcels in order to reach the set goal of 300 waterfront parcels (see the next section for more detail on sample size. There is also addition information in Appendix C).

Figure 2.32: An example of a sampled condo development.

Due to the variability of mapping procedures from county to county, researchers had to make some adjustments to parcels while conducting their analysis. Condominiums presented the greatest challenge. In some counties, condominiums were mapped as one large unit, encompassing all buildings and grounds belonging to that particular development. Other counties created parcel lines for each building within a condominium complex. For example, if a complex consisted of five buildings, there would be five different parcels individually listed. Finally, some counties divided condominiums into parcels at the unit level. In these counties, a five building complex having 10 units in each building would appear as 50 individual parcels. To the extent possible, researchers used the orthophotographs and information in the attributes of the parcel data to identify all parcels belonging to the same condominium complex. From those parcels, one representative parcel was selected (the others were deleted from the final count of waterfront parcels), and, if that complex was randomly selected, information was gathered for the whole complex.

Researchers faced additional challenges given the subjectivity of aerial photo interpretation. For example, the seemingly straightforward question of “What is waterfront?” sometimes proved to be quite complicated to answer. In ideal instances, a parcel was clearly bordered by navigable water such as a wide river, a large lake, or the Intracoastal Waterway. In other situations, a parcel bordered on what was likely or clearly not navigable water such as a small retention pond in a residential community, or a small stream running alongside a road. Though these water features appeared not to be navigable, two of the datalayers did not distinguish between navigable and non-navigable, so all parcels bordering on all water were considered “waterfront”.

Understanding that this is a sampling process for a study on recreational boating, it would appear odd to some that a house abutting a retention pond would be "waterfront". Yet, in order for this process to be replicated by others, the subjective nature of determining what is and is not navigable had to be eliminated and, all parcels abutting water identified in the buffered water layer were considered "waterfront".

The exception to this rule was when orthophotographs and Google Earth clearly showed that a mapped water feature did not exist. In some, albeit few, situations, the line of a mapped water feature would cross a house, a road, or some other object that clearly was not water. In these situations, researchers marked the parcel as "non-waterfront."

Additionally, the standard practice was that if a parcel was separated from water by a road, it was not waterfront. However, in some cases the "road" looked more like a dirt path; or the piece of land across the road and adjacent to water looked vacant or had no clear attribute suggesting it was separate from the selected parcel. In these cases, researchers were instructed to use their best judgment, check online resources, and work together to determine if a parcel should be classified as "waterfront".

Having created a procedure that can be replicated, there are a few ways this sampling plan could be enhanced in order to be more accurate in the future. First, if the resolution and coverage of the orthophotographs was better, researchers would not need to consult multiple sources, adding variability by using images of different quality taken at different times. Second, a comprehensive GIS layer of "boatable" waters would eliminate the confusion over what a "waterfront parcel" should be in a study about recreational boating. However, defining "boatable" is difficult as the many waterbodies are suitable for some boats but not others. For example, if the use of airboats qualifies as "boating" then large areas that many would consider not suitable for general boating would need to be included. Third, a statewide standard procedure for mapping parcels would eliminate any errors introduced by having to determine which parcels belong to the same residential community. Lastly, it would benefit future sampling projects to have a complete and updated set of parcel data for *all* counties.

2.6.4 Statistical Analysis

The county-level waterfront residential property (WFP) boating access facility (BAF) survey sampling design consisted of a stratified random sampling design (Thompson, 2002). For each county, simple random sampling was carried out within each of 4 residential property parcel stratum sampling frames described above (single family (SF) residences; multi-family residences with 10 or fewer units (MF-10); multi-family residences with more than 10 units (MF+10), and condominium complexes (Condo).) Residential property parcel grids that could be used to define WFP sampling frames for each of these strata were available as GIS coverages for 63 of 67 Florida counties (Citrus, Highlands, Martin, and Sumter Counties were not surveyed because of the lack of available and complete parcel data).

WFPs were not identified explicitly in these GIS coverages. As discussed in the Residential Sampling Procedures section, a stratum sampling frame for potential WFPs was created by using GIS software to select polygons from the county residential property parcel coverage that met the stratum definition and whose boundaries fell within the 75 foot buffered water layer. Because verification of true WFP status required labor-intensive interpretation of aerial photographs, it was impractical to identify all of the true WFPs in such a "contaminated" sampling frame prior to sampling. Instead, simple random sampling of the "contaminated" stratum sampling frame was carried out, with the true WFPs in the sampling frame being viewed as a subpopulation of the property parcels meeting the 75-foot buffer zone criterion. Methods for estimating subpopulation parameters of interest from data randomly sampled from a parent population (Thompson, 2002) were used to estimate various BAF parameters characterizing the population of true WFPs in each stratum and county.

Standard estimators and variances for (subpopulation) proportions, means, and totals based on a simple random sampling design (Thompson, 2002) were used to estimate the following BAF parameters and 95% confidence intervals for each WFP stratum population in each county:

The proportion of:

- Property parcels in the "contaminated" stratum sampling frame that were true WFPs;
- WFPs in the stratum with at least one boat ramp;
- WFPs in the stratum with berthing dock footage;
- WFPs in the stratum with at least one boat slip; and
- WFPs in the stratum with at least one boat moored at the time the interpreted aerial photograph was taken.

The mean number of:

- Dock feet per WFP;
- Boat slips per 100 WFPs;
- Boats moored per 100 WFPs;
- Dock feet per WFP with dock footage;
- Boat slips per WFP with boat slips; and
- Boats moored per WFP with boats moored.

The total number of:

- WFP in the stratum;
- WFP in the stratum with at least one boat ramp;
- WFP in the stratum with dock footage;
- WFP in the stratum with at least one boat slip;
- WFP in the stratum with at least one boat moored;
- Dock feet in the stratum;
- Boat slips in the stratum; and
- Boats moored in the stratum.

The last 8 BAF parameter population totals were also estimated along with 95% confidence intervals for all 4 WFP strata combined, using an estimator and variance for totals based on a stratified random sampling design (Thompson, 2002).

As discussed above, stratum sample sizes were determined based on an analysis of preliminary survey data collected from Lee and Levy Counties. These two counties were thought to represent high and low extremes respectively with regard to the level of boating activity associated with WFPs. Preliminary data consisted of the number of dock feet and the number of boat slips estimated from aerial photographs for each of up to 200 verified WFPs per stratum. Strata with less than 200 WFPs were censused completely. A sample of 200 WFPs was drawn from strata containing more than 200 WFPs. Variances were calculated for stratum totals and for combined-strata totals assuming stratified random sampling. Methods described in Thompson (2002) incorporating these variances were used to estimate the sample size needed to be 95% confident that the relative error of an estimated total (the difference between the estimate and the true population total, expressed as a percentage of the population total) did not exceed a specified level. It was determined that a sample size of 300 WFPs per stratum would yield a relative error no greater than 20-25% and in some instances, 15-20% for the dock feet and boat slip estimated totals for Lee and Levy Counties. Assuming these variances would also be characteristic of

population totals for other counties, a decision was made to set initial stratum sample sizes to 300 WFPs for all counties. This meant that a "contaminated" stratum sampling frame would be sampled until 300 verified WFPs had been encountered in the overall sample, or until all WFPs had been censused when the sampling frame contained less than 300 true WFPs. When the sample size target for each stratum in each county was reached in this first phase of sampling, BAF parameter estimates and variances were calculated from the survey data already collected, and relative errors of the estimates were evaluated to determine if adequate levels of precision had been attained. If additional sampling within a stratum or county was deemed necessary to improve the relative error of a parameter estimate, the corresponding variance would be used to determine the additional number of WFPs to sample in the second phase of sampling. Because the final stratum sample size after a second phase of adaptive sampling is a random quantity, the usual estimators for simple and stratified random sampling designs will be biased (Thompson and Seber, 1996). Therefore, minimum variance unbiased estimators constructed using the Rao-Blackwell method (Thompson and Seber, 1996) would be used as an alternative for estimating BAF parameters if second-phase sampling of a stratum was carried out. However, due to time constraints and the levels of precision achieved for some of the most important BAF parameters obtained during first-phase sampling, no second-phase sampling was carried out in any of the counties surveyed.

After all sampling in all counties was completed, BAF parameter estimates, variances, and relative errors (precision) were calculated using the SAS statistical analysis software package (SAS Version 9.1.3, SAS Institute, Cary NC). Since the validity of the method used to calculate a 95% confidence interval for a BAF parameter estimate would be adversely affected by significant skewness in the sampling distribution of the estimator (Thompson, 2002), bootstrap methods for finite populations (Booth et al., 1994) were used to simulate the sampling distribution of each BAF parameter estimator. Review of skewness coefficients and histograms indicated no significant skewness in the simulated sampling distributions of BAF parameter estimators.

2.6.5 Results

County-level estimated totals and variances for each stratum, both individually and collectively, were used to estimate "statewide" (i.e., 63-county) population totals for dock footage, boat slips, and number of WFPs with dock footage and boat slips. Statewide totals and 95% confidence intervals for each WFP stratum and for all 4 WFP strata combined were calculated using an estimator and variance for totals based on a stratified random sampling design in which counties were viewed as strata (Thompson, 2002).

On a 63-county basis, this sampling method estimates that there are approximately 28,794 waterfront residential properties with boat slips, for an estimated total of 49,832 private residential boat slips. These numbers can be broken down by property type as previously defined in the Residential Sampling Procedures section of this report. (These estimates do not include Citrus, Highlands, Martin, or Sumter Counties because of the lack of complete parcel data.):

- ≈27,676 waterfront single family properties with boat slips (≈33,809 slips total)
- ≈398 waterfront multi-family less than 10 properties with boat slips (≈1,414 slips total)
- ≈230 waterfront multi-family greater than 10 properties with boat slips (≈4,060 slips total)
- ≈490 waterfront condominiums with boat slips (≈10,548 slips total)

Additionally, this method produced estimates of residential facilities with boat docks (a T-dock, broadside berthing, or configuration other than (a) wetslip(s)). In total, there are an estimated 158,556 waterfront residential properties with some sort of dock configuration other than wetslips. As with wetslips, these numbers can also be broken down by property type as previously defined in the

Residential Sampling Procedures section of this report. (These estimates do not include Citrus, Highlands, Martin, or Sumter Counties because of the lack of complete parcel data.):

- ≈155,191 single family properties had boat docks
- ≈2,105 multi-family less than 10 properties had boat docks
- ≈549 multi-family greater than 10 properties had boat docks
- ≈711 condominiums had boat docks.

Within the 63-county study area, properties were less likely to have wetslips than broadside berthing (Figure 2.33).

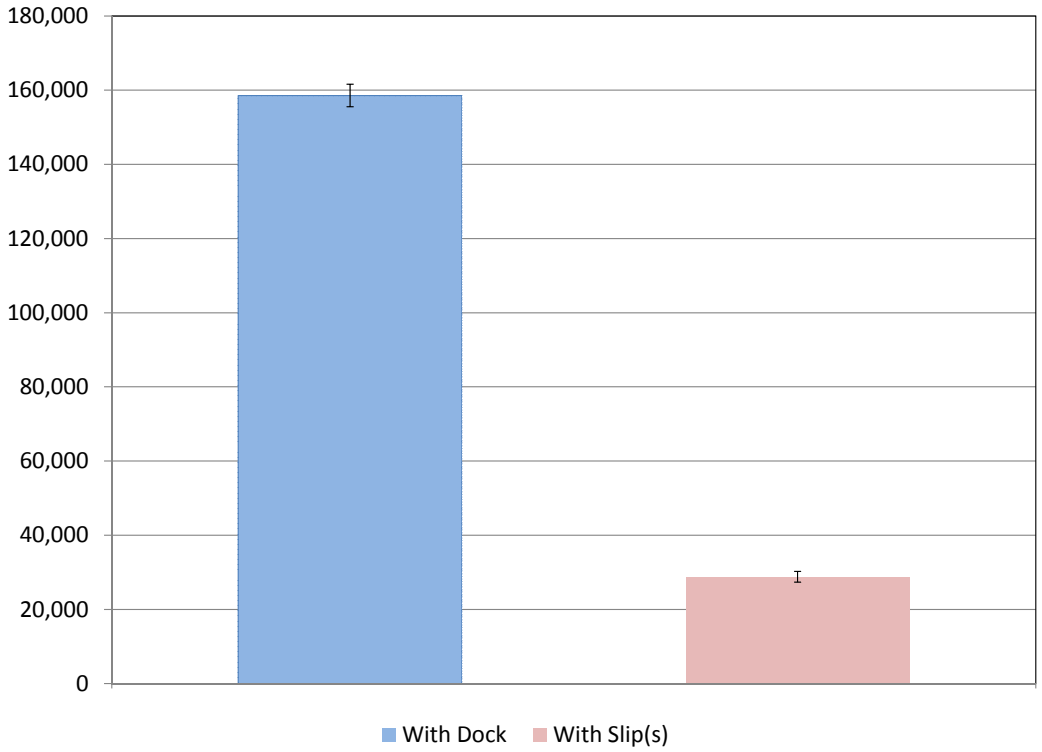


Figure 2.33: The estimated number (±SE) of residences with docks and/or wetslips in the 63 counties analyzed.

In some cases, a residential facility had a wetslip or wetslips as well as another type of dock configuration. These situations were not analyzed as a separate category. Instead, they were counted in both the wetslip and the dock counts.

In addition to providing information about the number of docks and wetslips at residential facilities on a 63-county basis (Tables 2.6 and 2.7), the sampling data also yielded estimates at the county level, as described in Figures 2.34 to 2.41. Some observations from the residential sampling include:

- Lee County had the highest number and percentage of single family parcels with wetslips, while 14 counties had no single family properties with wetslips.
- The number of single family properties with broadside berthing space was much higher than the number of single family properties with wetslips. Hardee was the only county where the estimated number of single family properties with broadside berthing equaled zero.

- It is estimated that more than one half of the sampled counties do not have any wetslips at multi-family properties with less than 10 units. (Several counties did not have any waterfront facilities of this type: Baker, Calhoun, Columbia, Dixie, Gadsden, Gilchrist, Gulf, Holmes, Jefferson, Lafayette, Liberty, Suwannee, Union, Wakulla, and Washington.)
- It is estimated that more than one half of the sampled counties do not have any wetslips at multi-family properties with 10 or more units. (Several counties did not have any waterfront facilities of this type: Dixie, Gadsden, Gilchrist, Jefferson, Lafayette, Liberty, Okeechobee, and Taylor.)
- It is estimated that approximately 40% of the sampled counties do not have any docks at multi-family properties with 10 or more units.
- It is estimated that approximately one half of the sampled counties do not have any wetslips at condominiums. (Several counties did not have any waterfront facilities of this type: Baker, Calhoun, Columbia, Dixie, Gadsden, Gilchrist, Hamilton, Holmes, Jackson, Jefferson, Lafayette, Liberty, Madison, Santa Rosa, St. Johns, Suwannee, Taylor, Union, and Washington.)
- It is estimated that approximately one half of the sampled counties do not have any docks at condominiums.

Table 2.6: Estimated number of wetslips at residential properties in the 63-county study area.

Property Type	63-County Total Estimated Slips	Standard Error	95% Confidence Interval	
			Lower	Upper
Condominium	10,548	581	9,409	11,687
Multi-family +10 Units	4,060	158	3,751	4,370
Multi-family -10 Units	1,414	135	1,149	1,678
Single Family	33,809	1,876	30,132	37,486

Table 2.7: Estimated number of feet of dock at residential properties in the 63-county study area.

PropertyType	63-County Total Estimated # of Feet of Berthing Dock	Standard Error	95% Confidence Interval	
			Lower	Upper
Condominium	179,413	13,655	152,649	206,178
Multi-family +10 Units	90,220	4,242	81,906	98,533
Multi-family -10 Units	127,855	2,600	122,759	132,952
Single Family	6,103,077	149,987	5,809,107	6,397,047

Additional parameter estimates by stratum and county are summarized in Appendix C. Though mentioned earlier, it is important to note again that the term “waterfront” property does not directly relate to navigable waterways, and thus the information in the tables and graphs should not be considered an accurate estimate of “waterfront” properties without including a detailed explanation of the term “waterfront” to avoid any confusion.

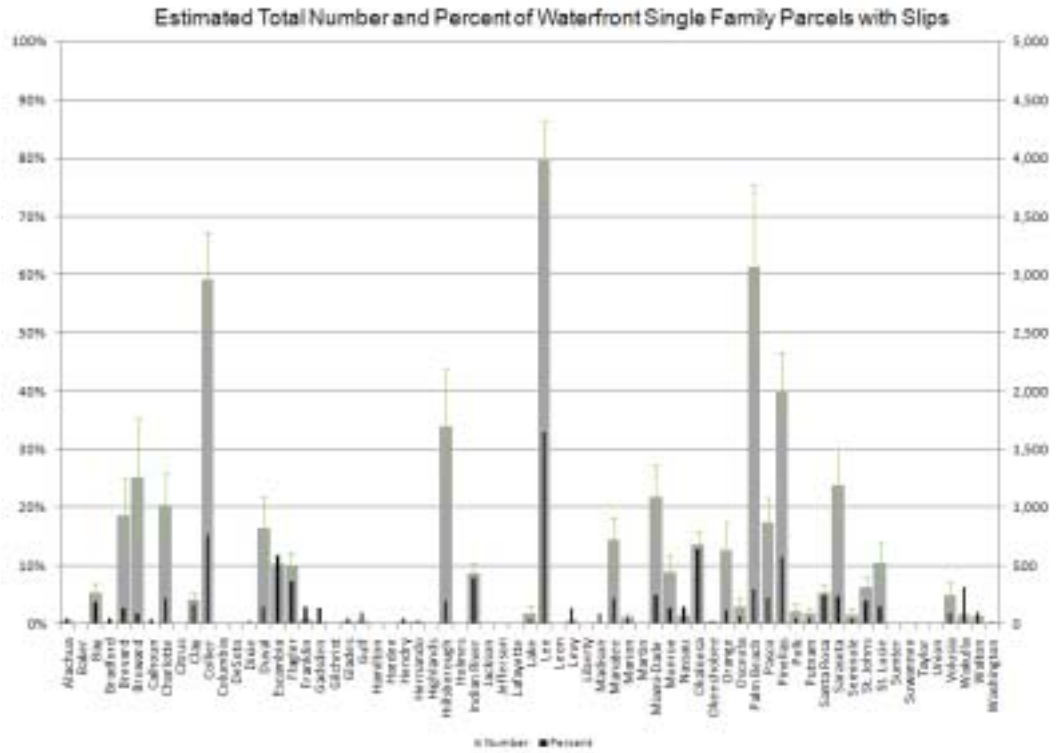


Figure 2.34: The estimated number (±SE) and percent of waterfront single family parcels with wetslips.

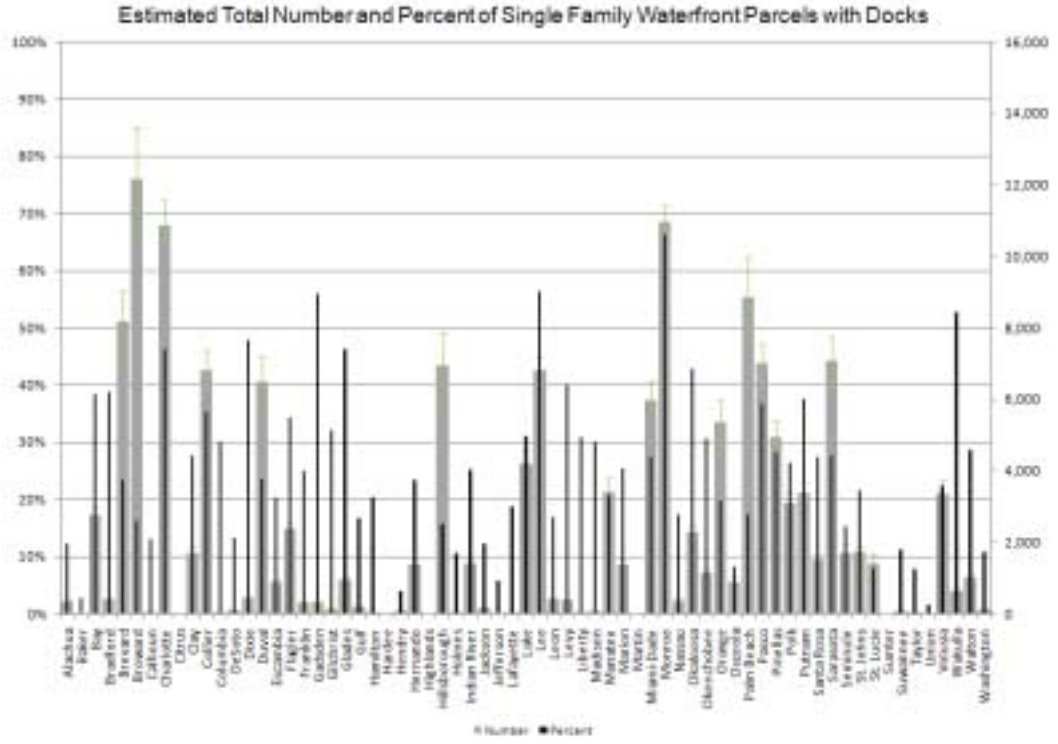


Figure 2.35: The estimated number (±SE) and percent of waterfront single family parcels with docks.

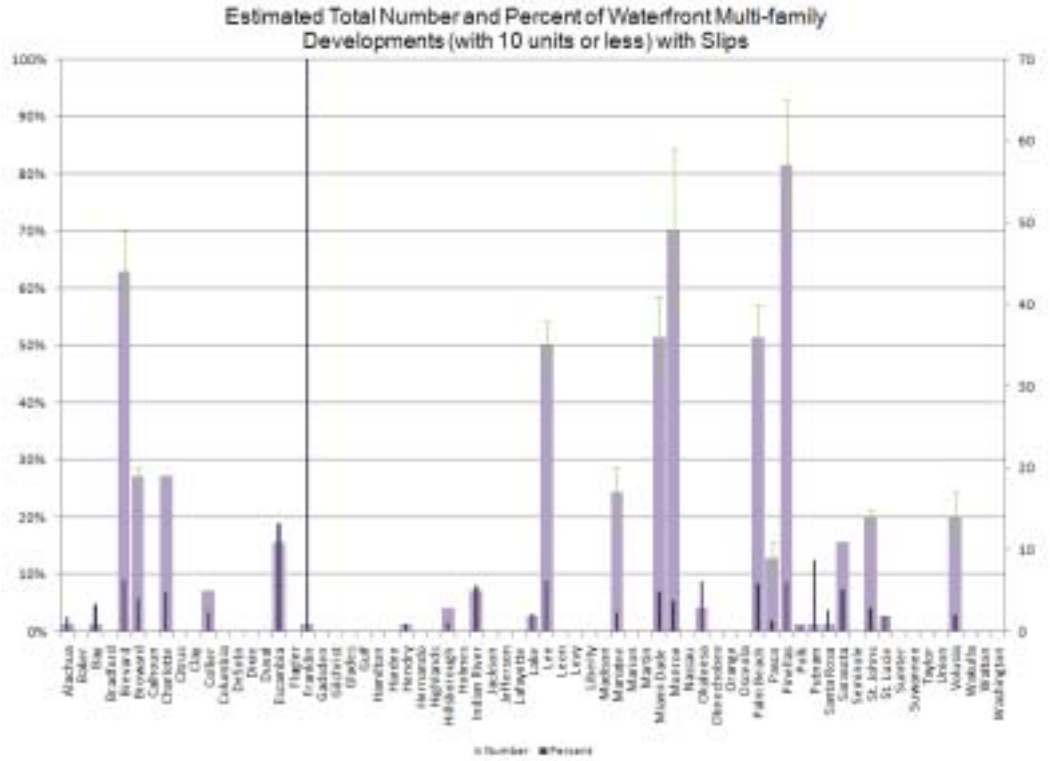


Figure 2.36: The estimated number (±SE) and percent of waterfront multi-family parcels (with 10 units or less) with wetslips.

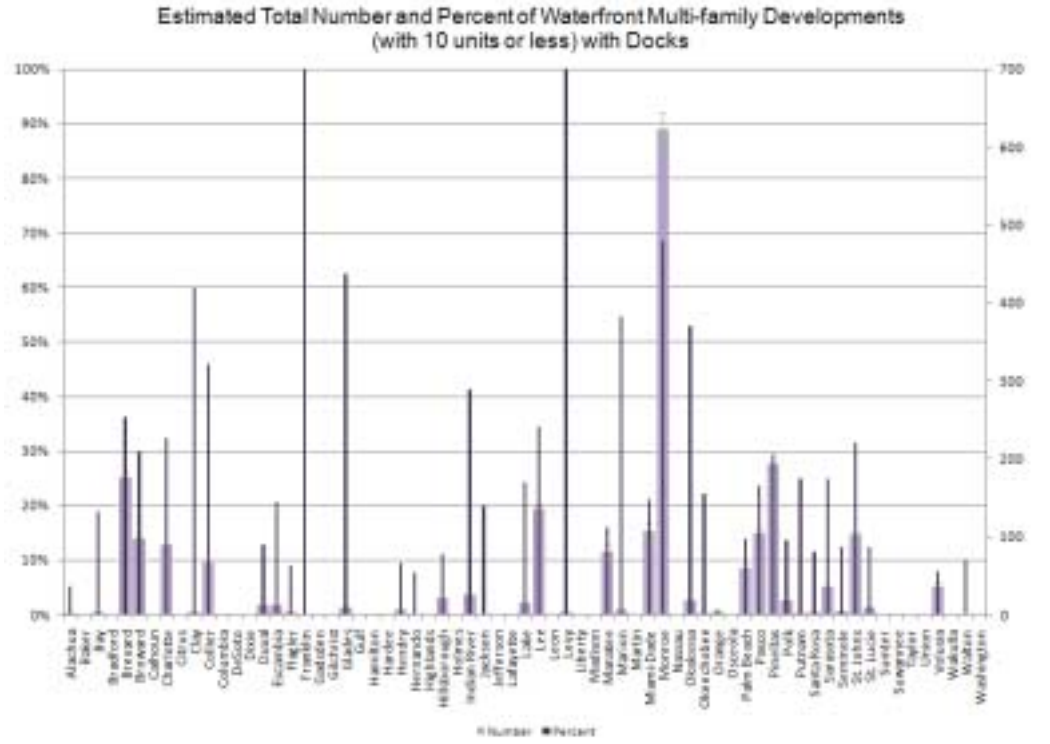


Figure 2.37: The estimated number (±SE) and percent of waterfront multi-family parcels (with 10 or less units) with docks.

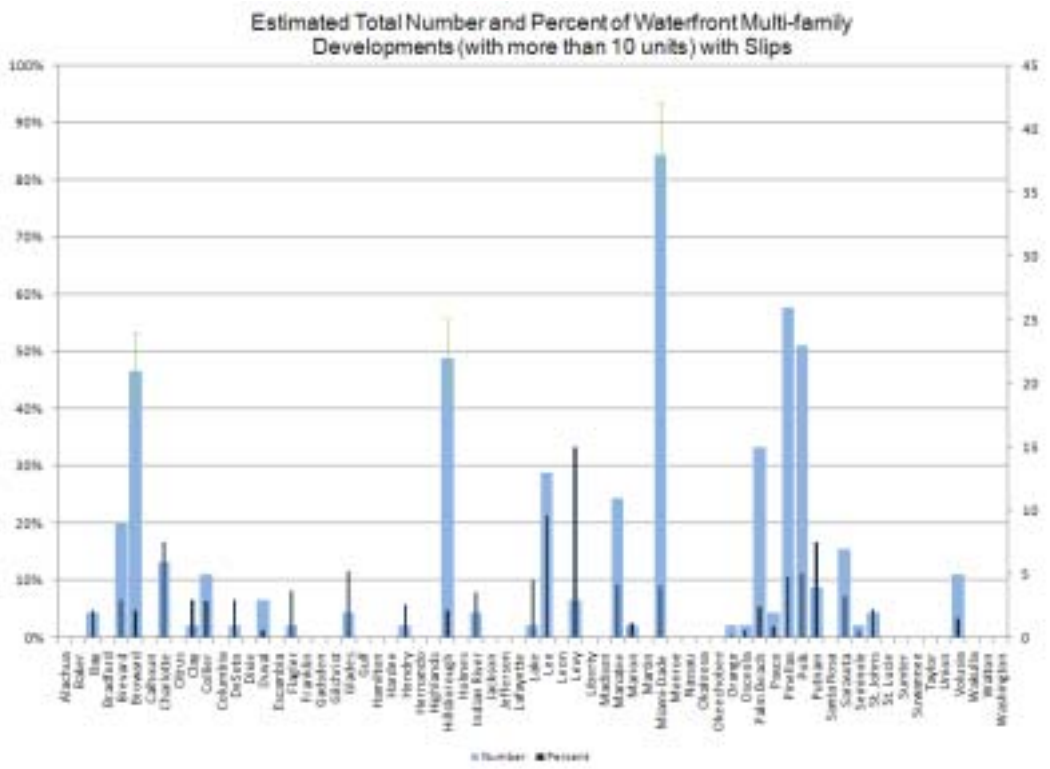


Figure 2.38: The estimated number (±SE) and percent of waterfront multi-family parcels (with more than 10 units) with wetslips.

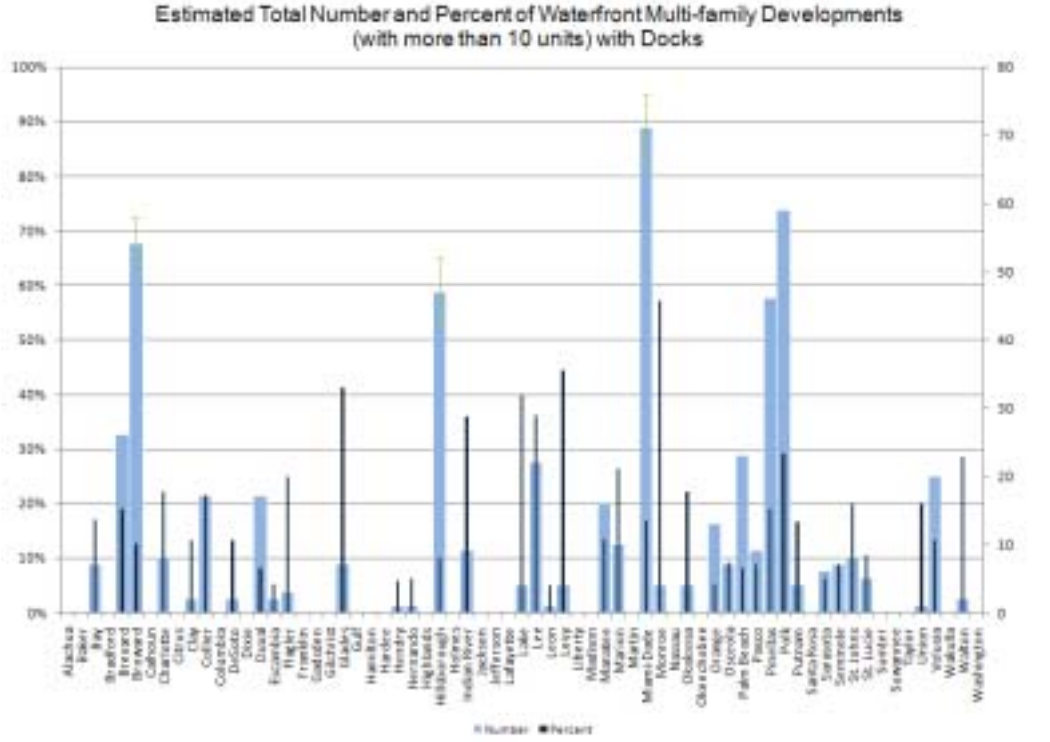


Figure 2.39: The estimated number (±SE) and percent of waterfront multi-family parcels (with more than 10 units) with docks.

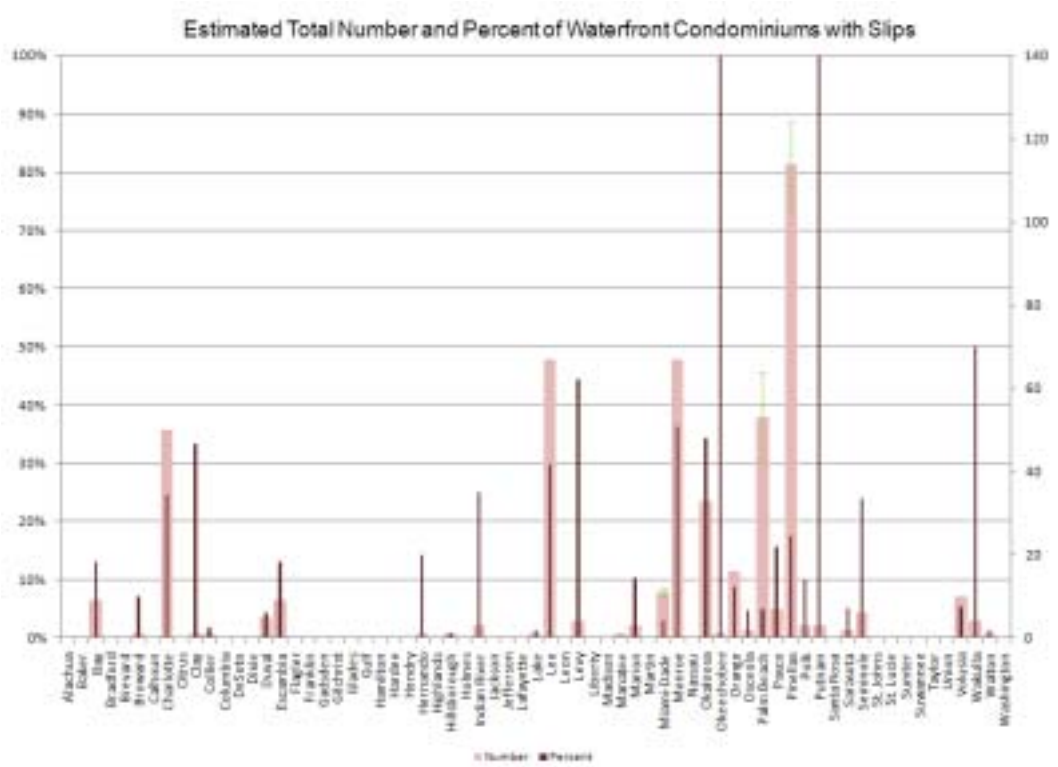


Figure 2.40: The estimated number (±SE) and percent of condominiums with wetslips.

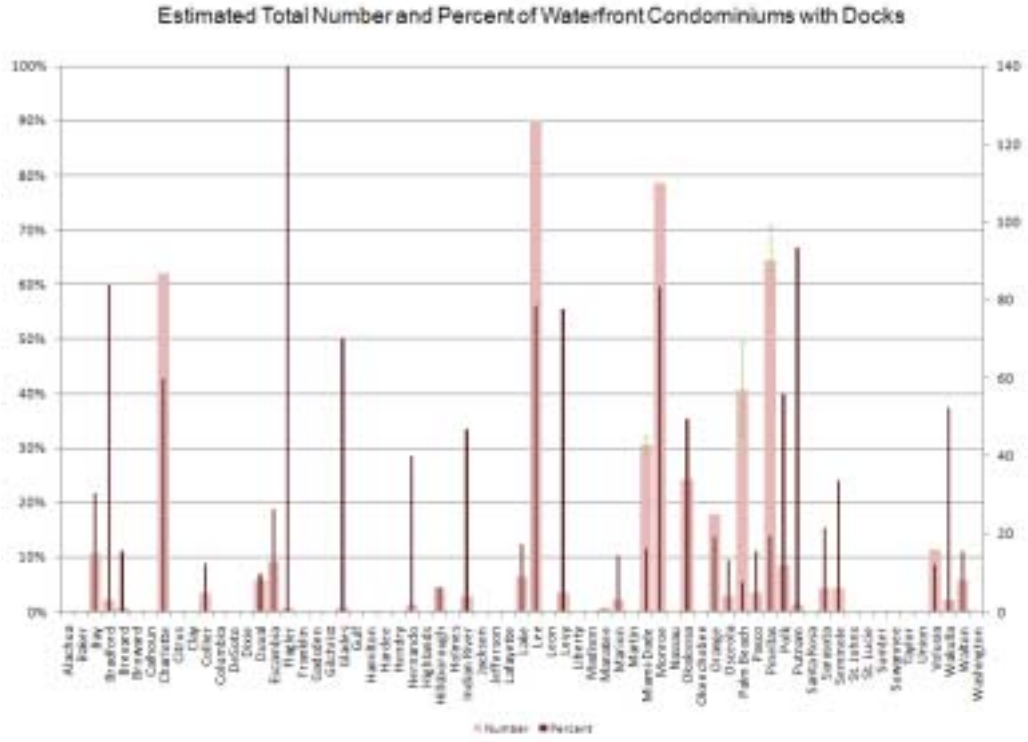


Figure 2.41: The estimated number (±SE) and percent of condominiums with docks.

SECTION 3

3. ECONOMIC STUDIES 77

3.1 Introduction: An Overview of Economics 77

3.2 Economic Impact 79

3.2.1 Overview 79

Multipliers 79

3.3 Economic Significance of Recreational Boating in Florida 80

3.3.1 Introduction 80

3.3.2 Recruitment of Florida Registered Boat Owners 80

3.3.3 Monthly "Last Trip" Surveys of Panel Members 81

3.3.4 Analytical Methods 84

Boat Segments 84

Regions 84

Weighting 85

Boat Size/Type Weights 86

3.3.5 Boating Activity 89

Days of Use by Segment 89

Day versus Overnight Trips 89

Origin-Destination Patterns 91

3.3.6 Boater Spending 93

Trip Spending Averages 93

Craft Spending Averages 103

Trip and Craft Spending by Boat Storage Segments 104

Number of Trailering Boat Trips and Related Trip Spending 107

Expanding Results to all Registered Boats 107

3.3.7 Economic Significance of Boater Spending 115

Statewide Significance 115

Regional Significance 124

County-Level Impacts: All Registered Boats and a Sample Marina and Launch Site 131

Impacts of Registered Boaters in Lee County 132

Economic Significance of a 100-Boat Marina on the Lee County Economy 133

Economic Significance of Launch Ramps to the Lee County Economy 136

3.3.8 Florida Online Economic Impact Model 139

3.4 Economic Value 152

3.4.1 Overview 152
3.4.2 Background 153
3.4.3 Random Utility Model 153
3.4.4 Estimation Results 156
On-the-water Destination Choices 157
Marine Ramp Launch Destination Choices 158
Freshwater Ramp Launch Destination Choices 159
Ramp Values 161
3.5 Site Suitability 164
3.5.1 Method 164
Environmental, Physical and Regulatory Assessment 164
Economics Assessment 166
3.5.2 Case Studies – Lee County Random Utility Models for Boating 167
Overview 167
Results 167
Lee County Environmental, Physical and Regulatory Assessment 173
Case Studies 174
3.6 Estimate of Future Demand 182
3.6.1 Projecting boating demand to the year 2025 182
3.6.2 Discussion on capacity and demand 189
Freshwater Capacity and Demand 189
Salt Water Capacity and Demand 196
3.6.3 Supply of Launch Access and Facilities 196
3.7 A Process to Identify What Capital Costs Will be Necessary to Meet Current and Future Access Demand 197
3.7.1 Introduction 197
3.7.2 Capital Budgeting Needs, Projects and Expenditures 197
3.7.3 Utilizing Study-Produced Information and Tools to Improve the Efficiency and Effectiveness of Evaluating Boating Access Investments 202
Future Demand and Launch Site Capacity to Launch Ratios 202
RUM Models and Estimates of Consumer Surplus Associated with Public Boat Launch Sites 220
Economic Significance Models 224
3.7.4 Boating Access Information Needs 225
Performance Utilization of Launch Sites 225
Integrated Boating Access Information System 226

Boating Access Surveillance and Indexing System (BASIS).....228
3.7.5 Outreach 234

Section Authors

3.1-3.3 Edward Mahoney, Daniel Stynes, Yue Cui, Teresa Herbowicz and Tanya Stock.

3.4 Michael Thomas, Frank Lupi and Michael Kaplowitz.

3.5 Michael Thomas, Frank Lupi, Jack Wiggin, Dan Hellin and Michael Kaplowitz.

3.6 Michael Thomas, Frank Lupi and Michael Kaplowitz.

3.7 Edward Mahoney and Daniel Stynes.

3. ECONOMIC STUDIES

3.1 INTRODUCTION: AN OVERVIEW OF ECONOMICS

The management of natural resources and their dependent activities is often developed with little to no clear connection to human activities, desires and values. This oversight can lead to policy that is less efficient and ineffective, yet, by integrating the social sciences into the management process one can establish policy that better accommodates human needs with environmental capacity. The social science of economics is well structured to describe and guide the allocation of goods and services among competing uses. Goods are things of value, such as boats, fish and boat ramps, while services are actions of value such as fishing and boating and it is the interaction of consumer's desire for these goods and services and their costs that ultimately determines demand. In the end, a good understanding of the demand for the goods and services that depend on access to Florida's waterways will assist policy makers in planning the supply and placement of public boat ramps and accesses points.

Economics can be broadly viewed in two distinct ways: 1) a means to measure the value of a good or service, providing a monetary metric for comparisons; and 2) a framework to categorize the type of impact that resource-dependent activities have on society. As a monetary metric, economics permits a social accounting of human uses of natural resources and a means to evaluate the relative importance of these competing uses. For example, people may value the convenience of an additional boat ramp at $20 per trip. In a similar manner, by tracking economic expenditures related resource dependent activities one is permitted to measure of impact on businesses and the accumulated ripple effect on households and local governments via income and taxes.

To illustrate, consider the diagram below (Figure 3.1). The curve depicts a typical demand curve for boating trips to a particular site. The higher the cost of the trips (given by the vertical axis), the fewer trips a boater is expected to take (shown on the horizontal axis). Thus, at price "P" the demand curve indicates that "T^o" trips will be taken. The demand curve illustrates both economic concepts discussed above, economic value and economic impacts. When T^o trips are taken by this individual at a cost of P per trip, then an amount given by $P \times T^o$ is spent for the trips. This spending is depicted in Figure 3.1 as the shaded area. This money that is spent by the boater is a cost to the boater, but it has an economic impact because it is the spending that then circulates into the economy causing economic impacts on incomes and jobs.

The figure also depicts the economic value concept this project seeks to measure. The area between the demand curve and the shaded area that depicts spending represents what a boater would be willing to pay for each trip above and beyond what was actually spent. Thus the value is given by the net difference in the area under the demand curve minus the cost to the boater (the spending). This net benefit or economic value is sometimes referred to as the consumer surplus. This economic value concept can be used to value access to a boat ramp (the consumer surplus associated with the T^o trips to the site).

In addition, if there are factors that cause the demand curve to shift, then we can assess the effect these factors have on spending and on economic value. For example, suppose quality of the site improves and this improvement shifts the demand curve to the right. In Figure 3.2, this shift is indicated by a movement of the demand curve at quality Q^o to the demand curve at quality Q^1. In this case, at the higher quality level, more trips are taken to the site at any given cost. For example, at a cost of P per trip, the number of trips shifts from T^o to T^1. This type of quality-induced shift in demand will be a part of the economic demand modeling being performed in the project.

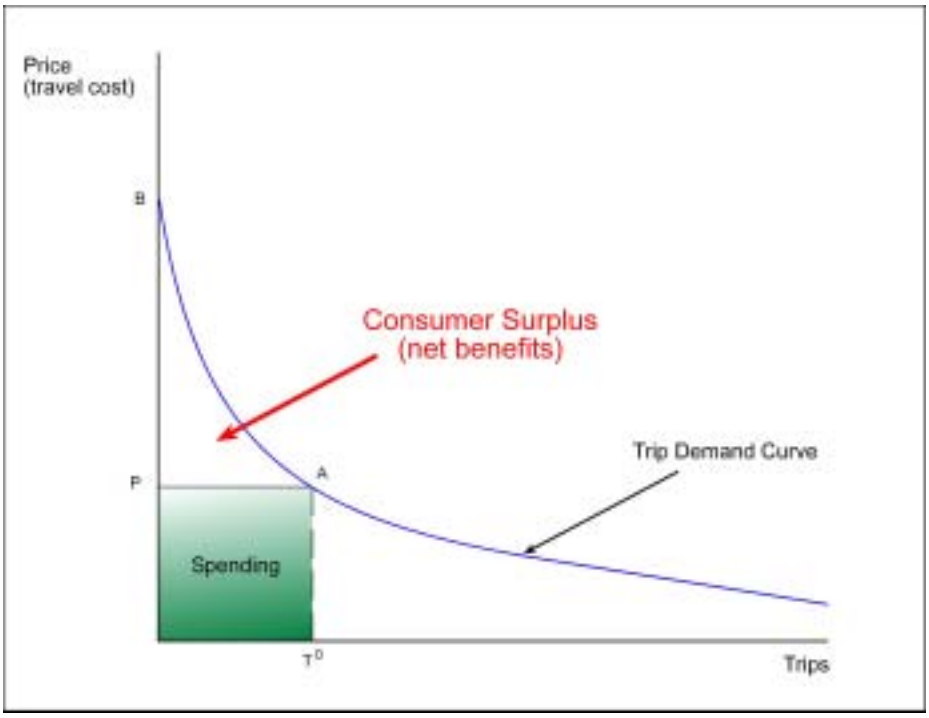


Figure 3.1: Demand for boating trips demonstrating the relationship between expenditures (spending) and value (consumer surplus).

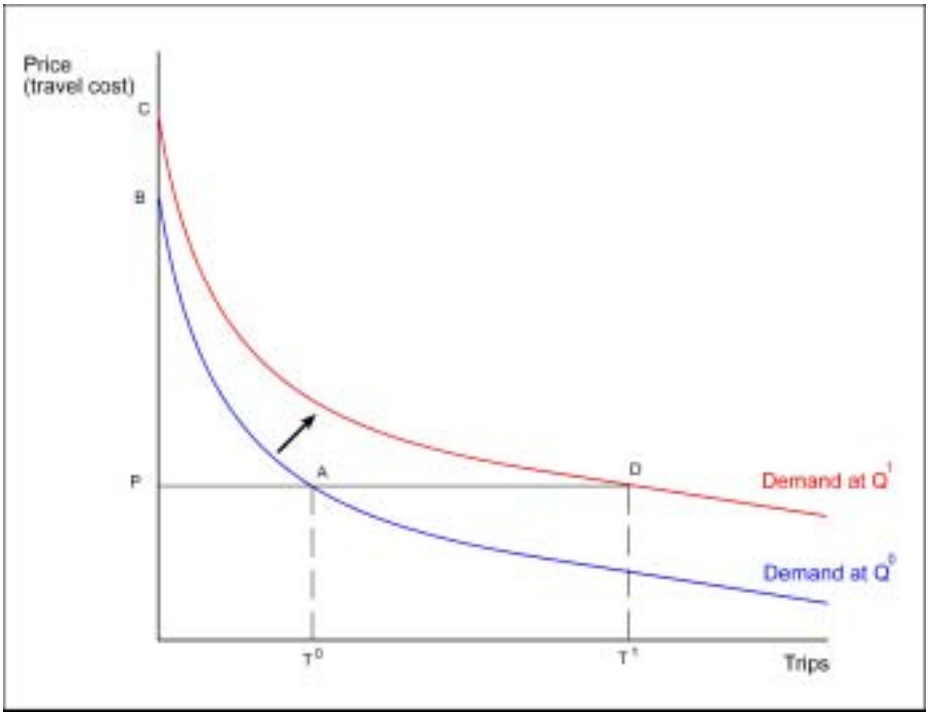


Figure 3.2: Shift in demand.

Another set of factors that influences the position of the demand curve are general demographic characteristics of the boaters. These demographic factors can include income, age, and ethnicity, as well as where people live within the state which then influences their cost of reaching any site.

Naturally, as demographic changes occur within a population, these demographic changes will induce shifts in the demand curves for boating sites. The demand forecasting section of the economic analyses of the project focuses on linking regional demographic projections to the models of the demand for trips both statewide and at the site level.

3.2 ECONOMIC IMPACT

3.2.1 Overview

The purpose of the economic impact analysis is to identify expenditure, revenue, and employment flows, along with employment in a particular region and the state attributed to recreational boating. The economic impact analysis illustrates the economic contributions made to local, regional or state economies by expenditures related to recreational boating.

In this study, the economic impact analysis estimates the expenditures made by recreational boaters who engaged in boating trips. As people go on boating trips or prepare for these trips they typically spend money (e.g., gasoline, food, and safety equipment): these expenditures then become part of a revenue stream of the relevant businesses and industries in that community and eventually become part of the incomes and employment realized by the community.

The relationship between the expenditures and their effect on the economic condition of a community is more complex and involved that it may seem at first. When a dollar is spent on a good or service – a meal at a restaurant, for example, that dollar initially becomes part of the business owner's revenue. Out of this revenue the owner must pay for the resources (workers, the building, materials and machinery) hired or engaged to produce the meal. A portion of the initial expenditure then becomes income for the workers and revenue for the business that provides supplies to the restaurant. Some of these suppliers may be located in the same community; others may not be located in the same community. So the initial expenditure may have an economic impact not only on the community or region where the restaurant is located, but elsewhere as well. Some of this additional income will also be spent, further magnifying or "multiplying" the flow of revenues, expenditures, employment and incomes across the economy.

The economic analysis for this report is performed with version 2.0 of IMPLAN, a software program designed to analyze economic impacts. IMPLAN's structure is based on the conventional input/output (I/O) approach to determining economic impacts.

Input/output models provide a rigorous mathematical expression of the economic relationships among sectors of an economy and between businesses and consumers. An input/output model represents the flows of economic activity between sectors within a region, capturing each sector's purchases from other sectors of the economy in order to produce a dollar's worth of goods and services.

Multipliers

A fundamental element of the input/output analysis is the magnification of expenditures through successive rounds of spending. The measurement and assessment of these effects is one of the primary uses of the input/output model. A change in an economy's final demand (final sales to consumers), such as an increase in spending produces further effects in production, employment and incomes. The restaurants, hotels, service stations, etc. servicing recreational boaters receive these expenditures as revenue, from which they pay their suppliers and employees. Some of the suppliers may be local; others, in other areas. Payments made to suppliers not located in the area represent a portion of the expenditures that exits the economy (leakage). Payments made to local suppliers, on the other hand, will continue to circulate throughout the local economy, having indirect and induced effects on their revenues. The employees of the restaurants are likely to be local residents and will make expenditures

of their own in the area, continuing the circulation of expenditures throughout the economy. Input/output models calculate multipliers for these changes in the expenditures and output of local industries and the incomes in the area.

As industries continue to respond to consumer demand by providing final goods and services, or by supplying intermediate goods, these multiple effects continue to cascade through the economy, but not indefinitely. A portion of income generated by expenditures will be saved, rather than spent, and thus will not play a direct role in local or regional output as incomes. Local residents are also likely to spend a portion of their income on goods and services not produced in the area. Yet another portion of revenues received by businesses may ultimately wind up as revenue to the owner, who may be located in another state or country.

The IMPLAN input/output model and its multipliers capture the broadest effects of expenditures made by recreational boaters. These include: the direct effects on industries and businesses which satisfy final demand (these are the expenditures made by boaters for such things as gasoline, hotels, food, etc.); the indirect effects generated by purchases and sales of intermediate goods as they supply the industries which satisfy final demand; and the induced effects brought about by the spending patterns of households in response to changes in income.

3.3 ECONOMIC SIGNIFICANCE OF RECREATIONAL BOATING IN FLORIDA

3.3.1 Introduction

This part of the report presents the results of the economic impact analyses. It begins with a description of a web-based survey system that was used to both recruit and monthly survey a panel of almost 8,300 registered Florida boaters. The next section describes the methods used in the boating activity and economic impact analyses including, boat segments and regions that framed the analyses and how the monthly surveys were weighted to be representative of all registered boats. Boating activity (i.e., boating days) estimates for segments and regions along with origin-destination patterns are reported in the third section. Information relating to the economic significance of recreational boating is presented in the following section including, estimates of boater spending and associated economic effects (i.e., jobs, sales, wages and salaries, value added). The economic significance section also includes case studies of the economic impact of a marina and boat launch site located in Lee County. The last section describes a system of online models that allows users to estimate the economic significance of registered boats, marinas and boat launch sites. This system of models can also be used to simulate the economic impacts of changes in the boating systems such as the development or loss of marinas and boat launch sites.

3.3.2 Recruitment of Florida Registered Boat Owners

The first step in this study was to recruit an online panel of owners of boats registered in Florida. A random stratified sampling method was used to select proportional sample of 20,000 registered boaters from the most current list of registered boats. Boats registered in January 2007 to Florida residents were stratified based on type and size and the location of the owners residence. Invitations to join a continuing panel of Florida recreational boat owners were mailed to 20,000 registered boat owners in January 2007. Some boaters heard about the panel through other boaters (e.g., word of mouth) and online customers of West Marine were also invited to become panel members. By the end of January, 6,625 owners of registered boats had joined the panel and by the end of February, and before the first monthly survey, the panel was populated by 7,750 persons. An additional 563 persons joined during February after the first monthly survey was completed.

The invitation letter to join the panel identified the Florida Fish and Wildlife Conservation Commission as the sponsor, described the purpose of the study, explained the panel including the requirements (i.e., complete a registration survey and monthly "last trip" surveys), and detailed the incentive consisting of a $20 off $100 purchases at West Marine for every survey completed. Those selected to join the panel were also provided with a unique identification number to enter when completing the registration survey.

The registration survey collected information to determine (1) whether the panel members currently owned the boat that was sampled from the registration data, (2) whether they owned other boats (3) the characteristics of their primary watercraft (e.g., type, size, registration status, engine type and size of the boat they took out on the water most often, (4) where they stored the primary boat, (5) whether they trailered it, (6) whether they owned a waterfront permanent home, and (7) panel members' personal and household characteristics (e.g., age, income, race, number and ages of children) (Appendix D). The information collected on the registration survey was used to assess the representativeness of the panel, to identify a primary boat that would be the focus of the monthly surveys and to calculate weights.

Appendix E presents a descriptive profile of the panel. Table E1 shows their gender, age, household size, race and incomes. The demographic characteristics of panel members represent the population of owners of boats registered in Florida. Most of the panel members (97%) were white; almost half had family income greater than $100,000, and about 57% were between 50 and 69 years of age. Table E2 indicates that 97% of the panel members owned a boat at the time of the registration to the panel. Non-owners were not sent monthly trip surveys. Forty-four percent of panel members owned one boat, over 28% owned two boats and also about 28% owned three or more boats including jet skis, canoes, kayaks, inflatables and rowboats. Table E2 also shows the types of boats that were the owners' primary boats (i.e., taken out on the water most often). The majority of the primary boats were powerboats (80.9%) of various types and sizes followed by sailboats (15.2%). The characteristics of their primary power and sailboats are shown in Tables E3 andE4. The table reveals that the Florida Boater Panel over-represented (compared to the distribution of all registered boats) larger powerboats which, in turn, required weighting of the monthly survey responses to represent the fleet of registered recreational boats.

Results in Table E5 point out that 97% of panel members had taken their primary boat out on the water during the last 12 months. The results of national boating surveys indicated that Florida Boater Panel members were more active in terms of the percentage that took their boats out on the water and the number of days they boated than registered boaters in general. Table E6 shows where panel members used their boats during the 12 months previous to registering for the panel. Almost 60% used their boats on the Gulf of Mexico, 40%, on the Atlantic Ocean, 37%, on rivers and streams including canals and 16% on inland lakes.

3.3.3 Monthly "Last Trip" Surveys of Panel Members

The data needed to conduct the economic analyses reported in this chapter were produced by a unique web-based survey system combined with the state-of-the art survey technology including a sequence of HTML maps connected via hyperlinks that collected geographic information about boating trips. At the beginning of each month, panel member were sent an email inviting them to complete their monthly ("last trip") boating survey on the web (Appendix F). The monthly survey itself was data-driven, meaning that a survey was customized for each respondent based on how they had answered various earlier questions comprising the survey. If survey respondents said that they made a boating trip during the month and trailered their boat, they would see questions concerning launch ramps that would not be seen by boaters whose boat was kept in a marina or at a permanent waterfront home. The survey also used "piping" to make the questions more specifically relevant to each respondent. For example, the

size and type of their primary boat was piped/inserted from the database into questions related to the use of the boat.

Appendix F shows a paper version of the December survey as an example of all potential questions that could comprise the monthly survey panel members answered. This particular month, in addition to the "last trip" section, additional questions about panelists' annual craft spending on their primary boat were added to the survey.

Each monthly survey began by verifying, and if necessary updating, key information including boat ownership status, the location of their permanent address, whether they owned a waterfront second home or cottage and where they kept/stored their primary boat. This information was used to update the database and drive the sequence of questions the panel members answered each month. In this way, key information about the origin of their boating trips was always up to date.

The monthly survey asked whether panel members took their primary boat out on the water, and if so, how many days, and whether they visited/used the boat without taking it out on the water. If they did not take the primary boat out on the water, they exited the survey. Those who did take it out on the water were queried about their last boating trip including: (1) the date it began, (2) whether it was a day or overnight trip, (3) number of persons aboard, (4) boating activities including saltwater fishing, (5) spending on the trip, (6) origin of the trip and (7) whether the boat was trailered, and if so, what types of launch sites were utilized. Different questions comprised the monthly surveys if the trip involved multiple boating occasions meaning that the boat was taken out on the water, returned to a dock, marina, second home or launch site and then taken out on the water again during the same last trip. Each time the boat was taken out on the water was referred to as an occasion. In the case of multiple-occasion trips, the survey asked specifically about the last occasion on the water.

The economic impact analyses and demand/logit models required geographically precise information concerning the origin (e.g., permanent home, second home), the on-land destination (where respondents left for on-the-water portion of the trip, e.g., launch ramp, marina, riparian property) and where they spent most of the time on the water during their last trip. However, collecting information about boating trips was complex given that the trips could be of different lengths (e.g., day, overnight, longer vacations), begin from different origins, and involve more than one occasion on a particular trip (e.g., a three-week stay at a campground involving multiple boating occasions to different locations). Many previous studies have asked survey respondents to indicate a county or zip code for the origins and destinations of their boating trips. Some researchers have survey participants to identify boating starting and ending points on paper maps. However, in this case, county and zip code designations were considered too imprecise and it is usually difficult, if not impossible, for boaters to identify the zip codes of their boating destinations (e.g., boat launch). In the case of this study, paper maps would have been too costly to administer to this many panel members, never mind the cost to code the data from the paper maps into the database (i.e., translate locations on a map to latitude and longitude coordinates).

To increase the precision of the geographic information collected about boating trips, the "last trip" web-based survey was specifically designed to capture origin and destination coordinates (latitude and longitude) for the last boating trip panel members took during the previous month. Working in close collaboration with the Florida Fish and Wildlife Conservation Commission, the Recreational Marine Research Center at Michigan State University developed a unique way to incorporate GIS mapping applications as part of this survey. Near the end of the survey, respondents were presented with a customized sequence of image maps based on information collected earlier in the survey about their boating trips including, where the boat used on the trip was kept (e.g., marina, waterfront home dock, on a trailer at their permanent home) and where the trip began. For example, if panel members indicated that they trailered the boat they used on the trip, they were first asked to indicate the county in which they launched the boat and then they were automatically connected though a hyperlink to two

progressively more detailed maps of that county to indicate where the launch ramp was located. The last map provided the location of roads, towns, and water bodies to assist panelists in identifying a specific launch location (Appendix F). Underlining the last two maps was a series of one-square-mile grids. When respondents clicked on these maps to indicate location, the longitude and latitude of the centroid of the grid containing the clicked-on pixel was recorded in the database. Data from the registration survey and from earlier questions in the "last trip" surveys determined the sequence and wording of the map questions.

The data-driven map sequences generated information on the location of a variety of different types of origins (e.g., permanent home, second home, marina, a campground where they stayed on their trips), different on-land destinations (e.g., marinas, second homes, launch sites) and on-water locations. The on-water locations were used for a separate economic analysis of saltwater sport fishing trips. Because fishing trips vary considerably, forty-two different origin and destination maps were configured. Respondents saw a customized combination of maps depending on the origin of their trips (permanent waterfront home, second home, marina), whether the boat was trailed, and whether the trip was one or more than one day.

A special module of questions asked if panel members engaged in saltwater fishing during their last boating trip during the month. The questions gathered information about: (1) the number of hours respondents fished, (2) their fishing locations, (3) whether they targeted various species, (4) the number of different species they caught and released, (5) their "willingness to pay" measured by the additional distance they would travel to catch one more fish of various species, and (6) their perceptions of how the population of different fish species had changed during the last twelve months. The data from these questions are being used in a special study of the benefits associated with hatchery-reared fish.

As mentioned above, unlike the other monthly surveys, the one in December also included additional questions to collect information about respondents' craft spending on their primary boat during the previous year. This included spending on: (1) boat loan payments, (2) maintenance and repairs, (3) fuel, (4) insurance, (5) new motors and trailers, (6) accessories, (7) storage and (8) taxes. If respondents spent any money in one of the above categories, they were asked more specific questions to describe and verify their spending. These data were used to verify, and if necessary to adjust, their spending estimates.

Table 3.1: Number of respondents by month.

Month	N	%
February	4,243	16%
March	4,030	15%
April	2,137	8%
May	2,089	8%
June	2,105	8%
July	1,994	7%
August	1,902	7%
September	1,868	7%
November	3,248	12%
December	3,154	12%
Total	**26,770**	**100%**

The monthly "last trip" surveys produced 26,770 completed surveys over the course of ten months (Table 3.1; Figure 3.3). Two-thirds of the boat owners reported taking their boat out on the water during

the last month yielding comprehensive data on about 17,313 boating trips where 84% of them were day trips and 16%, involved an overnight stay.

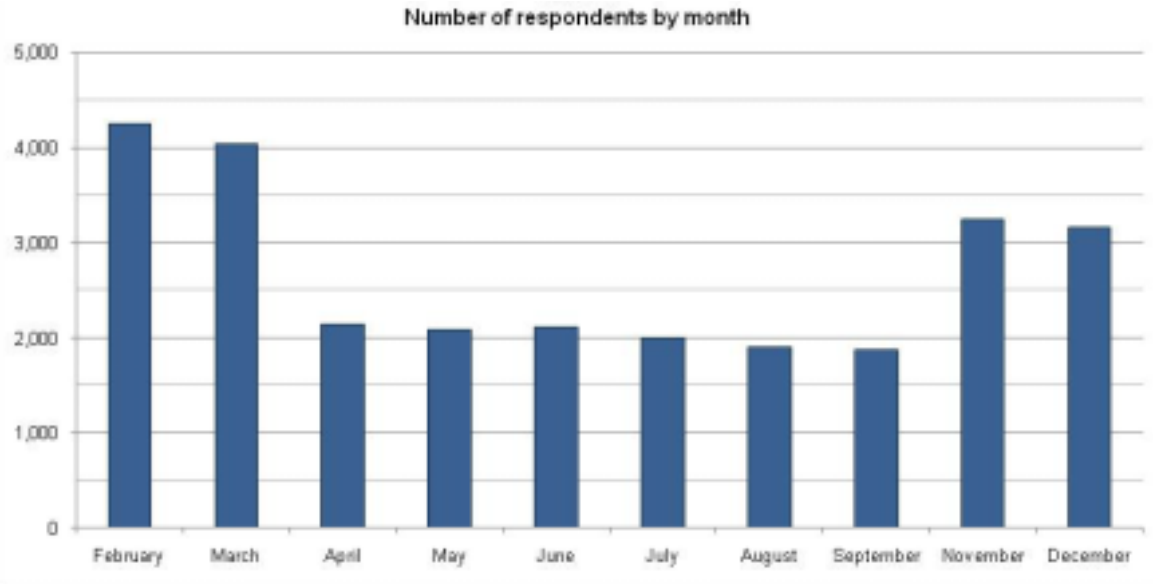


Figure 3.3: Number of respondents by month.

3.3.4 Analytical Methods

Boat Segments

Boats were divided into ten segments based on boat size and type. Power boats were divided into six size classes. Sailboats were split into two classes, one less than 23 feet in length and the other 23 feet or longer. Personal watercraft (PWC) and canoes/kayaks made up the final two boat segments (Table 3.2).

Kayaks are not included in state boat registration statistics, but they are included with canoes in this report when estimating the canoe spending averages. There is no scientific verifiable estimate of the number of non-registered canoes and kayaks in Florida. For purpose of estimating economic impacts only registered canoes are included.

Regions

The ten regions below were defined to represent Florida economic regions and capture boater origin-destination patterns (Figure 3.4). Boater trip origins and destinations were coded by county and region.

West Panhandle:	Bay, Escambia, Holmes, Okaloosa, Santa Rosa, Walton, and Washington counties.
Central Panhandle:	Calhoun, Franklin, Gadsden, Gulf, Jackson, Leon, Liberty, and Wakulla counties.
North Central:	Alachua, Baker, Bradford, Citrus, Columbia, Dixie, Gilchrist, Hamilton, Hernando, Jefferson, Lafayette, Levy, Madison, Marion, Sumter, Suwannee, Taylor, and Union counties.
Northeast:	Clay, Duval, Nassau, Putnam, and St. Johns counties.
South Inland:	Desoto, Glades, Hardee, Hendry, Highlands, Okeechobee, Osceola, and Polk counties.
East Central:	Brevard, Flagler, Lake, Orange, Seminole, Volusia counties.
Southeast:	Indian River, Martin, Palm Beach, and St. Lucie counties.
West Central:	Hillsborough, Pasco, and Pinellas counties.

Southwest: Charlotte, Collier, Lee, Manatee, and Sarasota counties.
South: Broward, Miami-Dade, and Monroe counties.

Table 3.2: Number of registered boats in the sample by boat size/type segments.

Boat segments	March sample
Power boats < 16'	170
Power boats 16-19'	654
Power boats 20-22'	821
Power boats 23-28'	965
Power boats 29-40'	540
Power boats ≥ 41'	193
Sailboats < 23'	66
Sailboats ≥ 23'	513
PWC	65
Canoes/Kayaks	43
Total	**4,030**

Weighting

While the sample is reasonably representative of the regional distribution of registered boats, it intentionally over-represents larger craft in order to obtain adequate sample sizes for the larger boat size classes. Weights were developed to adjust the sample to the fleet of registered boats based on the region of registration and boat segment. Boat weights are the number of registered boats in a given boat segment/region divided by the number in the sample of boats. March trip responses are used in calculating the boat weights. To minimize respondent fatigue, the panel was divided into two groups, and each group was alternately surveyed each month between April and September. This reduces the sample of trips reported in these months.

Table 3.3: Monthly trip weights.

Month	Returned trip	Weight
February	4,243	1.27
March	4,030	1.33
April	2,137	1.89
May	2,089	1.93
June	2,105	1.91
July	1,994	2.02
August	1,902	2.12
September	1,868	3.24
November	3,249	1.86
December	3,154	1.7
Total	**26,771**	

Monthly trip weights were developed to adjust the sample to the same number of boats each month (using March data as the baseline). Monthly weights adjust the sample to 4,030 boats each month, with

substitute months representing trips in the two months that were not surveyed (Table 3.3). Trips from December, February, and March were assumed to represent January trips and trips in September and November were assumed to represent October trips.

Boat Size/Type Weights

On average, each sampled boat represents 236 registered watercraft (Tables 3.4 to 3.6 and Figure 3.5). Weights are highest for small power boats and personal watercraft (PWC). Regional weights are reasonably consistent except for the South Inland region (Region 5). This region has the highest average weight due to a larger percentage of smaller boats in this region.

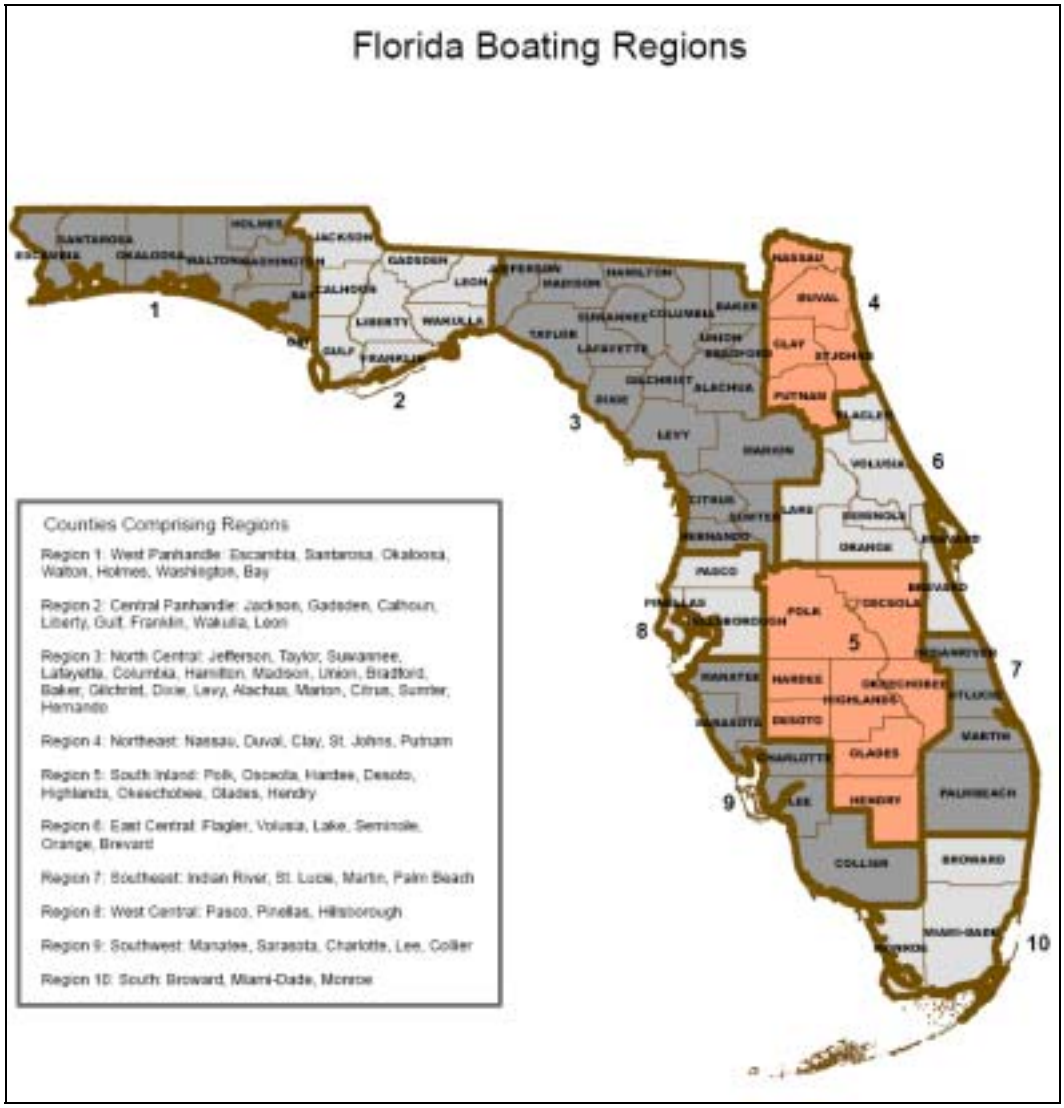


Figure 3.4: Florida boating regions.

Table 3.4: Sample of boat owners responding in March by region and boat segment.

Region	Power boats						Sailboats		PWC	Canoes/ Kayaks	Total
	< 16'	16-19'	20-22'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
West Panhandle	19	43	72	73	43	15	7	47	10	2	331
Central Panhandle	17	33	42	28	11	0	3	10	3	3	150
North Central	17	58	75	54	12	3	4	15	5	8	251
Northeast	21	47	64	61	38	15	6	34	7	2	295
South Inland	9	24	30	18	3	0	3	3	2	1	93
East Central	28	116	137	126	66	19	9	65	12	8	586
Southeast	12	77	74	105	67	34	4	34	10	2	419
West Central	12	106	109	170	68	28	6	115	3	5	622
Southwest	18	90	124	183	129	44	16	108	3	8	723
South	10	48	82	134	92	30	6	65	7	4	478
Total	**163**	**642**	**809**	**952**	**529**	**188**	**64**	**496**	**62**	**43**	**3,948**

Note: The difference between the total number of boat owners in this table 4 (3,948) from the total number of boat owners in table 2 (4,030) results from 82 cases missing the region and / or boat segment identifiers.

Table 3.5: Florida boat registrations by region and boat segment, 2006.

Region	Power boats						Sailboats		PWC	Canoes/ Kayaks	Total
	< 16'	16-19'	20-22'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
West Panhandle	28,072	19,229	8,929	7,509	2,276	791	530	1,154	8,653	296	77,439
Central Panhandle	16,538	9,004	3,505	2,241	536	159	189	225	1,930	243	34,570
North Central	33,217	29,390	12,029	5,988	1,110	170	406	446	6,178	1,228	90,162
Northeast	20,750	21,989	9,426	6,200	2,180	688	436	1,235	8,040	559	71,503
South Inland	20,151	20,701	9,052	3,900	656	140	176	216	6,178	503	61,673
East Central	38,684	44,834	21,015	11,964	3,351	928	1,072	1,876	18,859	1,662	144,245
Southeast	16,134	19,232	12,817	13,172	5,624	1,525	413	1,030	9,237	568	79,752
West Central	28,117	30,471	17,589	14,717	4,896	1,120	1,137	2,704	16,234	1,681	118,666
Southwest	25,473	30,849	23,491	20,965	7,605	2,068	1,070	3,007	13,206	1,194	128,928
South	20,460	25,060	18,973	24,406	11,633	3,192	720	2,712	17,476	583	125,215
Total	**247,596**	**250,759**	**136,826**	**111,062**	**39,867**	**10,781**	**6,149**	**14,605**	**105,991**	**8,517**	**932,153**

Note: Table omits 17,907 boats that were registered with a state tag or to an out of state address.

Table 3.6: Boat weights by region and boat size/type segments.

Region	Power boats						Sailboats		PWC	Canoes/ Kayaks	Average
	< 16'	16-19'	20-22'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
West Panhandle	1,477	447	124	103	53	53	76	25	865	148	234
Central Panhandle	973	273	83	80	49	57	63	23	643	81	230
North Central	1,954	507	160	111	93	57	102	30	1,236	154	359
Northeast	988	468	147	102	57	46	73	36	1,149	280	242
South Inland	2,239	863	302	217	219	57	59	72	3,089	503	663
East Central	1,382	387	153	95	51	49	119	29	1,572	208	246
Southeast	1,345	250	173	125	84	45	103	30	924	284	190
West Central	2,343	287	161	87	72	40	190	24	5,411	336	191
Southwest	1,415	343	189	115	59	47	67	28	4,402	149	178
South	2,046	522	231	182	126	106	120	42	2,497	146	262
Average weight	**1,519**	**391**	**169**	**117**	**75**	**57**	**96**	**29**	**1,710**	**198**	**236**

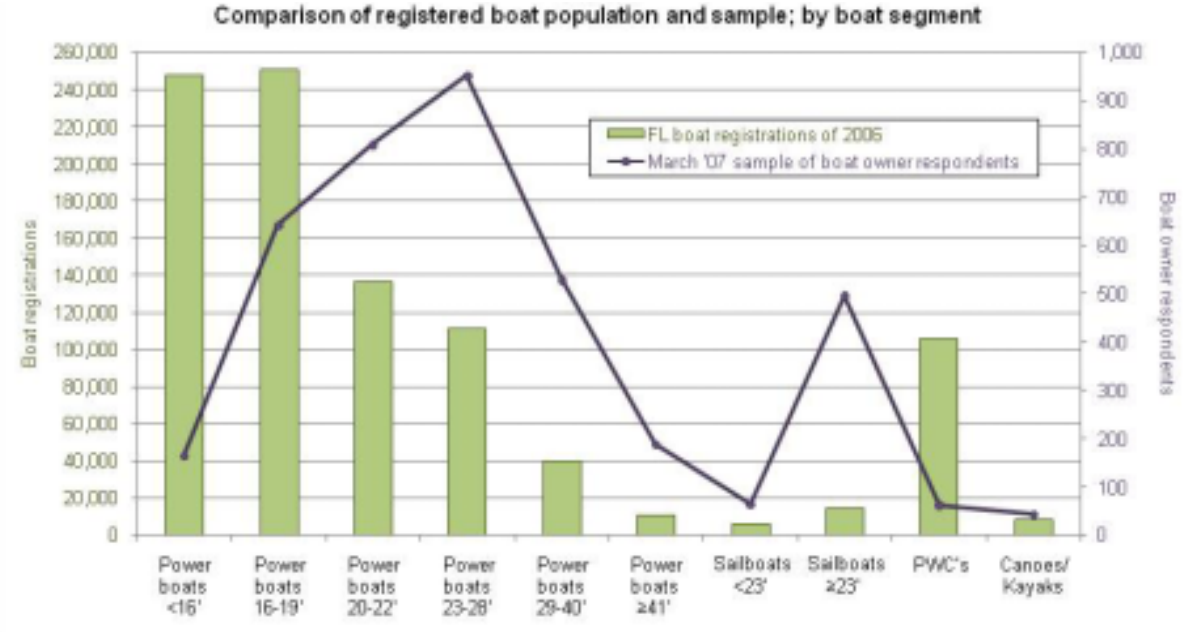


Figure 3.5: Comparison of registered boat population and sample by boat segment.

3.3.5 Boating Activity

Days of Use by Segment

Sixty-one percent of the boat owners responding each month had taken the boat out on the water at least once that month. The sampled boat was used about 4 days per month with larger boats used slightly longer than smaller boats (Table 3.7; Figure 3.6). The overall patterns of use did not vary significantly from month to month. Annual use was estimated as 12 times the average monthly use, taking into account boats that may not have been used in a given month. On an annual basis, the average registered boat was used about 30 days. Days of use per year varied from 45 days for power boats 41 feet or longer to 23 days for power boats under 16 feet.

Table 3.7: Monthly and annual average boat days and trips by segment.

Segment	Monthly Average		Annual Average	
	Boat taken out	Days on water [a]	Days on water [b]	Trips on water
Power boats < 16'	50%	3.8	22.8	18.8
Power boats 16-19'	65%	3.9	30.6	25.8
Power boats 20-22'	66%	4.2	33.3	26.7
Power boats 23-28'	69%	4.1	33.3	25.4
Power boats 29-40'	70%	4.6	38.3	19.3
Power boats ≥ 41'	69%	5.5	44.9	14.1
Sailboats < 23'	51%	4.1	25.0	20.2
Sailboats ≥ 23'	60%	5.0	36.6	14.3
PWC	54%	4.8	31.1	25.2
Canoes/Kayaks	58%	3.9	27.5	20.6
Total	**61%**	**4.1**	**29.9**	**23.0**

[a] Average days for boats that were taken out at least once. Trips outside the US are excluded.

[b] Estimated as 12 * Pct taken out each month * average days on the water per month.

Day versus Overnight Trips

The average number of trips per year was estimated based on the average days on the water for each boat segment, along with the percentage of day versus overnight trips, and the average number of days boats were taken out on the water on overnight trips.

A boating trip is a trip on which a boat was taken out on the water (under power, sail, or human power) including trips primarily for fishing, watersports, diving, cruising, or sailing. A boating trip includes any travel to and from: (1) locations where boats are launch; (2) marinas or second homes where boats are docked; or (3) drystack storage facilities where boats are kept. Most trips start when the boating party leaves their residence to go boating and ends when they return to their residence. Examples of boating trips are: (1) leaving from a dock or mooring in front of a permanent home to go sailing, cruising, fishing, or skiing; (2) leaving from a permanent residence in the morning, trailering and launching your boat from a ramp, fishing or cruising for half the day, and returning to your home that afternoon; and (3) traveling to your second home/cabin/cottage on/near the coast or a lake for a several-day stay and, while there, using your sailboat several times. In this case, the several-day visit would be considered the trip and each time the boater went sailing would constitute a separate outing.

The overall average of 30 days on the water per boat in 2007 breaks down into 20.7 days on day trips and 9.2 days on overnight trips. Larger power and sail boats were more likely to take overnight trips. For

example, about half of the trips taken by the largest power boats (41 feet or larger) were overnight trips and of the about 45 days they were on the water in 2007, 38 days were during overnight trips. Overall, ten percent of the boat trips on the water were overnight trips. Boats were used an average of 3.7 days on a typical overnight trip (Table 3.8; Figures 3.7 and 3.8).

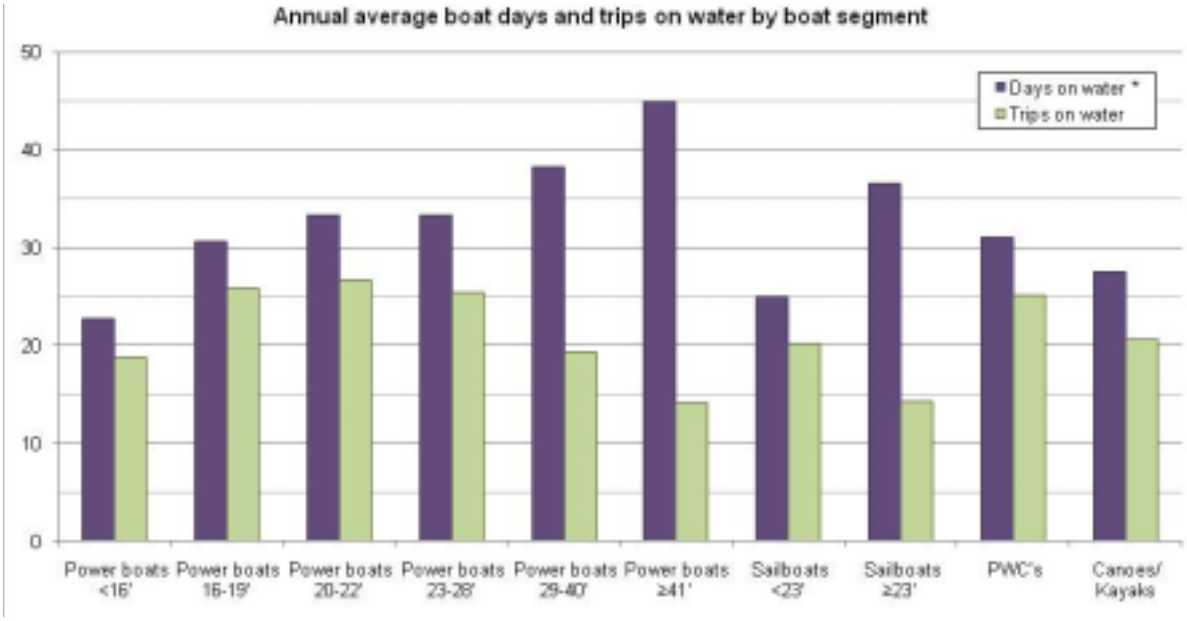


Figure 3.6: Annual average boat days and trips on water by boat segment.

Table 3.8: Annual average day and overnight trips by boat segment.

Segment	Trips in 2007	Percent overnight trips	Boat days in 2007		
			On day trips	On overnight trips	Total
Power boats < 16'	18.8	8%	17.3	5.5	22.8
Power boats 16-19'	25.8	6%	24.2	6.4	30.6
Power boats 20-22'	26.7	8%	24.7	8.6	33.3
Power boats 23-28'	25.4	10%	22.8	10.5	33.3
Power boats 29-40'	19.3	28%	13.9	24.4	38.3
Power boats ≥ 41'	14.1	49%	7.2	37.7	44.9
Sailboats < 23'	20.2	8%	18.7	6.3	25.0
Sailboats ≥ 23'	14.3	39%	8.8	27.9	36.6
PWC	25.2	6%	23.6	7.5	31.1
Canoes/Kayaks	20.6	11%	18.2	9.3	27.5
Total	**23**	**10%**	**20.7**	**9.2**	**29.9**

Note: Trips do not include trips to visit the boat when the boat was not taken out on the water or trips outside the U.S.

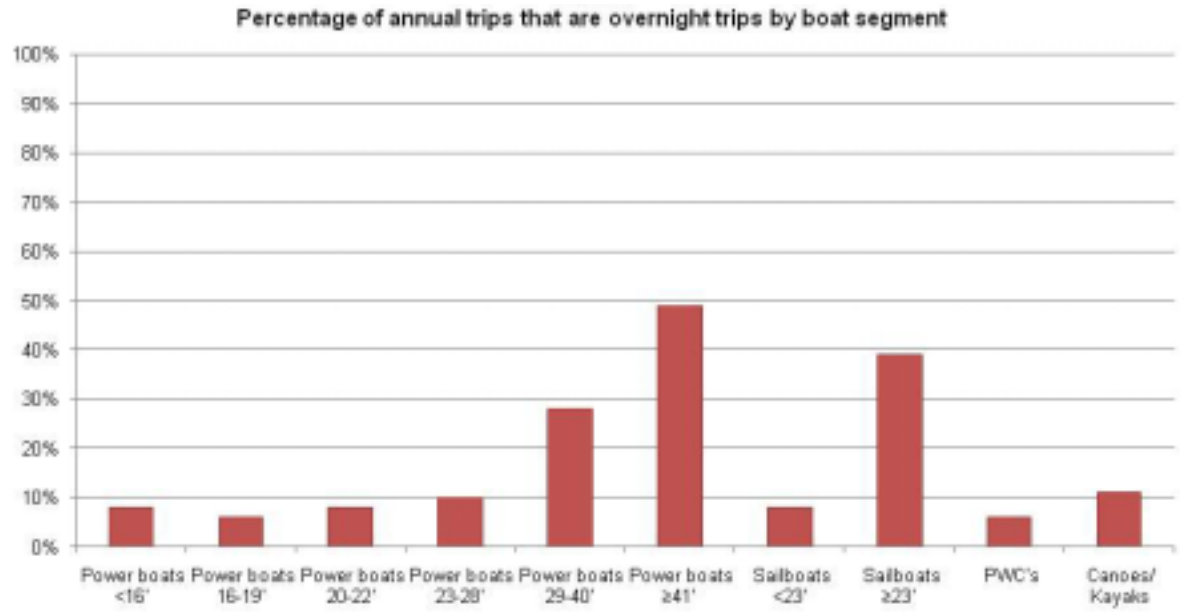


Figure 3.7: Percentage of annual trips that are overnight trips by boat segment.

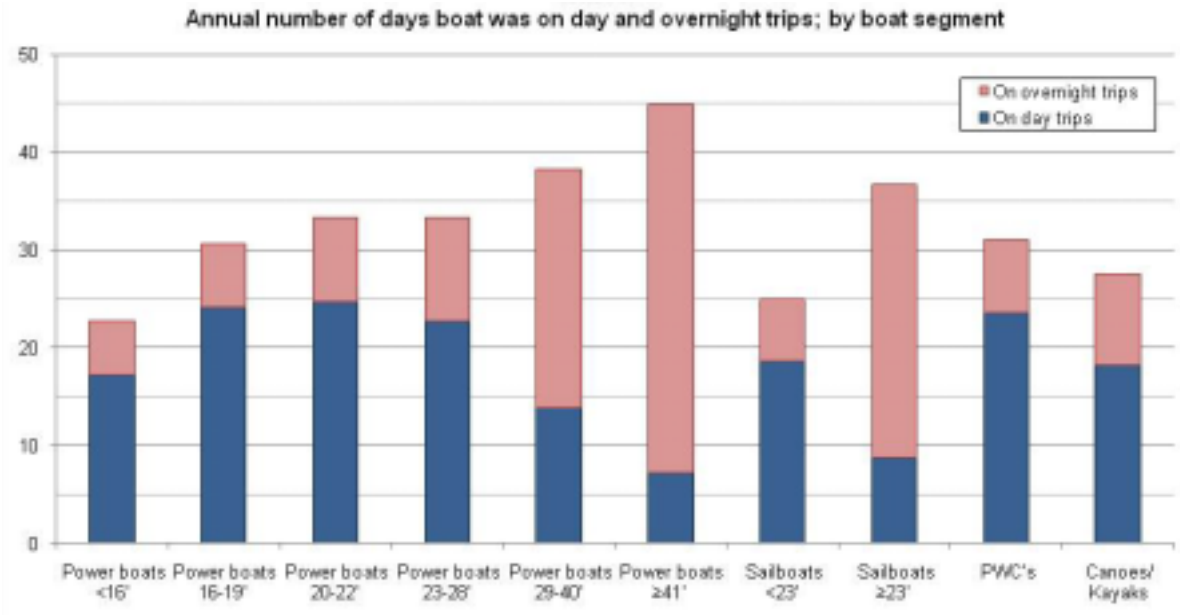


Figure 3.8: Annual number of days boat was on day and overnight trips by boat segment.

Origin-Destination Patterns

To estimate flows of spending around the state, day and overnight boating trips were divided into three categories: (1) trips within the county of registration, (2) trips within the region of registration, but outside of the county of registration, and (3) trips outside of the region of registration. The percentages of day and overnight trips for these three trip types were estimated for each region of origin using the weighted sample of reported trips (Table 3.9).

For this analysis, it was assumed that the zip code of the primary residence was the county of registration for the boat. If the home zip code was missing, the location where the boat was kept is assumed to be the home residence county. For boaters with an out-of-state residence reporting a

Florida seasonal home, the county of their seasonal home was used as the origin of the trip. Note that this analysis only covers boats registered in Florida. It excludes smaller craft that do not need to be registered and also boats registered in other states.

Statewide, 92% of day trips stayed within the region of origin (registration), 73% stayed within the origin county, and 8% involved travel outside the home region. Overnight trips were more likely to go outside the home county and region. Fifty-four percent of overnight trips stayed in the home region, 29% stayed within the home county and 46% went outside the home region (Table 3.9; Figures 3.9 and 3.10).

There were some variations in these patterns across regions. The Central Panhandle and South Inland regions were more likely to send trips outside the home county and region, especially overnight trips. Boaters in the Western Panhandle region were less likely to travel outside of their home region.

Table 3.9: Distribution of day and overnight trips by region and trip types

Region	Day trips			Overnight trips		
	In region	In county	Outside region	In region	In county	Outside region
West Panhandle	98%	82%	2%	80%	65%	20%
Central Panhandle	89%	30%	11%	62%	8%	38%
North Central	89%	62%	11%	57%	20%	43%
Northeast	96%	72%	4%	54%	31%	46%
South Inland	61%	56%	39%	17%	6%	83%
East Central	90%	73%	10%	38%	26%	62%
Southeast	95%	78%	5%	43%	29%	57%
West Central	93%	77%	7%	43%	30%	57%
Southwest	97%	83%	3%	66%	37%	34%
South	93%	77%	7%	81%	35%	19%
Total	**92%**	**73%**	**8%**	**54%**	**29%**	**46%**

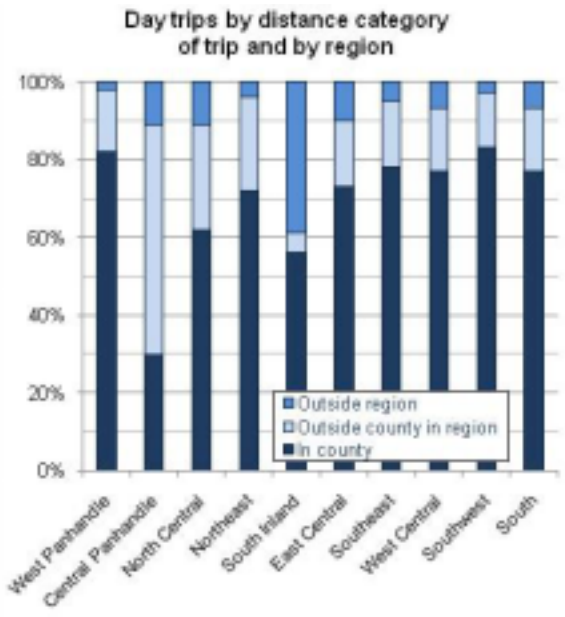


Figure 3.9: Day trips by distance category of trip and by region.

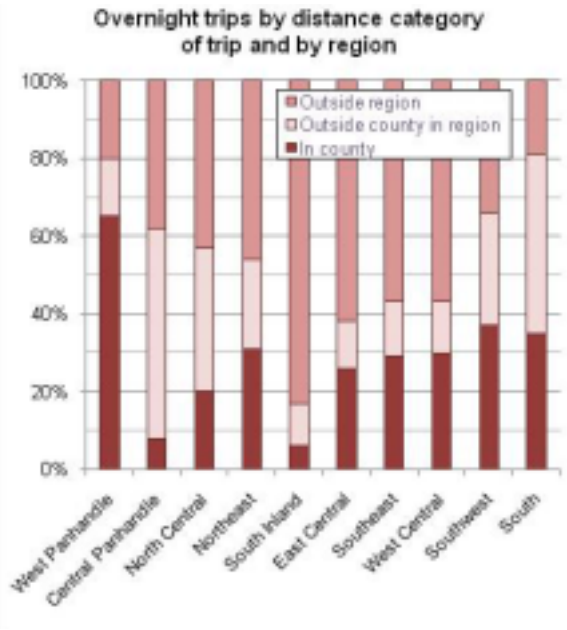


Figure 3.10: Overnight trips by distance category of trip and by region.

3.3.6 Boater Spending

Trip Spending Averages

The monthly trip surveys asked the respondent to report spending on their most recent trip. By sampling registered boat owners each month, a good representation of trips throughout the year was obtained. Spending was divided between spending within 20 miles of home and spending en route or near the boating destination. For trips of less than 20 miles, all of the spending was reported as within 20 miles of home. Spending was reported within 10 spending categories.

Spending averages for each boat segment were developed from the weighted samples of day and overnight trips. For each boat segment, distinct spending averages were estimated for the three types of trips identified above (i.e., within county trips, within region but outside county of registration trips, and inter-regional trips). Separate spending profiles were estimated for day and overnight trips.

All spending is assigned to the home region for trips remaining within the region. For trips going outside the home region, spending within 20 miles of home is assigned to the home region and spending en route or near the destination is assigned to the destination region.

Trips involving an international destination were excluded in this analysis. Also, seven spending outliers were omitted. The average spending is reported separately for day trips and overnight trips within the 10 boat size/type segments. Within a given boat segment, the spending averages did not vary significantly across regions, but the averages did vary considerably by trip types. The statewide averages for day and overnight trips by segment and trip types are applied to all regions.

Trip spending varies with the size and type of boat, whether the trip involves an overnight stay away from home, and the length of the trip. Spending averages were estimated for day and overnight trips within the ten boat size/type segments. Averages were also estimated for three categories of trips based on distance traveled: (1) trips within the home county; (2) trips outside the home county but within the region; and (3) trips outside the home region.

Spending on the average boating trip was $156 (Table 3.10 and Figure 3.11). Thirty-five percent of trip spending was for boat fuel, 14% for restaurant meals, 13% groceries, 12% lodging on overnight trips,

and 10% auto fuel (Tables 3.11 and 3.12; Figures 3.12 and 3.13). Spending per trip varied across the ten segments from a high of $936 for the largest power boats to $46 for smaller sail boats and $95 for canoes.

The overall trip spending average of $156 has a sampling error of 4% (95% confidence interval). Sampling errors for individual boat segments varies from 7-10% for most power boat categories to 27% for the smallest power boats and PWC (Table 3.10). Since most canoes are not registered, the sample of canoe trips is small and the spending average may be unreliable.

For the purpose of estimating impacts for local areas, spending is rearranged in Table 3.13 and Figure 3.14 to report all trip spending as at the destination for trips that stay within the county of registration/residence. With this adjustment, three-fourths of boater trip spending occurs at destination or en route.

The average spending on day trips was $90 (Table 3.14 and Figure 3.15), with almost half of this spending going to boat fuel (Figure 3.12). Day trip spending varied from $42 per trip for the smallest power boats to $381 for the largest power boats.

Spending on overnight trips averaged $841 across all registered boats (Table 3.15 and Figure 3.16). With an average overnight trip lasting about 4 days, per-day spending on overnight trips is about double that of day trips, due primarily to extra lodging expenses and additional fuel associated with longer trips. Lodging accounted for 26% of overnight trip expenses with the largest lodging expenses associated with smaller boats (Figure 3.13).

Sailboaters spent considerably less than corresponding size power boats due to lower fuel expenses and a smaller proportion reporting lodging expenses.

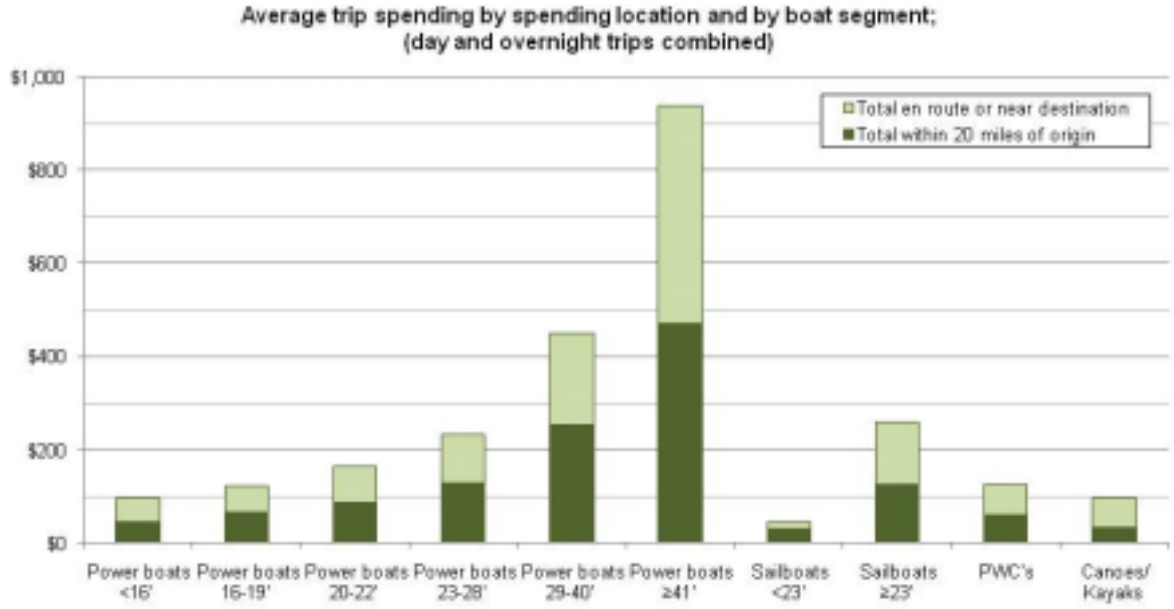


Figure 3.11: Average trip spending by spending location and by boat segment.

Table 3.10: Trip spending averages by boat segment, day, and overnight trips combined.

Spending category	Power boats						Sailboats		PWC	Canoes/ Kayaks	Weighted average
	< 16'	16-19'	20-22'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
Within 20 miles of home											
Boat fuel and oil	11.12	25.15	38.72	64.20	128.62	221.74	1.37	12.09	27.51	0.72	34.39
Temporary dockage	0.30	0.61	0.97	2.47	17.72	48.58	0.57	12.68	4.04	0.43	2.33
Pump-out and launch fees	0.59	0.53	0.53	0.51	0.78	2.13	0.32	0.39	0.20	0.20	0.51
Restaurant meals and drinks	5.33	9.00	12.18	16.18	33.07	62.98	7.51	23.93	7.41	6.18	10.83
Groceries, take-out food and drinks	8.19	9.03	11.60	17.32	30.14	64.23	6.19	35.06	7.87	6.69	11.57
Auto gas and oil	9.12	9.75	8.59	8.32	6.01	3.58	4.22	4.01	7.12	6.18	8.62
Shopping	0.71	0.95	1.15	1.63	5.04	14.82	2.04	5.24	0.45	0.85	1.25
Recreation and entertainment	1.60	1.36	2.50	3.72	7.03	16.52	1.05	5.50	0.64	1.39	2.17
Lodging	4.76	3.89	4.64	5.22	6.75	2.89	0.28	1.36	3.74	7.08	4.43
Other expenses	2.87	4.63	6.65	8.10	18.44	31.49	6.55	24.61	1.57	3.48	5.54
En route or near destination											
Boat fuel and oil	5.62	12.90	23.16	39.05	77.68	178.30	1.94	15.00	15.40	0.52	20.09
Temporary dockage	0.94	1.20	1.33	4.85	23.05	83.94	1.23	22.83	6.29	1.32	3.83
Pump-out and launch fees	0.31	0.45	0.37	0.37	0.74	2.71	0.01	0.72	0.26	0.25	0.40
Restaurant meals and drinks	7.83	8.50	11.34	15.16	29.99	86.89	5.46	33.69	8.08	10.16	11.20
Groceries, take-out food and drinks	6.83	6.81	8.29	11.20	18.93	34.08	2.21	25.01	6.80	8.28	8.41
Auto gas and oil	7.46	7.87	9.17	8.13	5.61	3.54	2.61	5.24	9.00	8.98	8.02
Shopping	1.74	1.74	1.96	3.52	8.81	18.03	0.34	8.19	1.43	2.72	2.40
Recreation and entertainment	2.06	1.69	2.16	2.96	7.08	16.84	0.63	6.34	1.45	2.92	2.33
Lodging	16.76	13.80	16.26	13.49	16.95	5.35	0.37	2.16	13.12	25.34	14.68
Other expenses	1.57	1.94	3.17	5.27	6.14	37.45	1.10	13.99	2.30	1.61	3.05
Total within 20 miles of origin	**44.59**	**64.91**	**87.53**	**127.66**	**253.61**	**468.97**	**30.10**	**124.87**	**60.54**	**33.20**	**81.64**
Total en route or near destination	**51.11**	**56.89**	**77.21**	**103.99**	**194.98**	**467.13**	**15.89**	**133.17**	**64.14**	**62.11**	**74.41**
Total spending on trip	**95.71**	**121.80**	**164.73**	**231.65**	**448.59**	**936.10**	**46.00**	**258.04**	**124.68**	**95.31**	**156.06**
N	**523**	**2,736**	**3,428**	**4,234**	**2,455**	**914**	**226**	**2,234**	**180**	**175**	**17,105**
Standard deviation	**335**	**364**	**378**	**530**	**736**	**1,510**	**162**	**628**	**274**	**254**	**463**
Percent error	**30%**	**11%**	**8%**	**7%**	**6%**	**10%**	**46%**	**10%**	**32%**	**39%**	**4%**

Note: Total column weighted for the statewide distribution of trips by boat segment.

Table 3.11: Trip spending averages by boat segment, day, and overnight trips combined.

Spending category	Power boats						Sailboats		PWC	Canoes/ Kayaks	Weighted average
	< 16'	16-19'	20-22'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
Boat fuel and oil	16.74	38.05	61.88	103.25	206.3	400.04	3.31	27.09	42.91	1.24	54.49
Temporary dockage	1.24	1.82	2.3	7.33	40.76	132.52	1.8	35.51	10.33	1.75	6.16
Pump-out and launch fees	0.9	0.97	0.9	0.88	1.52	4.85	0.32	1.1	0.47	0.45	0.91
Restaurant meals and drinks	13.16	17.5	23.52	31.33	63.06	149.88	12.97	57.61	15.49	16.34	22.03
Groceries, take-out food and drinks	15.02	15.84	19.89	28.51	49.07	98.31	8.39	60.07	14.67	14.97	19.98
Auto gas and oil	16.58	17.62	17.76	16.45	11.62	7.12	6.83	9.25	16.12	15.17	16.63
Shopping	2.45	2.68	3.1	5.15	13.85	32.86	2.38	13.43	1.88	3.57	3.64
Recreation and entertainment	3.66	3.06	4.66	6.67	14.11	33.36	1.68	11.84	2.09	4.32	4.5
Lodging	21.51	17.69	20.9	18.7	23.7	8.23	0.66	3.52	16.86	32.42	19.11
Other expenses	4.43	6.57	9.82	13.37	24.58	68.94	7.66	38.61	3.87	5.09	8.59
Total	**95.71**	**121.8**	**164.73**	**231.65**	**448.59**	**936.1**	**46**	**258.04**	**124.68**	**95.31**	**156.06**
Percent at destination	**53%**	**47%**	**47%**	**45%**	**43%**	**50%**	**35%**	**52%**	**51%**	**65%**	**48%**

Table 3.12: Distribution of trip spending by spending category.

Spending category	Day Trips	Overnight Trips	All Trips
Boat fuel and oil	47%	21%	35%
Temporary dockage	2%	6%	4%
Pump-out and launch fees	1%	0%	1%
Restaurant meals and drinks	14%	14%	14%
Groceries, take-out	13%	13%	13%
Auto gas and oil	12%	9%	11%
Shopping	1%	4%	2%
Recreation and entertainment	2%	4%	3%
Lodging	0%	26%	12%
Other expenses	7%	3%	5%
Total	**100%**	**100%**	**100%**

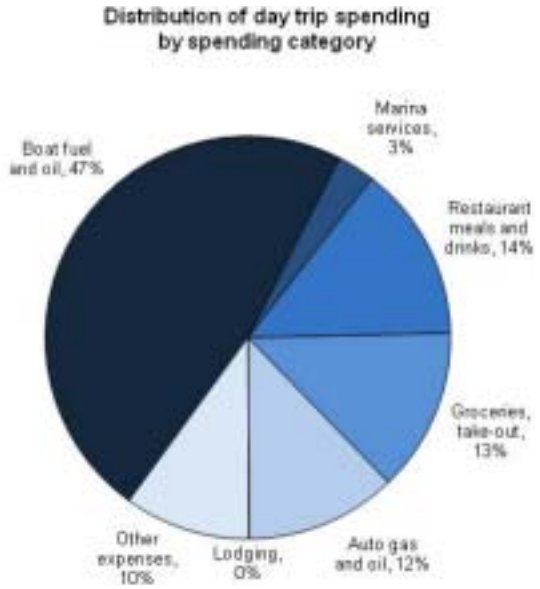


Figure 3.12: Distribution of day trip spending by spending category.

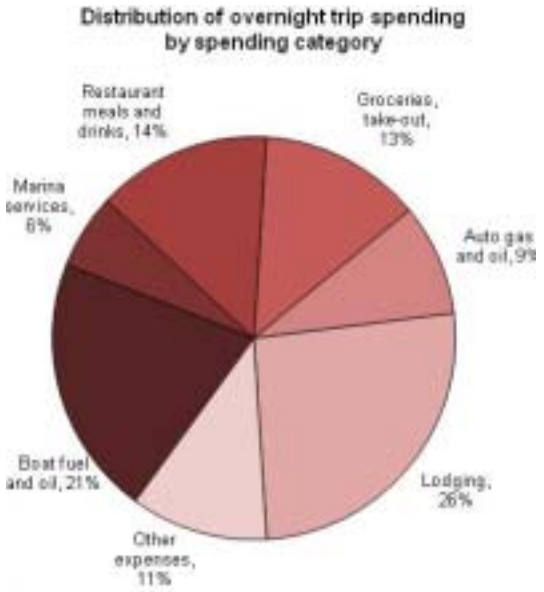


Figure 3.13: Distribution of overnight trip spending by spending category.

Table 3.13: Average trip spending at origin and destination by boat segment.

Spending category	Power boats						Sailboats		PWC	Canoes/ Kayaks	Weighted average
	< 16'	16-19'	20-22'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
At origin											
Boat fuel and oil	4.32	9.60	13.91	23.21	62.93	119.61	0.84	7.97	16.28	0.15	14.31
Temporary dockage	0.12	0.43	0.65	1.35	11.38	31.71	0.49	9.55	1.24	0.00	1.31
Pump-out and launch fees	0.22	0.23	0.23	0.18	0.44	0.55	0.30	0.24	0.26	0.01	0.23
Restaurant meals and drinks	2.06	4.19	4.72	6.62	16.85	36.32	2.61	16.49	5.01	1.36	5.00
Groceries, take-out food	3.32	4.41	5.84	7.70	16.34	38.62	2.79	21.48	2.91	2.18	5.46
Auto gas and oil	5.17	5.58	5.72	5.45	3.75	2.40	3.75	2.89	6.13	5.95	5.45
Shopping	1.15	0.41	0.68	1.27	3.63	7.00	0.22	3.86	0.25	0.00	0.89
Recreation and entertainment	0.99	0.72	1.44	2.41	4.65	16.35	0.31	3.85	2.26	0.28	1.58
Lodging	2.24	5.67	3.40	5.05	4.56	1.08	0.06	0.90	3.46	0.49	4.01
Other expenses	0.87	2.28	4.04	2.67	6.56	16.50	0.06	8.25	0.58	1.68	2.41
At destination or en route											
Boat fuel and oil	14.10	24.48	44.69	79.22	146.56	276.44	1.54	19.51	33.76	0.85	40.18
Temporary dockage	0.61	1.32	1.71	5.89	27.22	102.41	1.45	27.00	9.70	0.01	4.85
Pump-out and launch fees	0.57	0.78	0.61	0.71	1.30	5.04	2.79	1.72	0.65	0.59	0.68
Restaurant meals and drinks	11.78	12.94	18.77	24.99	46.16	110.93	6.95	39.86	10.54	16.64	17.03
Groceries, take-out food	11.02	10.59	14.63	20.66	33.26	61.72	5.12	39.30	9.09	13.44	14.52
Auto gas and oil	16.13	10.77	11.94	11.20	7.51	5.49	5.63	6.46	10.63	16.74	11.19
Shopping	3.22	2.20	2.31	3.84	8.60	26.22	0.71	8.10	0.24	9.65	2.75
Recreation and entertainment	2.75	2.23	3.47	4.21	8.58	22.12	1.67	7.84	1.26	3.25	2.92
Lodging	11.57	18.43	19.18	14.48	17.07	7.73	1.37	2.13	8.14	19.44	15.10
Other expenses	3.48	4.57	6.78	10.53	21.24	47.87	7.36	30.61	2.28	2.58	6.18
Total Spending	**95.71**	**121.80**	**164.73**	**231.65**	**448.59**	**936.10**	**46.00**	**258.04**	**124.68**	**95.31**	**156.06**
Percent en route/at destination	**79%**	**72%**	**75%**	**76%**	**71%**	**71%**	**75%**	**71%**	**69%**	**87%**	**74%**

Note: For trips within the county of residence, all spending is assigned to the destination. For trips outside the county of residence, spending within 20 miles of home is assigned to the origin and spending en route or at the destination is assigned to the destination. Total column weighted for the statewide distribution of trips by boat segment.

Table 3.14: Trip spending averages by boat segment, day trips.

Spending category	Power boats						Sailboats		PWC	Canoes/ Kayaks	Weighted average
	< 16'	16-19'	20-22'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
Boat fuel and oil	13.34	32.88	52.90	86.12	144.08	199.53	1.97	7.10	38.25	0.76	42.75
Temporary dockage	0.07	0.91	1.24	1.44	6.26	14.16	0.03	3.20	10.02	0.01	2.21
Pump-out and launch fees	0.70	0.82	0.71	0.61	0.70	5.15	0.25	0.30	0.29	0.09	0.68
Restaurant meals and drinks	5.28	11.43	16.71	20.87	30.06	49.08	8.22	14.20	9.54	4.48	12.59
Groceries, take-out food and drinks	7.98	10.19	13.45	19.03	24.69	46.63	5.57	17.44	9.18	3.94	11.79
Auto gas and oil	10.25	12.55	11.70	10.32	6.23	4.04	5.73	4.89	11.16	5.05	11.09
Shopping	0.20	0.88	0.97	0.88	1.87	3.33	0.26	0.87	0.10	0.18	0.68
Recreation and entertainment	1.33	1.11	2.48	3.34	3.08	8.51	0.85	2.01	0.17	0.70	1.64
Lodging	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other expenses	3.04	5.58	8.93	10.60	24.46	50.76	7.34	33.78	2.77	2.92	6.77
Total	**42.20**	**76.35**	**109.09**	**153.21**	**241.44**	**381.18**	**30.22**	**83.78**	**81.47**	**18.14**	**90.20**
Percent at destination	**29%**	**31%**	**33%**	**34%**	**29%**	**29%**	**29%**	**37%**	**40%**	**36%**	**33%**

Table 3.15: Trip spending averages by boat segment, overnight trips.

Spending category	Power boats				Sailboats		PWC	Canoes/ Kayaks	Weighted average
	< 23'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
Boat fuel and oil	113.50	253.75	368.99	608.51	19.34	58.87	113.50	5.00	176.51
Temporary dockage	15.04	59.04	130.99	255.57	23.22	86.89	15.04	1.20	47.23
Pump-out and launch fees	3.23	3.32	3.65	4.54	1.15	2.38	0.50	0.00	3.30
Restaurant meals and drinks	106.39	123.27	149.34	254.69	70.21	126.63	105.54	107.90	120.21
Groceries, take-out food and drinks	98.40	111.87	112.82	152.04	42.31	127.86	97.60	100.18	105.11
Auto gas and oil	91.61	70.24	25.74	10.32	20.04	16.19	91.22	93.25	74.29
Shopping	29.05	42.69	45.16	63.56	27.97	33.39	28.81	29.70	34.45
Recreation and entertainment	31.36	35.99	42.94	59.20	11.74	27.48	31.02	32.23	34.18
Lodging	276.03	183.06	85.66	16.79	8.56	9.11	271.96	282.75	217.75
Other expenses	20.90	37.68	24.89	87.83	11.45	46.28	20.59	21.78	27.54
Total	**785.52**	**920.90**	**990.18**	**1513.06**	**235.99**	**535.08**	**775.77**	**673.99**	**840.60**
Percent at destination	**69%**	**60%**	**53%**	**55%**	**43%**	**55%**	**69%**	**71%**	**64%**

Note: Due to a small sample of overnight trips for smaller power boats, small sailboats, PWC and canoes, the overnight trip spending averages for these boat segments were set by collapsing some groups and using patterns for day trips. Spending averages for power boats under 23 feet were based on the combined sample of power boats under 23 feet. Boat fuel and oil expenses were varied by size, but other spending categories were set to the spending average for power boats under 23 feet. The PWC and canoe averages were also set to these values with boat fuel set at $5.00 per trip for canoes. For small sailboats, the overnight trip average was set to the overnight trip average for larger sailboats times the ratio of the day trip spending averages of small to large sailboat.

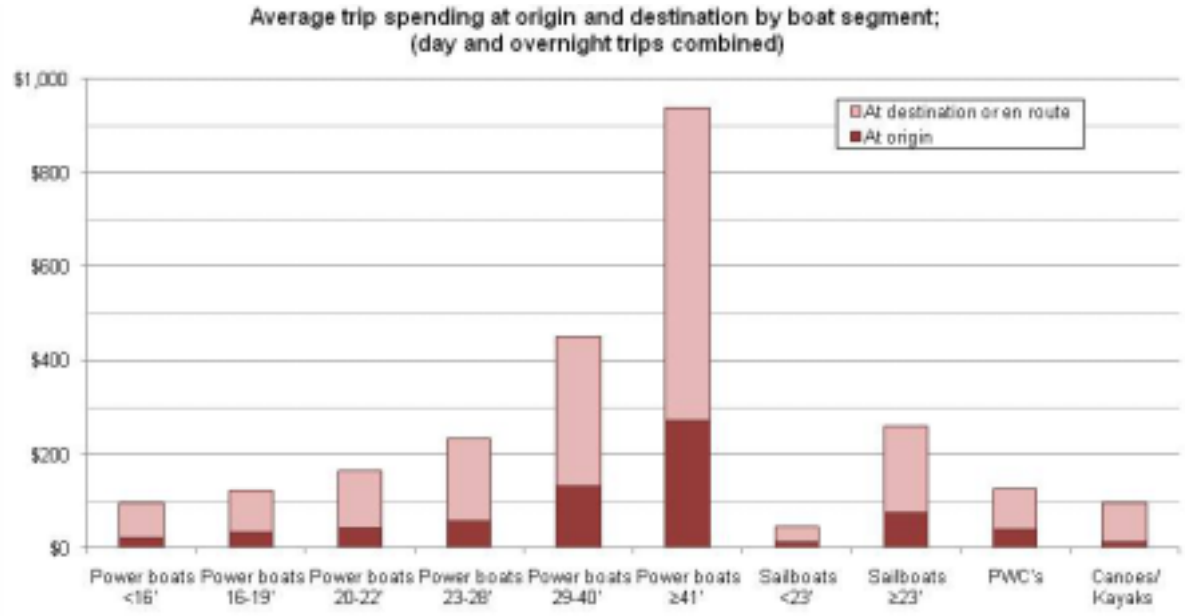


Figure 3.14: Average trip spending at origin and destination by boat segment.

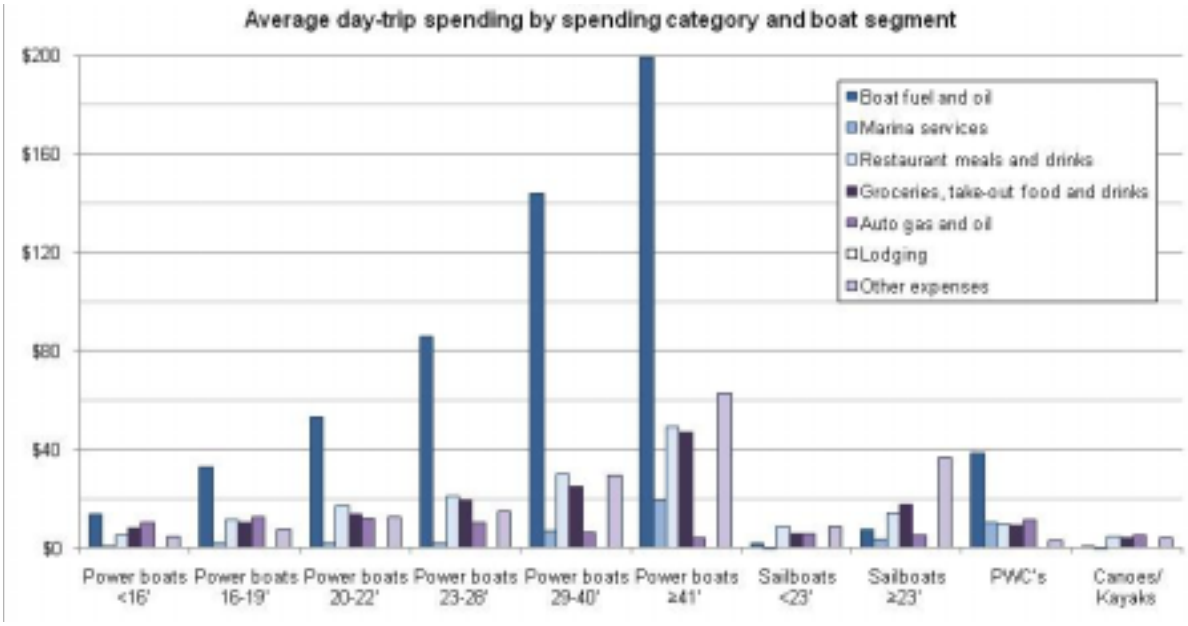


Figure 3.15: Average day trip spending by spending category and boat segment.

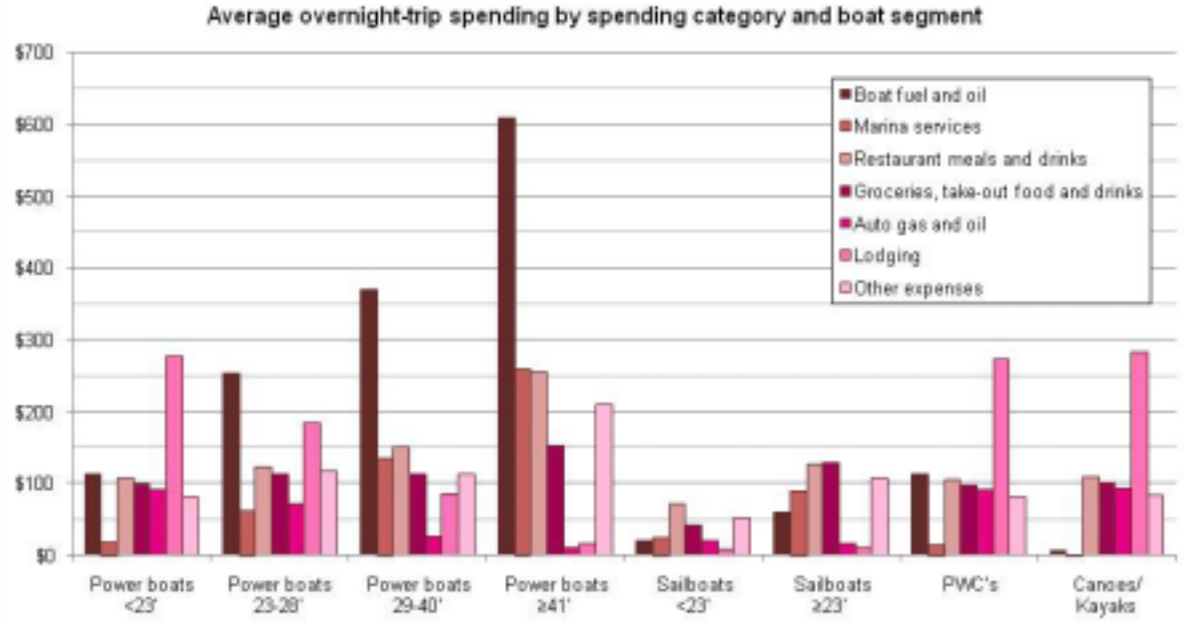


Figure 3.16: Average overnight trip spending by spending category and boat segment.

Trip spending increases with distance from home. The average trip spending on day trips varies from $79 per trip for within county trips, to $114 for trips within the region but outside the county to $131 for trips outside the home region (Table 3.16 and Figure 3.17).

Spending on overnight trips varies from $498 per trip for trips within the county to $698 for trips within the region to $1,161 for trips outside the region. Two-thirds of the spending on overnight trips outside the region of origin occurs near the destination or en route.

Table 3.16: Trip spending by trip distance category ($ per trip).

Trip type/boat segment	Trip distance category		
	Within home county ($/trip)	Within region, outside county ($/trip)	Outside region ($/trip)
Day trips			
Power boats < 16'	33	60	70
Power boats 16-19'	65	102	111
Power boats 20-22'	93	142	173
Power boats 23-28'	135	192	243
Power boats 29-40'	224	293	317
Power boats ≥ 41'	350	455	568
Sailboats ≥ 23'	70	126	128
PWC	75	94	111
Canoes/Kayaks	15	15	50
All day trips	79	114	131
All overnight trips	498	698	1161

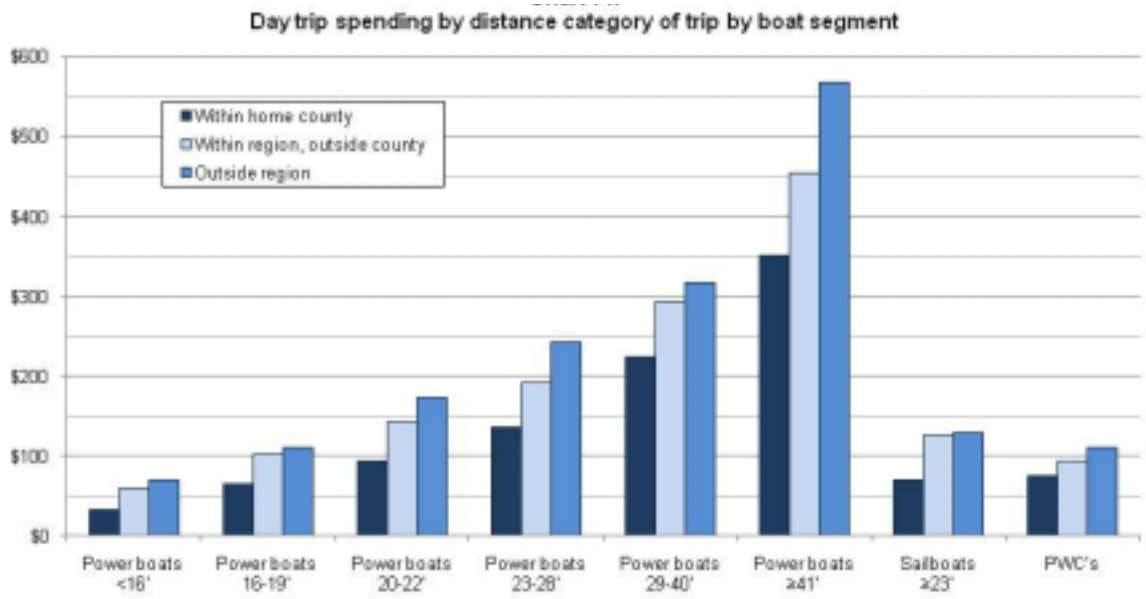


Figure 3.17: Day trip spending by distance category of trip by boat segment.

Craft Spending Averages

The trip surveys only capture expenses on boating trips. Boat owners also incur other expenses during the year for maintenance, repairs, insurance, equipment, accessories, and other items. These expenses are not associated with any particular trip.

The final monthly (December) trip survey was extended in length to measure annual boat-related expenses during 2007. Annual craft-related expenses were obtained from 3,774 boat owners. After omitting 19 outliers[1], craft spending averages were estimated from the remaining 3,755 boat owners.

Average annual expenses within 10 spending categories were computed for the ten boat size/type segments. The craft-related spending averages were applied to the number and types of registered boats in each county and region to estimate total craft-related spending.

All but 4% of registered boat owners spent something on their boat in 2007. Over 80% of the owners spent money for insurance, fuel, and maintenance, while less than 5% reported purchases of new motors or trailers (Table 3.17).

On average, boaters spent $5,530 on their boats in 2007. Spending varied from a high of almost $48,000 for power boats over 41 feet to $700 for owners of canoes, $1,771 for smaller sailboats, and $2,231 for power boats less than 16 feet. PWC owners reported expenses of $2,571 to operate and maintain their boat (Table 3.18 and Figure 3.18).

Boaters also reported annual boat fuel purchases. When expanded to the registered boating fleet, total fuel costs in 2007 were $600 million. This figure is about half of the boat fuel estimate derived from the spending reported on boating trips. Due to questions about accurate recall over a 12-month period, the fuel spending estimate from the trip reports was assumed to be more reliable.

The majority of craft-related expenses were for equipment and repairs. Spending figures exclude purchases of boats, but include purchases of new outboard motors, trailers, accessories, and safety and

[1] Outliers included one respondent reporting for a boat over 100 feet in length and 18 other cases reporting expenses of more than $100,000 on any single item.

other equipment. Combined, these items account for 45% of craft-related spending. Maintenance, repairs and installations account for 21% of the spending. Other expenses include boat loan payments (15%), insurance (8%), storage (9%) and taxes (2%).

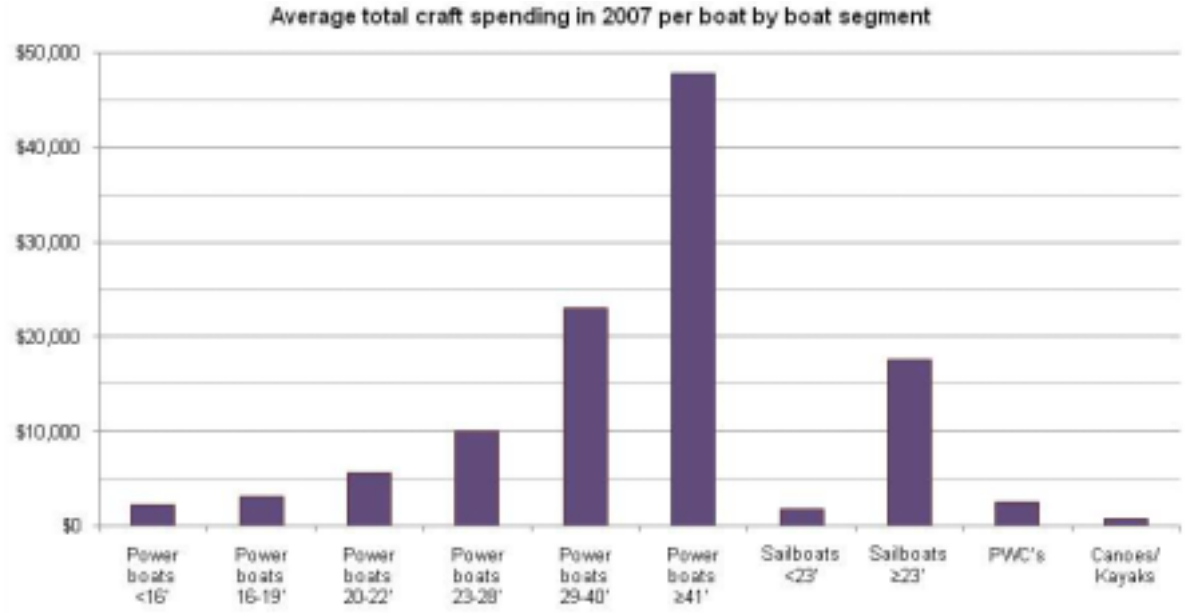


Figure 3.18: Average total craft spending in 2007 per boat by boat segment.

Trip and Craft Spending by Boat Storage Segments

There are some significant differences in boater trip patterns and spending across distinct boat storage types. Marinas and waterfront homes provide boating access for larger boats while launch ramps serve smaller trailerable boats. Boats kept in the water tend to be used more frequently than boats that must be trailed to access sites. Boats kept at marinas and dry stack facilities incur additional storage costs. The eight tables comprising Appendix G compare and contrast spending by boat storage segments.

The six storage segments were defined:

- Waterfront home in water, including waterfront second homes;
- Waterfront home on land, including waterfront second homes on land;
- Non-waterfront home;
- Marina including commercial or public marinas, boat or yacht clubs or owned dockominium wetslips;
- Boat yard including boats stored at boat yards, in dry stacks, or commercial storage facilities; and
- Other.

Boats stored at marinas spent $267 per trip in 2007, split about evenly between spending within 20 miles of home and spending en route or near the destination. Boat fuel accounted for $110 of this spending.

Table 3.17: Percentage of boat owners spending money on their boat (craft-related) in 2007 by boat segment and spending category.

Spending category	Power boats						Sailboats		PWC	Canoes/ Kayaks	Weighted average
	< 16'	16-19'	20-22'	23-28'	29-40'	≥ 41'	< 23'	≥ 23'			
Any spending	84%	94%	97%	97%	99%	100%	97%	98%	88%	62%	96%
Boat loan payments	2%	16%	26%	29%	44%	42%	2%	23%	20%	2%	26%
Fuel	72%	86%	89%	91%	94%	93%	54%	85%	73%	2%	87%
Insurance	34%	71%	86%	86%	93%	95%	42%	86%	63%	6%	81%
New outboard motors	9%	3%	3%	4%	4%	3%	8%	6%	3%	2%	4%
New trailers	3%	3%	4%	4%	1%	0%	3%	1%	3%	5%	3%
Storage	7%	14%	28%	33%	48%	61%	32%	68%	8%	2%	36%
Taxes	24%	24%	26%	30%	34%	42%	24%	38%	13%	2%	30%
Boating accessories	61%	73%	74%	79%	88%	89%	88%	90%	55%	54%	79%
Boat maintenance	58%	73%	80%	86%	93%	94%	64%	88%	58%	24%	82%
Boating safety items	61%	66%	69%	72%	75%	78%	73%	76%	55%	78%	71%

Table 3.18: Average craft-related spending in 2007 by boat segment and spending category ($ per boat).

Spending category	Power boats						Sailboats		PWC ($/boat)	Canoes/ Kayaks ($/boat)	Weighted average ($/boat)
	< 16' ($/boat)	16-19' ($/boat)	20-22' ($/boat)	23-28' ($/boat)	29-40' ($/boat)	≥ 41' ($/boat)	< 23' ($/boat)	≥ 23' ($/boat)			
Boat loan payments	127	419	905	1,582	4,490	8,790	20	1,858	504	25	848
Insurance	80	233	419	747	2,114	4,940	114	1,485	284	43	439
New outboard motors	234	217	360	586	693	115	50	113	6	8	277
New trailers	42	54	82	162	55	0	35	25	107	9	72
Storage	90	182	484	1,305	2,094	4,080	287	2,795	133	13	497
Taxes	30	55	115	191	415	1,274	20	204	7	18	99
Boating accessories	485	786	1,310	2,234	5,900	13,260	516	5,375	798	136	1,384
Regular maintenance	114	179	297	534	1,350	3,581	48	726	107	4	308
Regular repairs	144	233	352	846	2,157	5,583	139	1,773	140	7	455
Installation	125	245	451	610	1,405	3,619	100	1,914	40	28	375
Boating safety items	522	317	380	556	957	1,327	280	490	316	237	450
Other items	237	106	386	621	1,375	1,223	162	740	129	172	324
Total	**2,231**	**3,027**	**5,542**	**9,974**	**23,004**	**47,791**	**1,771**	**17,496**	**2,571**	**700**	**5,530**
N	**133**	**612**	**698**	**879**	**515**	**201**	**59**	**555**	**40**	**63**	**3,755**
Standard deviation	**4,206**	**4,200**	**9,531**	**18,977**	**23,919**	**41,291**	**2,060**	**22,287**	**4,338**	**1,184**	**21,607**
Percent error (95% level)	**32%**	**11%**	**13%**	**13%**	**9%**	**12%**	**30%**	**11%**	**52%**	**42%**	**5%**

Note: Includes spenders and non-spenders.

Boats stored at marinas averaged almost $14,000 in annual craft expenses in 2007 including $3,255 on storage, $3,086 on accessories, and $2,028 on boat loan payments. Boats in other storage categories spent between $3,000 and $7,000 in annual craft expenses.

Total spending of all boats in each storage category is estimated by applying the statewide averages in Tables G5 and G6 to the estimated number of boats in each storage category (Table G3). Although almost half of all registered boats are stored at non-waterfront homes, these boats account for 37% of all trip spending (Table G7) and only 30% of annual craft spending (Table G8). The nine percent of registered boats stored at marinas account for 28% of annual craft spending and 16% of all trip spending.

Number of Trailering Boat Trips and Related Trip Spending

Trailering involves transporting a boat on a trailer from a residence (e.g., permanent home, second home) or other storage locations (e.g., off the water self storage facility) to boating locations. Usually boats are trailered to public or private launch sites. Trailering does not include the regular transport of boats kept in dry stack storage facilities from their cribs to the water. This most frequently done with lifts and not trailers.

Appendix H presents information on the number of boating trips involving trailering and related spending. Sixty-one percent of all boating trips involved trailering of the boat to a launch site. Use of launch sites is most prevalent for smaller boats and especially boats stored at non-waterfront homes (Table H 1). In 2007 there were an estimated 13.7 million launch trips. Almost 80% of launch trips were by power boats less than 23 feet in length; 12% were PWC (Table H2).

Ninety percent of launch trips are days trips, 10% are overnight trips. Two-thirds of launch day trips stay within the county of origin, while 80% of launch overnight trips go outside the home county. Ninety percent of launch day trips stay within the region of origin, compared to 47% for overnight launch trips.

In order to estimate economic impacts of launch sites, spending averages were developed for launch trips. For trips remaining within the county of residence, all trip spending is counted, while for launch trips going outside the county, only spending en route or at the destination is included.

On an average launch trip, boaters spend $116 near the launch site (Table H3). The largest expenses are for boat fuel, followed by lodging, restaurant meals, auto fuel and groceries. Spending varies considerably across the boat segments as spending is closely related to boat size and type.

Expanding Results to all Registered Boats

Total spending statewide and for individual regions and counties was estimated by applying statewide averages of boating activity and spending from the survey to the 2007 Florida boat registrations. This grounds the boating use and spending estimates in the most recent Florida boat registration data. Since the majority of boating trips occur near home, the registration statistics captures where most boating activity occurs.

The ten boat segments were used to capture differences in the number and types of trips and spending across boat type and size categories. The number of boat days generated in each county is estimated by multiplying the numbers of boats of each type registered in a given county or region (Table 3.5) by the statewide average of boat days for that segment (Table 3.7). Summing across segments yields the county and regional total boat days. Boat days are adjusted to boating trips based on the percentage of overnight trips taken by each boat segment and the average number of days boats were used on overnight trips (Table 3.8). The number of boat days and the number of day and overnight trips generated in each county are estimated similarly using county level registrations is shown in Table I1 of Appendix I. Appendix I consists of a series of tables that show the number of registered boats in Florida

counties, the number of boat trips involving trailering by county of origin, and spending by registered boat owners by county.

Total Boating Trips

Florida registered boats logged an estimated 21.7 million boating trips in 2007 in which the boat was taken out on the water. Ten percent of these trips were overnight trips (Table 3.19).

The greatest number of trips was generated in the East Central region (Brevard, Flagler, Lake, Orange, Seminole, Volusia counties; Figure 3.4). This region also has the greatest number of registered boats. To facilitate the estimation of flows between regions, trips were separated into those staying within the originating county, those leaving the county but staying in the same region, and those leaving the region.

Trip destinations were estimated by allocating day and overnight trips leaving the home county or region to the county and region of the destination. At the regional level, trips leaving the region of registration were allocated to destination regions based on the distribution of such inter-regional trips in the sample of trips. Estimates of trips by destination county involved an additional allocation of intra- and inter-regional trips to individual counties. Trips destinating in each region from outside the region were allocated to counties in the destination region based on the distribution of all boating trips to counties within each region. That is, we assumed the destination county preferences of boaters did not vary by boat size or type. The sample was not sufficient to explain any potential differences across boat segments at the county level.

The distribution of day and overnight trips across the ten Florida regions are shown in Table 3.19 and 3.20. Table 3.21 gives the regional origin-destination matrix of boating trips.

Table 3.19: Registered boat trips in 2007 by region of origin (thousands of trips).

Region	Day trips				Overnight trips				Day + overnight
	In country (000s)	Inside region (000s)	Outside region (000s)	Total (000s)	In country (000s)	Inside region (000s)	Outside region (000s)	Total (000s)	Total (000s)
West Panhandle	1,320	261	28	1,609	97	23	29	149	1,758
Central Panhandle	213	415	78	705	5	32	23	61	766
North Central	1,184	517	213	1,914	31	60	68	160	2,074
Northeast	1,087	364	68	1,518	43	31	65	139	1,658
South Inland	747	69	515	1,331	6	12	90	109	1,440
East Central	2,261	522	326	3,109	70	33	170	274	3,382
Southeast	1,321	283	91	1,695	52	24	102	178	1,873
West Central	1,938	425	165	2,527	73	33	139	245	2,772
Southwest	2,264	388	92	2,745	107	83	96	287	3,031
South	2,029	423	177	2,630	106	137	59	302	2,932
Total	**14,363**	**3,667**	**1,753**	**19,783**	**591**	**470**	**842**	**1,903**	**21,686**

Table 3.20: Registered boat trips in 2007 by region of destination (thousands of trips).

Region	Day trips			Overnight trips			Day + overnight
	Within region (000s)	Imports (000s)	Total (000s)	Within region (000s)	Imports (000s)	Total (000s)	Total (000s)
West Panhandle	1,581	39	1,620	120	37	157	1,777
Central Panhandle	627	41	669	38	33	71	740
North Central	1,701	234	1,935	91	60	151	2,086
Northeast	1,451	217	1,668	75	60	135	1,803
South Inland	816	107	923	18	40	59	982
East Central	2,783	188	2,971	103	46	150	3,121
Southeast	1,604	323	1,927	76	97	173	2,100
West Central	2,362	199	2,562	106	46	152	2,714
Southwest	2,653	240	2,893	191	156	347	3,240
South	2,452	163	2,616	243	266	509	3,125
Total	**18,030**	**1,753**	**19,783**	**1,061**	**842**	**1,903**	**21,686**

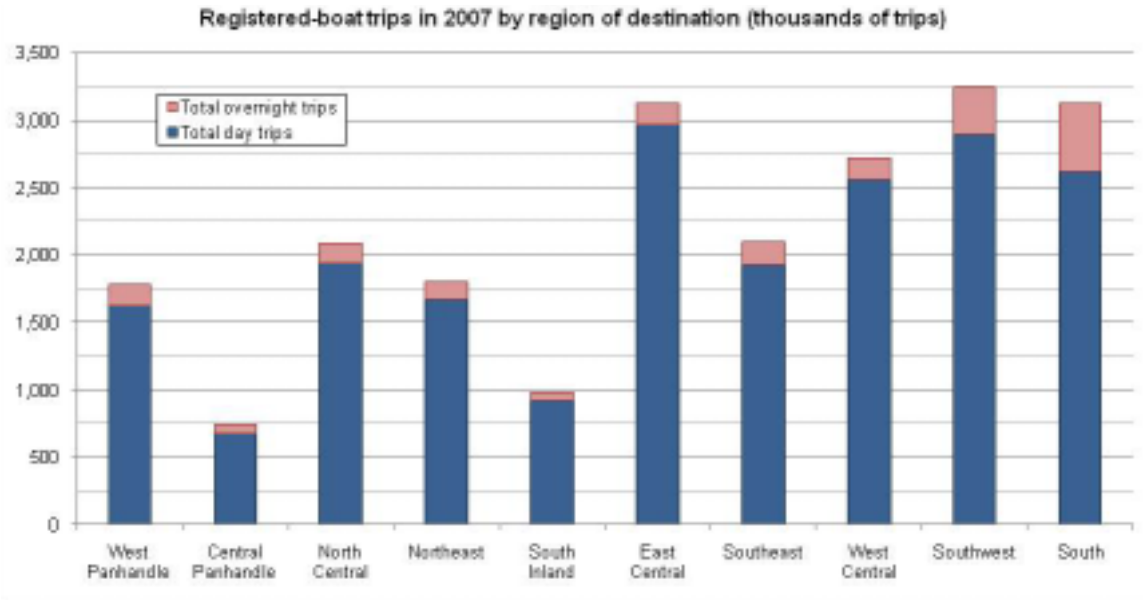


Figure 3.19: Registered boat trips in 2007 by region of destination (thousands of trips).

Table 3.21: Regional boating trip origin-destination matrix (thousands of trips).

Origin region	Destination region										Total (000s)
	West Panhandle (000s)	Central Panhandle (000s)	North Central (000s)	Northeast (000s)	South Inland (000s)	East Central (000s)	Southeast (000s)	West Central (000s)	Southwest (000s)	South (000s)	
Day trips											
West Panhandle	1,581.1	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.3	1,608.7
Central Panhandle	29.6	627.2	46.5	2.0	0.0	0.0	0.0	0.0	0.0	0.0	705.2
North Central	3.0	15.4	1,701.1	107.7	13.9	31.4	11.0	12.3	6.5	11.9	1,914.2
Northeast	3.0	0.0	43.5	1,450.7	0.0	7.7	1.3	0.0	0.3	11.9	1,518.4
South Inland	0.0	0.0	17.9	75.0	816.0	125.9	30.3	127.2	122.3	16.7	1,331.2
East Central	1.2	0.0	39.4	23.0	54.6	2,782.6	142.9	5.7	24.5	35.0	3,108.9
Southeast	0.3	0.0	1.2	0.4	6.0	11.8	1,603.8	0.5	0.4	70.5	1,694.9
West Central	0.0	0.0	70.6	3.5	12.8	4.8	0.7	2,362.4	68.6	3.8	2,527.3
Southwest	0.7	0.0	4.8	0.0	19.1	2.1	3.5	49.5	2,652.8	12.0	2,744.5
South	1.4	0.0	9.7	5.8	1.0	4.6	133.6	4.3	17.1	2,452.5	2,629.8
Total day trips	**1,620.2**	**668.6**	**1,934.7**	**1,668.0**	**923.3**	**2,970.9**	**1,927.3**	**2,561.9**	**2,892.7**	**2,615.5**	**19,783.1**
Overnight trips											
West Panhandle	120.1	24.2	1.1	0.0	0.0	0.0	0.0	1.5	0.7	1.7	149.3
Central Panhandle	9.5	37.5	1.3	0.0	0.5	0.0	0.0	0.4	0.2	11.6	61.0
North Central	15.0	3.0	91.1	23.0	0.0	5.6	0.1	10.0	1.7	10.0	159.5
Northeast	0.7	3.4	3.5	74.8	0.0	17.6	8.0	1.7	9.2	20.7	139.4
South Inland	0.0	0.0	9.3	0.7	18.3	6.1	8.4	6.4	43.4	16.0	108.7
East Central	0.0	0.0	15.4	12.8	4.6	103.3	46.7	8.9	32.9	49.0	273.6
Southeast	1.1	0.6	0.4	14.5	7.5	11.3	76.0	0.6	4.8	61.4	178.1
West Central	1.2	0.5	27.5	4.1	5.7	2.3	6.3	106.2	58.0	33.1	245.0
Southwest	9.0	1.8	0.8	1.4	6.4	0.2	1.1	12.9	190.5	62.6	286.7
South	0.3	0.0	1.0	3.7	15.8	3.2	25.8	3.5	5.5	243.1	301.9
Total overnight trips	**156.9**	**70.9**	**151.2**	**135.0**	**58.8**	**149.7**	**172.5**	**152.2**	**346.9**	**509.3**	**1,903.3**
Grand total	**1,777.1**	**739.5**	**2,085.9**	**1,803.0**	**982.1**	**3,120.6**	**2,099.8**	**2,714.0**	**3,239.6**	**3,124.8**	**21,686.4**
Percent	**8%**	**3%**	**10%**	**8%**	**5%**	**14%**	**10%**	**13%**	**15%**	**14%**	**100%**

Total Spending

Total trip spending is estimated by applying trip spending averages for each type of trip and boat segment to the number of such trips. Trip spending is estimated by destination region by assigning all trip spending to the region for trips that stay within the region of registration and assigning just the spending en route or at the destination for inter-regional trips. Craft-related spending is estimated at the county and regional level by applying the craft spending averages (Table 3.18) to the numbers of registered boats by size and type in the county or region (Table I1 and Table 3.5, respectively). Craft spending is assigned to the county/region where the boat is registered.

In total, Florida registered boat owners spent $3.384 billion on trips in 2007 (Table 3.22). Thirty-five percent of the trip spending was for boat fuel and oil. Restaurant meals and drinks accounted for 14%, groceries 13%, and lodging and auto fuel each accounted for about 11% of the total (Table 3.23). Total spending on day trips was $1.8 billion compared to $1.6 billion on overnight trips. The South region received the most spending (18% of the total) followed by Southwest Florida, East Central Florida and West Central Florida.

Registered boat owners spent a total of $5.16 billion on craft-related expenses in 2007 (Table 3.24). Table 3.25 shows the largest total expenditures were for boating accessories and products (25%) and boat loan payments (15%). The regions with the greatest total craft-related spending were South Florida and Southwest Florida.

Total boater expenditures including trip and craft-related spending in 2007 was $8.5 billion. Forty percent of the spending was for trip-related expenses, 60% for craft-related (Figures 3.20 and 3.21).

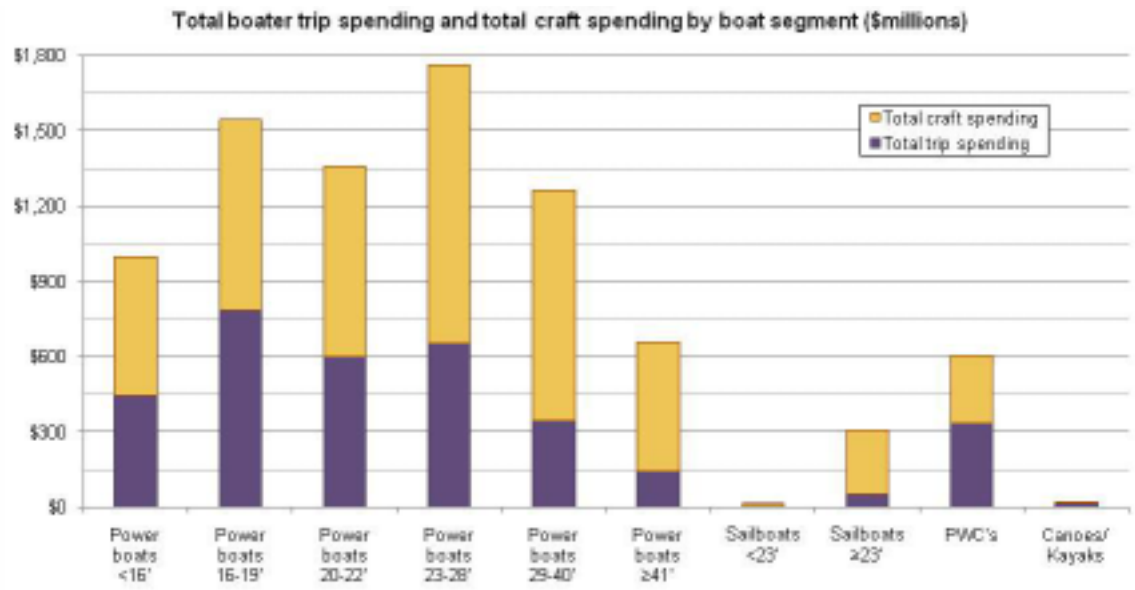


Figure 3.20: Total boater trip spending and total craft spending by boat segment ($millions).

Table 3.22: Total registered boater trip spending in 2007 by boat segment ($ millions).

Spending category	Power boats						Sailboats		PWCs ($millions)	Canoes/ Kayaks ($millions)	Total ($millions)
	< 16' ($millions)	16-19' ($millions)	20-22' ($millions)	23-28' ($millions)	29-40' ($millions)	≥ 41' ($millions)	< 23' ($millions)	≥ 23' ($millions)			
Boat fuel and oil	77.8	246.2	226.3	291.6	158.7	60.9	0.4	5.7	114.6	0.2	1182.3
Temporary dockage	5.8	11.7	8.4	20.6	31.3	20.1	0.2	7.4	27.5	0.3	133.3
Pump-out and launch fees	4.1	6.3	3.3	2.5	1.2	0.7	0.0	0.2	1.2	0.1	19.6
Restaurant meals and drinks	61.2	113.4	86.2	88.6	48.6	22.8	1.6	12.1	41.4	2.9	478.8
Groceries, take-out food and drinks	69.5	102.1	72.5	80.2	37.6	14.9	1.0	12.5	39.0	2.6	432.0
Auto gas and oil	77.0	114.0	65.0	46.5	8.9	1.1	0.8	1.9	43.0	2.7	361.0
Shopping	11.3	17.3	11.3	14.5	10.6	5.0	0.3	2.8	5.0	0.6	78.6
Recreation and entertainment	17.2	20.0	17.3	19.1	11.0	5.1	0.2	2.5	5.6	0.8	98.8
Lodging	99.7	114.2	76.2	52.7	18.2	1.2	0.1	0.7	44.9	5.7	413.7
Other expenses	20.6	42.5	35.9	37.7	18.9	10.5	1.0	8.1	10.3	0.9	186.2
Total	**444.3**	**787.7**	**602.3**	**653.9**	**344.8**	**142.4**	**5.7**	**53.9**	**332.6**	**16.7**	**3384.3**
Percent	**13%**	**23%**	**18%**	**19%**	**10%**	**4%**	**0%**	**2%**	**10%**	**0%**	**100%**

Table 3.23: Total registered boater trip spending in 2007 by destination region ($ millions).

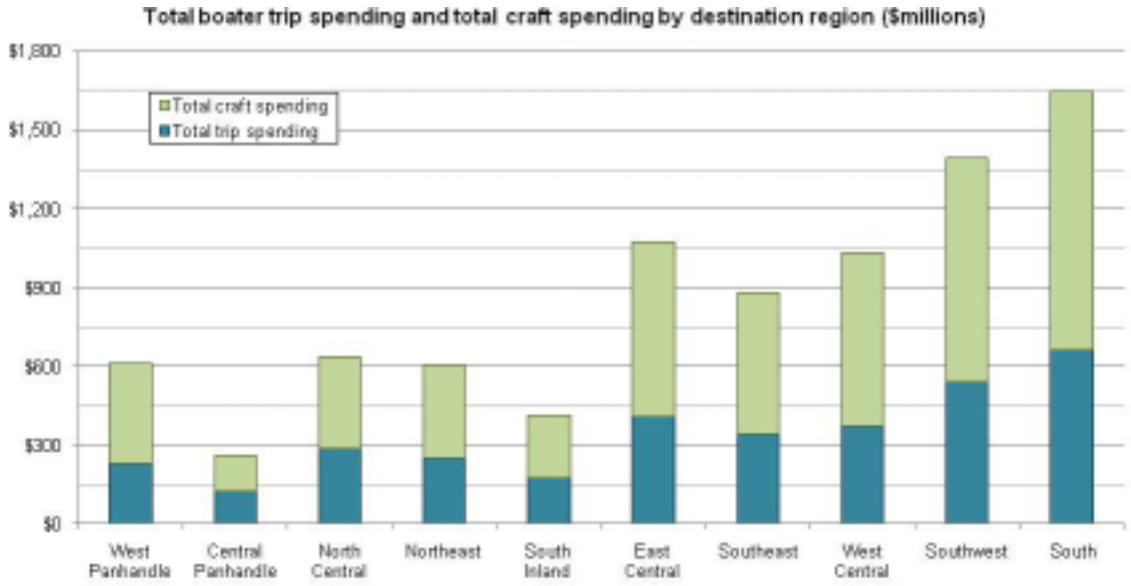
Spending category	Regions										Total ($millions)	Percent
	West Panhandle ($millions)	Central Panhandle ($millions)	North Central ($millions)	Northeast ($millions)	South Inland ($millions)	East Central ($millions)	Southeast ($millions)	West Central ($millions)	Southwest ($millions)	South ($millions)		
Boat fuel and oil	82.7	38.3	95.3	86.4	56.9	151.0	121.9	140.8	189.8	219.3	1182.3	35%
Temporary dockage	9.0	4.6	9.4	9.4	4.7	13.7	13.5	13.9	22.7	32.3	133.3	4%
Pump-out and launch fees	1.6	0.9	1.9	1.6	1.0	2.7	1.8	2.3	2.9	3.0	19.6	1%
Restaurant meals and drinks	33.3	16.6	40.5	35.8	23.0	57.0	47.7	52.4	77.5	94.9	478.8	14%
Groceries, take-out food and drinks	30.6	15.5	36.9	32.2	23.0	54.6	42.4	49.2	67.7	79.8	432.0	13%
Auto gas and oil	25.1	15.9	36.3	28.7	24.9	49.8	33.7	40.5	49.9	56.1	361.0	11%
Shopping	5.2	2.8	6.1	5.7	3.7	8.0	8.0	7.5	13.4	18.3	78.6	2%
Recreation and entertainment	6.2	3.7	8.3	7.3	5.2	11.1	10.3	10.3	16.0	20.4	98.8	3%
Lodging	23.7	17.4	35.5	29.9	20.6	36.3	40.7	33.0	70.7	105.9	413.7	12%
Other expenses	12.4	6.9	16.2	14.2	9.6	24.8	18.9	22.5	28.9	31.8	186.2	6%
Total	230.0	123.0	286.0	251.0	173.0	409.0	339.0	373.0	539.0	662.0	3384.3	100%
Percent	7%	4%	8%	7%	5%	12%	10%	11%	16%	20%	100%	

Table 3.24: Total craft-related spending on registered boats in 2007 by boat segment and spending category ($ millions).

Spending category	Power boats						Sailboats		PWCs ($millions)	Canoes/ Kayaks ($millions)	Total ($millions)
	< 16' ($millions)	16-19' ($millions)	20-22' ($millions)	23-28' ($millions)	29-40' ($millions)	≥ 41' ($millions)	< 23' ($millions)	≥ 23' ($millions)			
Boat loan payments	31.4	105.2	123.9	175.7	179.0	94.8	0.1	27.1	53.4	0.2	791
Insurance	19.8	58.4	57.3	83.0	84.3	53.3	0.7	21.7	30.1	0.4	409
New outboard motors	57.9	54.5	49.2	65.1	27.6	1.2	0.3	1.7	0.7	0.1	258
New trailers	10.5	13.5	11.2	18.0	2.2	0.0	0.2	0.4	11.3	0.1	67
Storage	22.4	45.7	66.3	144.9	83.5	44.0	1.8	40.8	14.1	0.1	464
Taxes	7.4	13.9	15.8	21.2	16.5	13.7	0.1	3.0	0.7	0.2	92
Boating accessories	120.1	197.2	179.3	248.1	235.2	143.0	3.2	78.5	84.6	1.2	1290
Regular maintenance	28.1	44.8	40.6	59.3	53.8	38.6	0.3	10.6	11.3	0.0	287
Regular repairs	35.8	58.5	48.2	94.0	86.0	60.2	0.9	25.9	14.8	0.1	424
Installation	31.0	61.4	61.7	67.7	56.0	39.0	0.6	27.9	4.3	0.2	350
Boating safety items	129.3	79.4	52.0	61.7	38.2	14.3	1.7	7.1	33.5	2.0	419
Other items	58.7	26.6	52.8	69.0	54.8	13.2	1.0	10.8	13.7	1.5	302
Total	**552**	**759**	**758**	**1108**	**917**	**515**	**11**	**256**	**273**	**6**	**5155**
Percent	**11%**	**15%**	**15%**	**21%**	**18%**	**10%**	**0%**	**5%**	**5%**	**0%**	**100%**

Table 3.25: Total craft-related spending on registered boats in 2007 by region and spending category ($ millions).

Spending category	Regions										Total ($millions)	Percent
	West Panhandle ($millions)	Central Panhandle ($millions)	North Central ($millions)	Northeast ($millions)	South Inland ($millions)	East Central ($millions)	Southeast ($millions)	West Central ($millions)	Southwest ($millions)	South ($millions)		
Boat loan payments	55.3	17.8	47.4	52.4	33.3	97.9	87.8	100.6	135.2	163.1	791	15%
Insurance	29.0	9.4	24.7	27.6	17.3	51.3	44.6	52.4	69.4	83.1	409	8%
New outboard motors	20.2	8.8	22.9	18.5	15.3	36.2	24.6	32.1	39.4	40.2	258	5%
New trailers	5.3	2.1	5.7	4.9	4.1	10.0	6.2	8.8	10.0	10.3	67	1%
Storage	32.7	10.5	27.2	30.6	18.5	56.3	50.6	60.7	81.5	94.9	464	9%
Taxes	6.6	2.3	6.0	6.2	4.1	11.5	10.1	11.5	15.7	18.4	92	2%
Boating accessories	94.6	32.9	84.9	88.9	58.6	166.3	135.8	165.6	213.9	249.0	1290	25%
Regular maintenance	21.0	7.4	18.9	19.6	13.0	36.3	30.9	36.1	47.9	56.5	287	6%
Regular repairs	30.7	10.4	26.0	28.6	17.7	52.1	46.3	53.9	72.2	86.4	424	8%
Installation	25.5	9.1	23.8	24.3	16.2	45.2	36.4	44.8	58.7	66.0	350	7%
Boating safety items	35.1	15.6	38.4	31.2	25.7	61.1	37.8	52.5	59.9	62.0	419	8%
Other items	23.0	9.0	22.5	20.7	15.0	39.5	30.7	38.5	48.7	54.4	302	6%
Total	**379.0**	**135.3**	**348.4**	**353.4**	**238.8**	**663.6**	**541.8**	**657.6**	**852.6**	**984.3**	**5155**	**100%**



Trips do not include trips to visit the boat when the boat was not taken out on the water or trips outside the U.S.

Figure 3.21: Total boater trip spending and total craft spending by destination region ($millions).

3.3.7 Economic Significance of Boater Spending

Statewide Significance

The contribution of registered boater spending to the Florida economy is estimated by applying the total trip and craft-related spending to an input-output model of the Florida economy.

Multipliers for the key tourism and boating-related sectors of the Florida state economy were extracted from a 2006 I-O model estimated with the IMPLAN system[2] and applied to estimates of total spending in each sector. Estimates of direct and secondary effects in terms of sales, jobs, labor income, indirect business taxes, and value added are made. Indirect business taxes are reported at the state level.

These economic terms are defined as follows:

- **Sales** are the receipts of businesses with the exception of retail trade sectors where sales only include the retail margin accruing to the retailer. The costs of goods sold at retail are assigned to the appropriate manufacturing sector, while the wholesale margin is assigned to the wholesale trade sector.
- **Jobs** are the average number of employees during the year without distinguishing between full time or part time workers.
- **Labor income** includes wages, salaries and payroll benefits, including incomes of sole proprietors.
- **Profits and rents** include corporate profits and payments to individuals in the form of rents, royalties, and dividends. Indirect business taxes include property taxes, excise taxes, severance taxes, fees, fines, licenses, and sales taxes paid by businesses to government.
- **Value added** is the sum of labor income, profits and rents, and indirect business taxes.

[2] See Appendix J for bridging of spending categories to IMPLAN sectors.

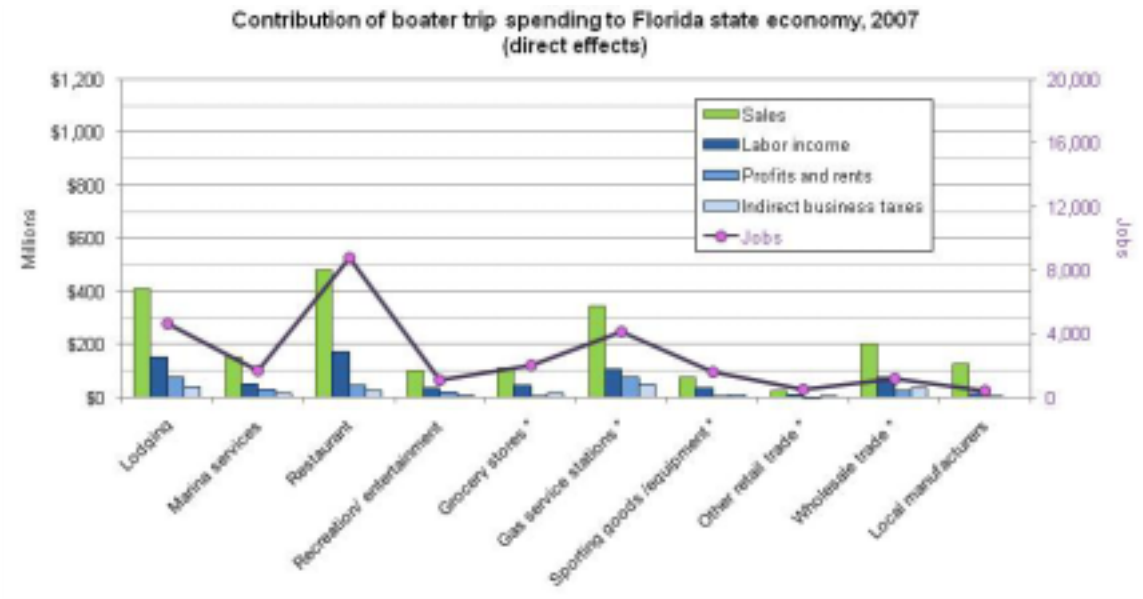
The $3.38 billion in trip spending had a direct effect of $697 million labor income, $194 million in indirect business taxes, $1.18 billion value added and approximately 26,000 jobs (Table 3.26). Including secondary effects the total contribution was over 38,000 jobs, $1.08 billion labor income, $284 million in indirect business taxes and $2.04 billion value added. Sectors benefiting directly from trip-related spending were restaurants, lodging establishments, gas service, grocery and other retail businesses (Figures 3.22 to 3.25).

Table 3.26: Contribution of boater trip spending to Florida state economy, 2007.

Sector/Spending category	Sales ($millions)	Jobs	Labor income ($millions)	Indirect business taxes ($millions)	Value added ($millions)
Direct effects					
Lodging	410	4,642	150	39	264
Marina services	152	1,641	53	12	94
Restaurant	479	8,758	170	25	242
Recreation/entertainment	99	1,064	34	8	61
Grocery stores [a]	109	1,974	47	12	67
Gas service stations [a]	345	4,130	107	50	236
Sporting goods/equipment [a]	78	1,607	33	11	49
Other retail trade [a]	27	475	11	4	16
Wholesale trade [a]	201	1,170	76	33	136
Local manufacturers	129	398	14	0	18
Total direct effects	**2,028**	**25,861**	**697**	**194**	**1,184**
Secondary effects	**1,479**	**12,394**	**381**	**89**	**857**
Total effects	**3,507**	**38,255**	**1,077**	**284**	**2,041**
Multiplier	**1.73**	**1.48**	**1.55**	**1.46**	**1.72**

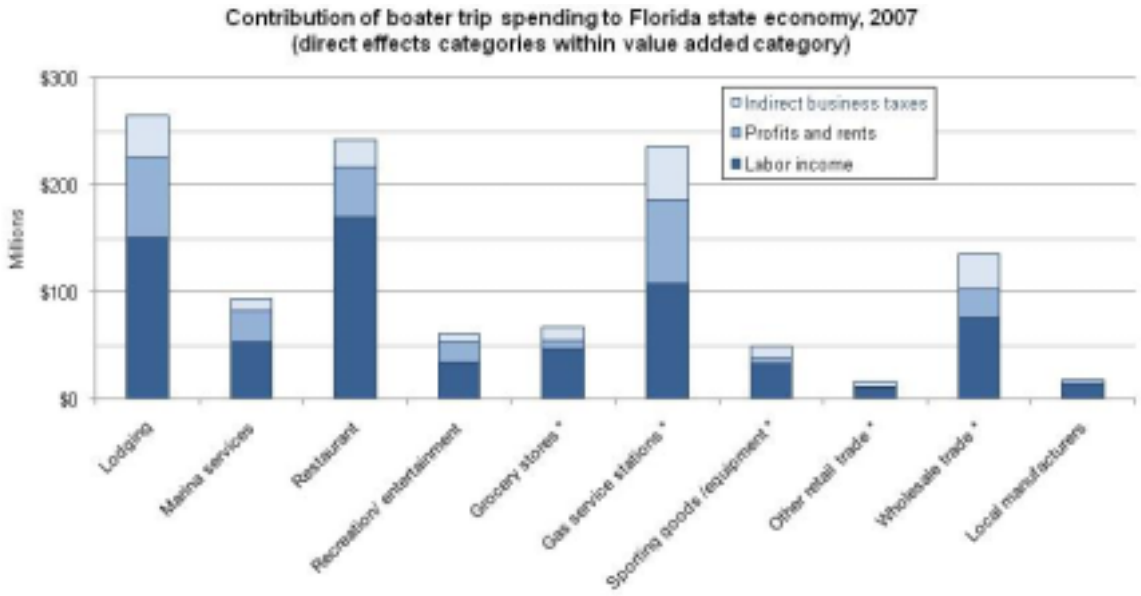
[a] Margins on goods purchased by boaters.
Note: direct sales are less than total trip spending as the cost of goods sold to retail establishments are not included unless the good is locally made. That is, only retail and wholesale margins are captured if the good is not made in Florida. IMPLAN RPC's were used to estimate the percentage of goods that were manufactured in Florida.

The $5.15 billion in craft-related boater expenses in 2007 directly supported over 39,000 jobs and $1.9 billion value added (Table 3.27). With secondary effects, the total economic contribution from craft-related spending was almost 59,000 jobs, $2.0 billion labor income, $442 million indirect business taxes and $3.3 billion value added. Craft-related expenses directly support jobs in marine trades including marinas, repair shops, and retail establishments selling boating-related products and accessories (Figures 3.26 to 3.29).



* Margins on goods purchased by boaters.
Value added = labor income + profits and rents + indirect business taxes.

Figure 3.22: Contribution of boater trip spending to Florida state economy, 2007 (direct effects).



* Margins on goods purchased by boaters.

Figure 3.23: Contribution of boater trip spending to Florida state economy, 2007 (direct effects categories with value added category).

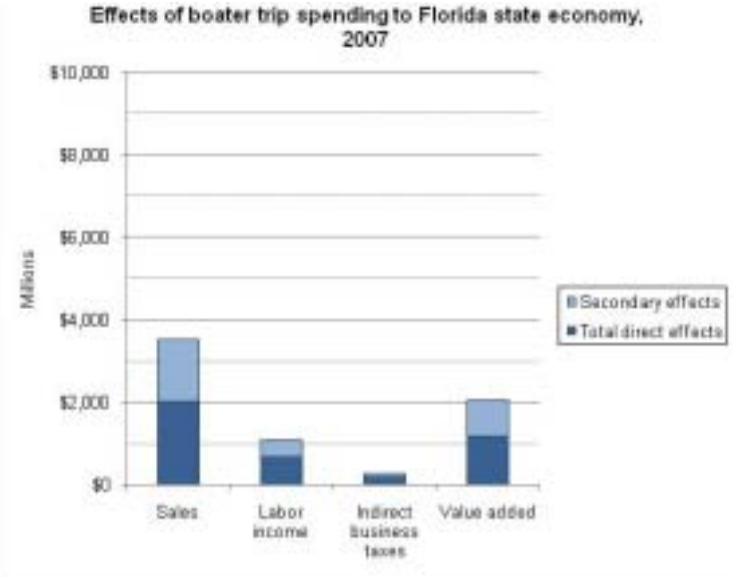


Figure 3.24: Effects of boater trip spending to Florida state economy, 2007.

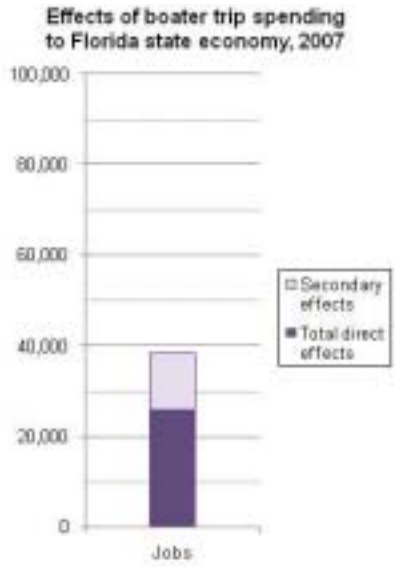


Figure 3.25: Effects of boater trip spending to Florida state economy, 2007.

Table 3.27: Contribution of boater craft expenses to Florida state economy, 2007.

Sector/Spending category	Sales ($millions)	Jobs	Labor income ($millions)	Indirect business taxes ($millions)	Value added ($millions)
Direct effects					
Slip	464	5,001	161	37	287
Repairs	1,062	13,765	372	80	486
Insurance	409	3,076	176	2	349
Credit intermediaries	51	307	21	2	33
Retail margins (motors, trailers & accessories)	886	14,968	382	129	538
Wholesale trade	333	1,934	126	49	224
Manufacturing (motors, trailers, & accessories)	22	68	4	0	6
Total direct effects	**3,226**	**39,119**	**1,243**	**299**	**1,922**
Secondary effects	**2,279**	**19,738**	**777**	**143**	**1,358**
Total effects	**5,505**	**58,857**	**2,020**	**442**	**3,280**
Multiplier	**1.71**	**1.5**	**1.62**	**1.48**	**1.71**

Note: does not include purchases of new or used boats.

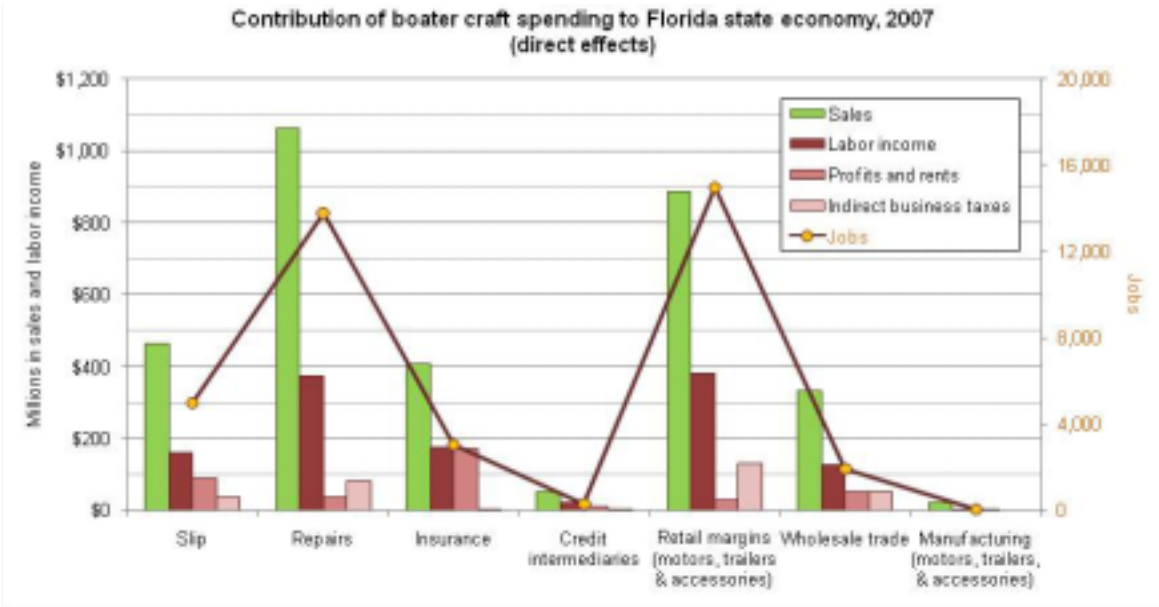
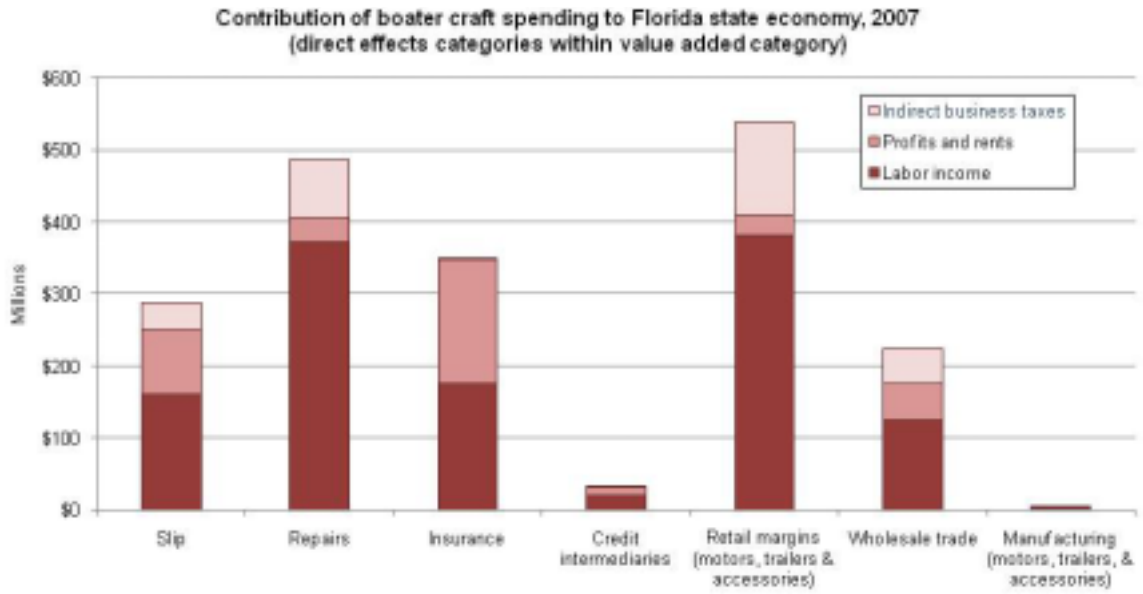


Figure 3.26: Contribution of boater craft spending to Florida state economy, 2007.



Does not include purchases of new or used boats.

Figure 3.27: Contribution of boater craft spending to Florida state economy, 2007 (direct effects categories within value added category).

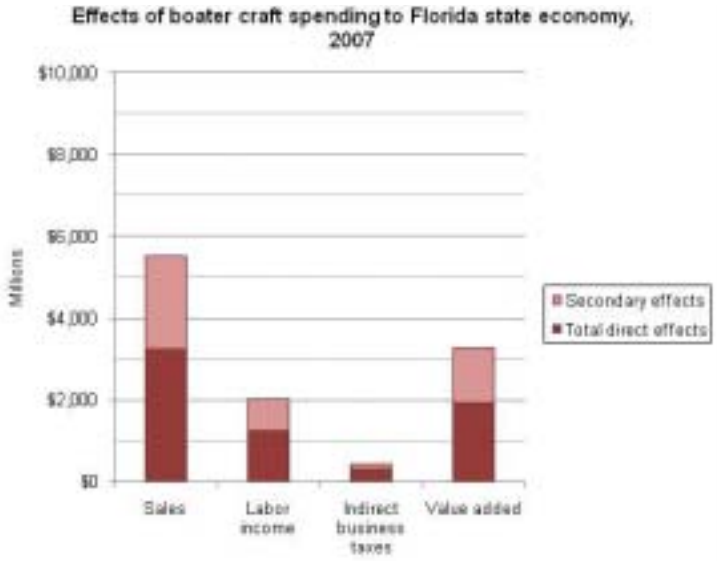


Figure 3.28: Effect of boater craft spending to Florida state economy, 2007.

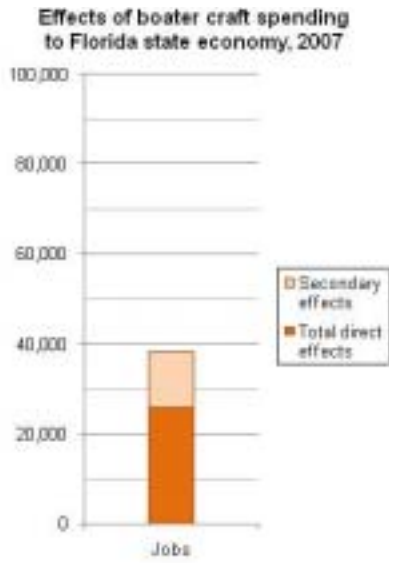


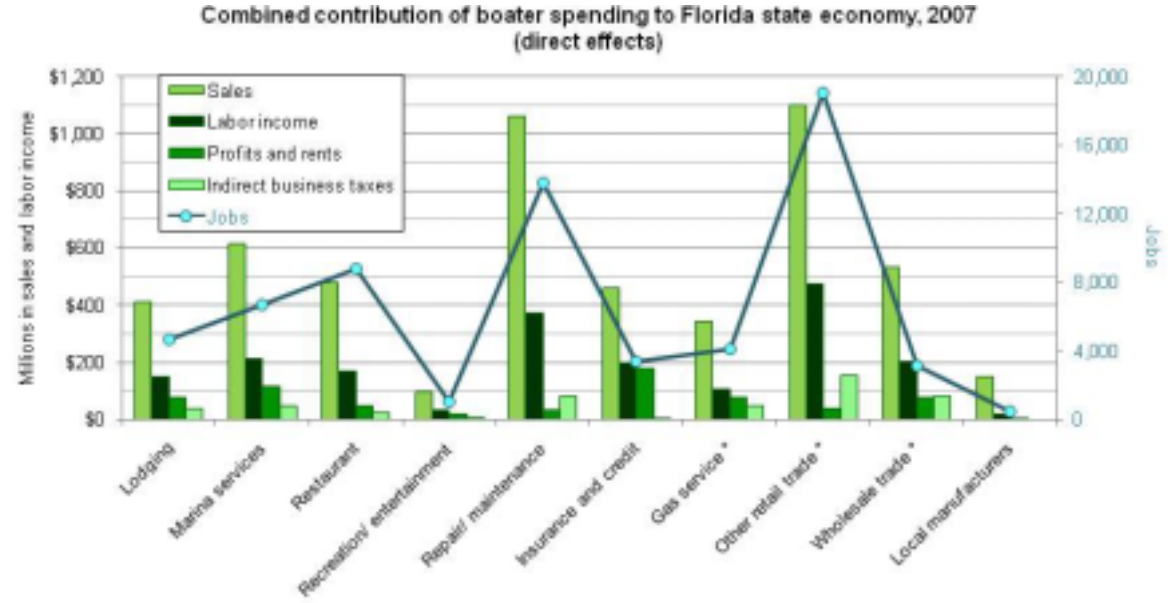
Figure 3.29: Effect of boater craft spending to Florida state economy, 2007.

The combined contribution of trip and craft-related spending to the Florida economy is over 97,000 jobs, $3.1 billion labor income, $726 million indirect business taxes and $5.3 billion value added (Tables 3.28 and 3.29 and Figures 3.30 to 3.33).

Table 3.28: Overall contribution of boater spending to Florida state economy, 2007.

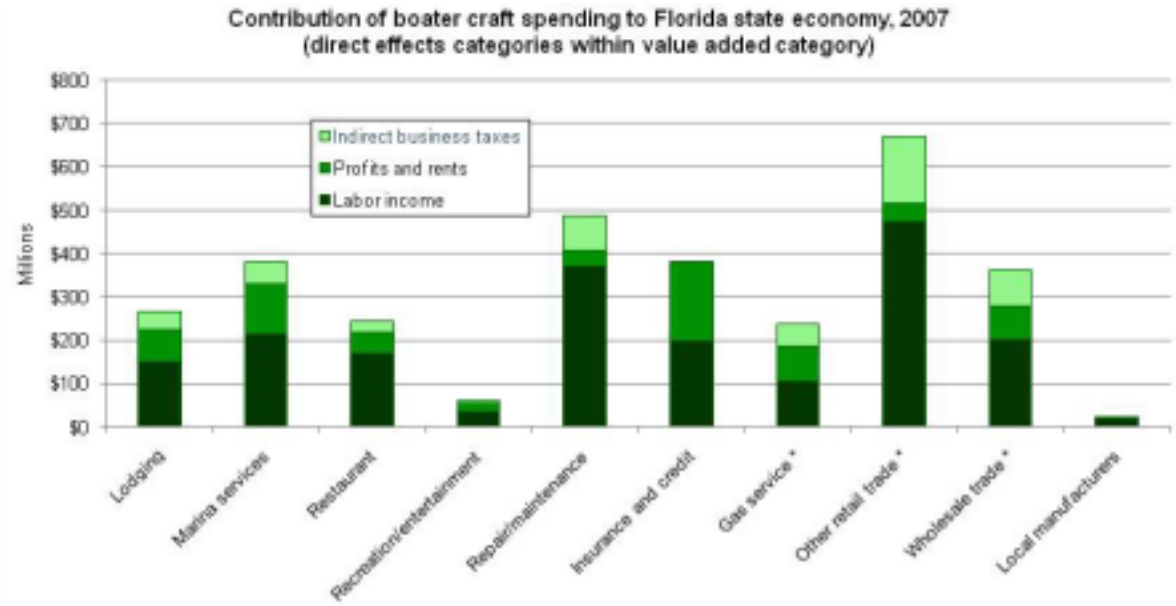
Sector/Spending category	Sales ($millions)	Jobs	Labor income ($millions)	Indirect business taxes ($millions)	Value added ($millions)
Direct effects					
Lodging	410	4,642	150	39	264
Marina services	616	6,642	214	50	381
Restaurant	479	8,758	170	25	242
Recreation/entertainment.	99	1,064	34	8	61
Repair/maintenance	1,062	13,765	372	80	486
Insurance and credit	460	3,383	198	5	382
Gas service [a]	345	4,130	107	50	236
Other retail trade [a]	1,100	19,025	473	156	670
Wholesale trade [a]	534	3,104	202	82	360
Local manufacturers	150	466	19	0	24
Total direct effects	**5,254**	**64,980**	**1,940**	**494**	**3,106**
Secondary effects	**3,758**	**32,132**	**1,157**	**232**	**2,215**
Total effects	**9,012**	**97,112**	**3,097**	**726**	**5,321**

[a] Margins on goods purchased by boaters.
Note: Sum of trip and craft spending in previous two tables.



* Margins on goods purchased by boaters.
Value added = labor income + profits and rents + indirect business taxes.

Figure 3.30: Combined contribution of boater spending to Florida state economy, 2007 (direct effects).



* Margins on goods purchased by boaters.

Figure 3.31: Combined contribution of boater spending to Florida state economy, 2007 (direct effects categories with value added category).

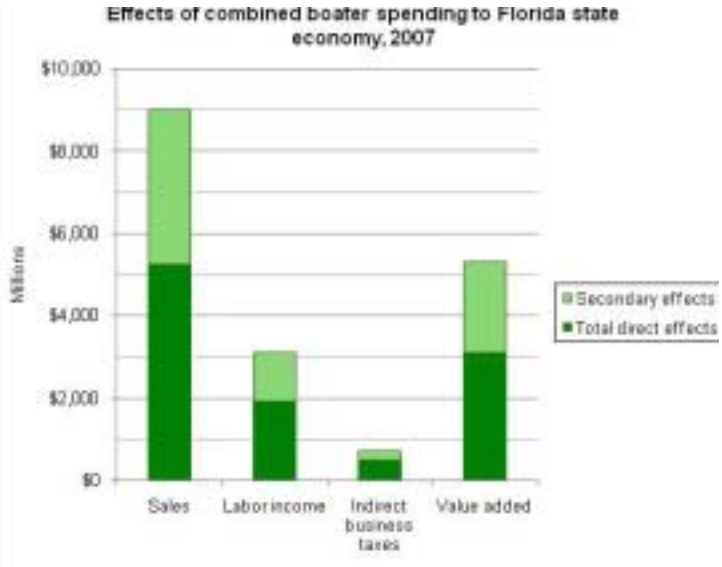


Figure 3.32: Effect of combined boater spending to Florida state economy, 2007.

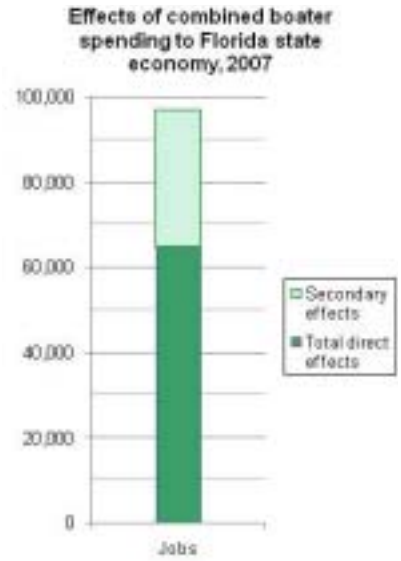


Figure 3.33: Effect of combined boater spending to Florida state economy, 2007.

Table 3.29: The economic contribution of owners of registered boats to the Florida economy, 2007.

Spending category	Expenditures	Jobs	Labor income	Indirect business taxes	Value added
Total boater trip spending	$ 3.38 billion	38,300	$ 1.08 billion	$ 284 million	$ 2.04 billion
Total craft-related spending	$ 5.15 billion	58,900	$ 2.02 billion	$ 442 million	$ 3.28 billion
Total spending	**$ 8.53 billion**	**97,200**	**$ 3.10 billion**	**$ 726 million**	**$ 5.32 billion**

Regional Significance

Multipliers for twenty economic sectors directly impacted by boater spending were estimated for the ten regions using the IMPLAN system with 2006 economic data. Sector-specific multipliers are applied to the regional spending totals to estimate direct and secondary impacts in terms of sales, income, jobs, and value added.

Since much of the boating activity and spending occurs within the boater's region of residence, results should be interpreted as economic significance rather than impacts in a with-versus-without sense. That is, much of the spending does not constitute export activity or "new dollars" to the region, so a large proportion of the spending would likely stay in the region in the absence of boating, but would shift to other sectors of the economy. The economic results demonstrate the contribution of boater spending to economic activity in the region and identify those sectors that benefit.

The South Florida region receives the greatest direct and total economic impacts from boater trip spending (Table 3.30 and Figures 3.34 to 3.37) and craft spending (Table 3.31 and Figures 3.38 to 3.41). The second greatest impact is Southwest Florida. The combined impact of trip and craft spending supports over 12,000 jobs in South Florida and over 18,000 jobs, when secondary effects are included (Table 3.32 and Figures 3.42 to 3.45). Detailed impact tables for each region are reported in Appendix K.

Table 3.30: Economic significance of registered boater's trip spending by region, 2007.

Region	Direct effects				Total effects			
	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)
West Panhandle	123	1,881	43	73	196	2,591	62	116
Central Panhandle	59	1,032	20	34	88	1,315	27	51
North Central	149	2,584	50	86	233	3,400	72	132
Northeast	164	2,050	54	91	276	2,999	83	157
South Inland	112	1,528	37	64	180	2,164	54	102
East Central	239	3,273	85	145	396	4,644	123	237
Southeast	202	2,565	72	123	325	3,581	104	198
West Central	225	3,061	76	130	394	4,427	117	225
Southwest	305	3,879	109	185	483	5,472	157	292
South	407	4,731	137	231	682	6,988	213	394
State total	**2,028**	**25,861**	**697**	**1,184**	**3,507**	**38,255**	**1,077**	**2,041**

Note: Region totals will not sum to state totals due to distinct capture rates and multipliers at the regional level versus state level. Direct sales is less than total spending in the region as the cost of goods sold at retail are omitted unless they are locally manufactured.

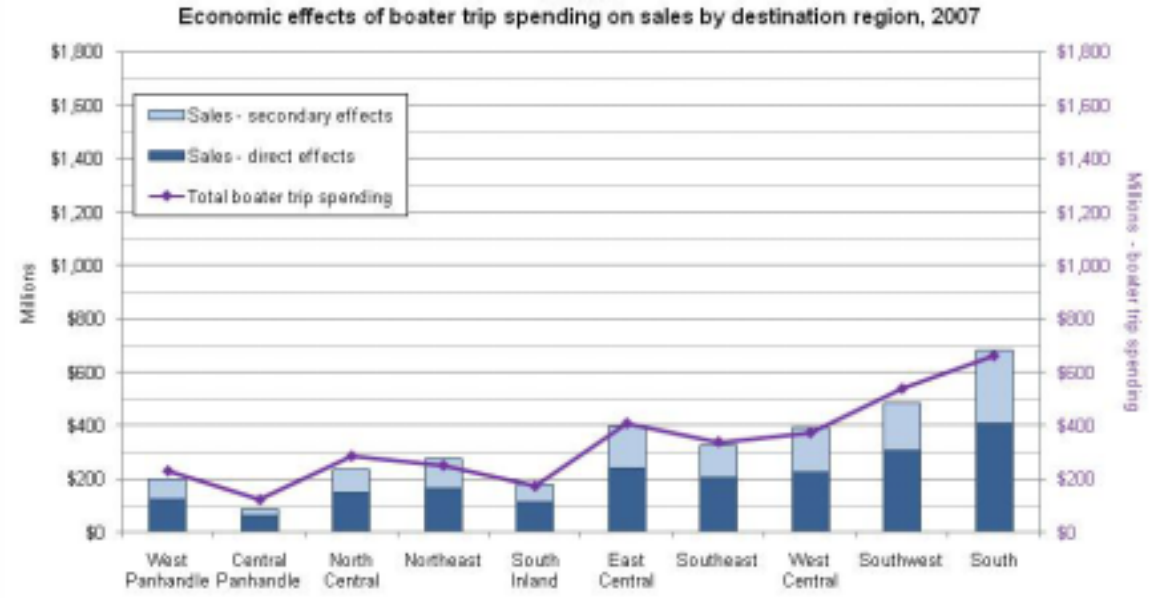


Figure 3.34: Economic effects of boater trip spending on sales by destination region, 2007.

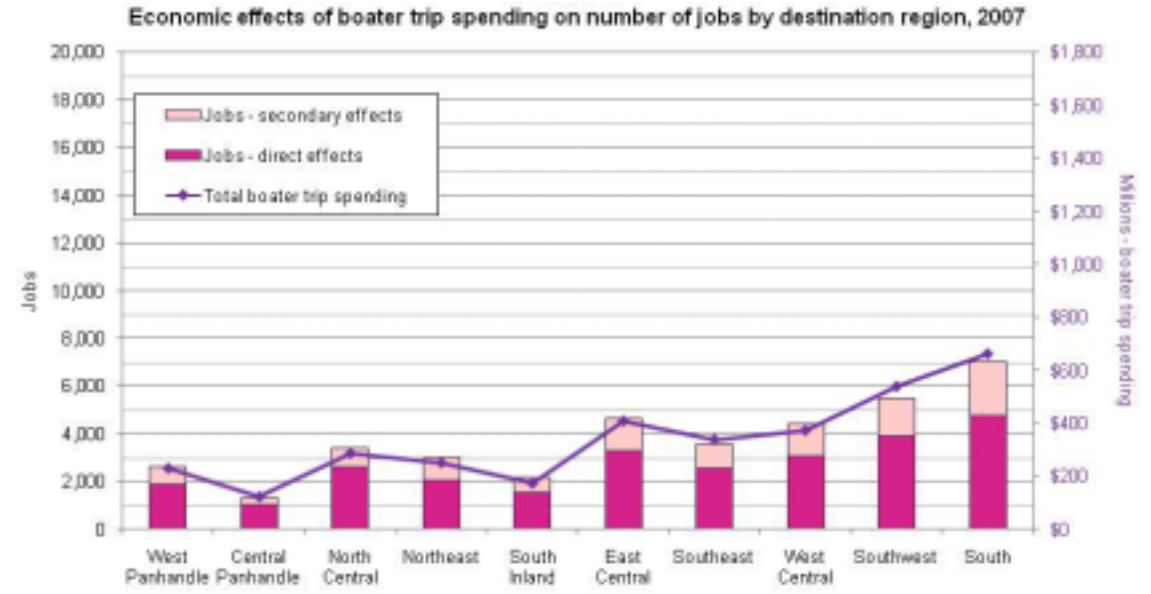


Figure 3.35: Economic effects of boater trip spending on number of jobs by destination region, 2007.

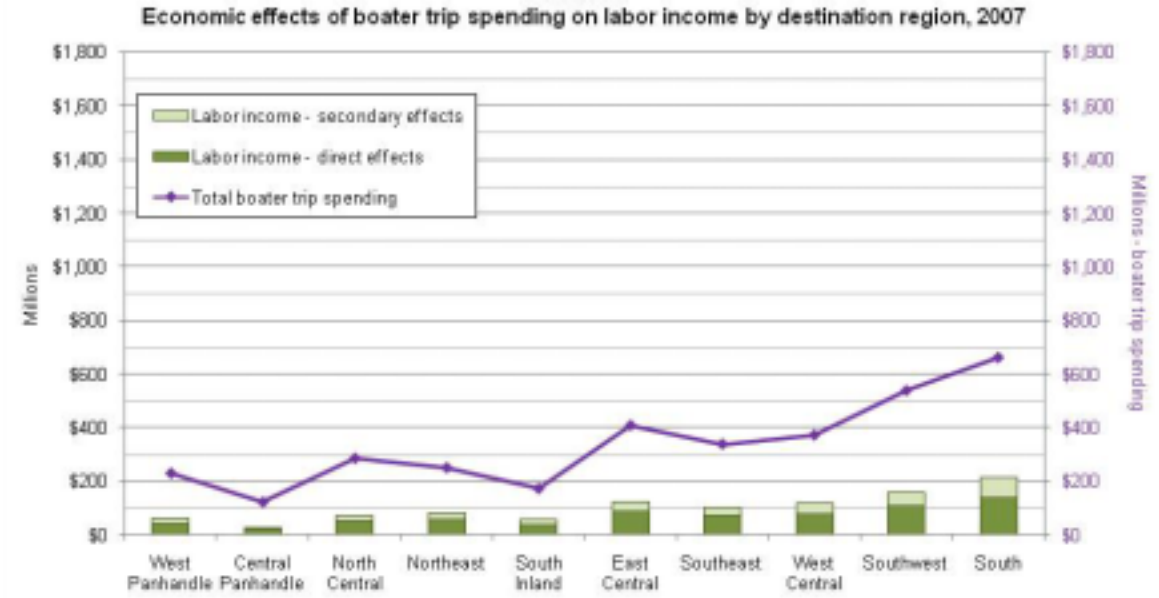


Figure 3.36: Economic effects of boater trip spending on labor income by destination region, 2007.

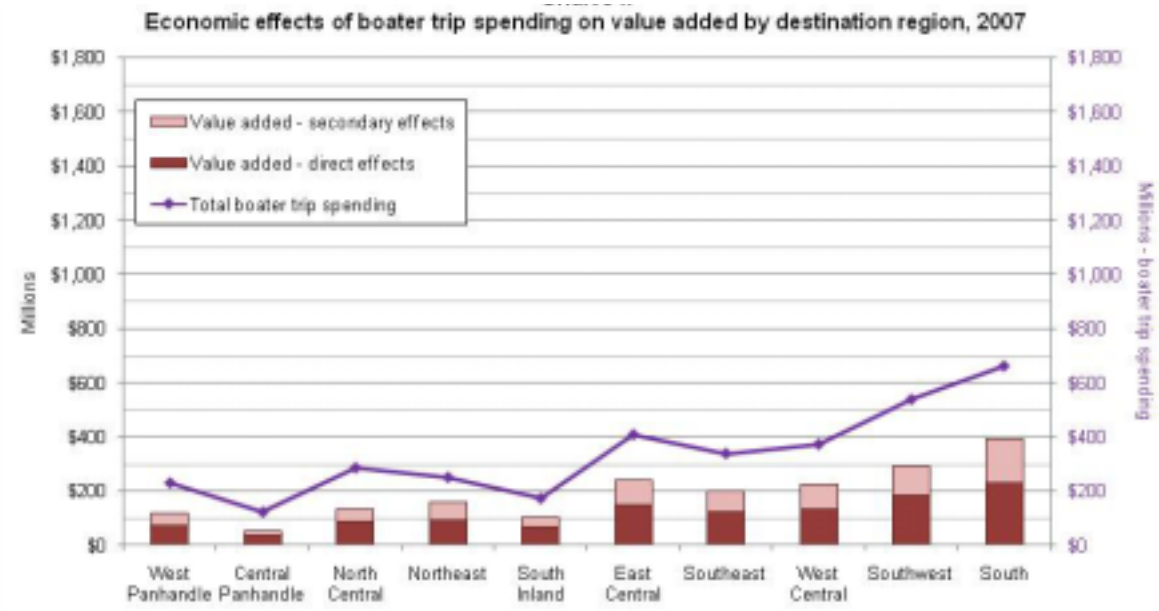


Figure 3.37: Economic effects of boater trip spending on value added by destination region, 2007.

Table 3.31: Economic significance of registered boat craft spending by region, 2007.

Region	Direct effects				Total effects			
	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)
West Panhandle	230	3,194	86	134	363	4,532	130	213
Central Panhandle	80	1,165	30	46	119	1,553	43	69
North Central	205	3,032	75	115	312	4,129	110	177
Northeast	220	2,763	84	131	365	4,056	134	219
South Inland	145	1,942	56	85	230	2,770	83	135
East Central	412	4,963	160	248	682	7,365	252	408
Southeast	339	4,023	131	204	543	5,733	202	330
West Central	411	5,267	157	244	699	7,723	254	415
Southwest	525	6,332	202	315	825	9,058	306	498
South	617	7,602	235	368	1,032	11,107	379	618
State total	**3,226**	**39,119**	**1,243**	**1,922**	**5,505**	**58,857**	**2,020**	**3,280**

Note: Region totals will not sum to state totals due to distinct capture rates and multipliers at the regional level versus state level. Direct sales is less than total spending in the region as the cost of goods sold at retail are omitted unless they are locally manufactured.

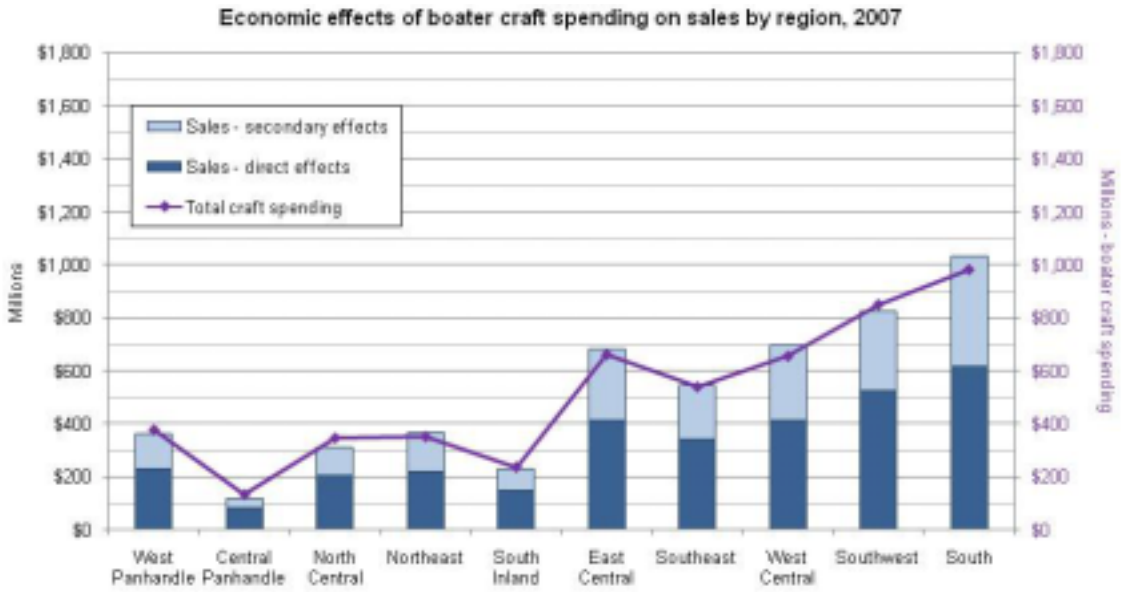


Figure 3.38: Economic effects of boater craft spending on sales by region, 2007.

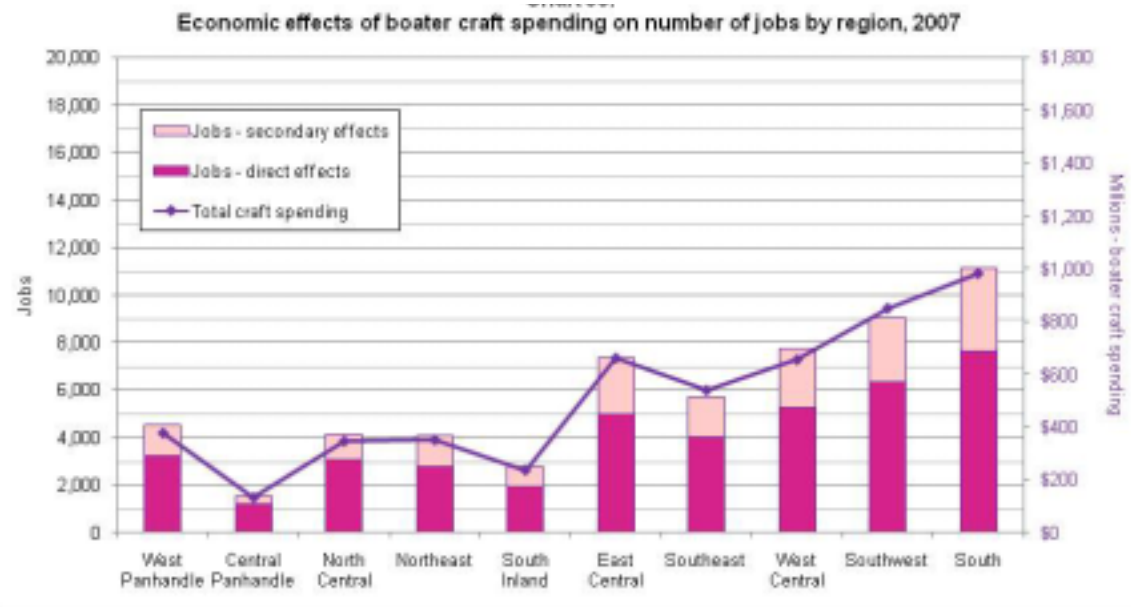


Figure 3.39: Economic effects of boater craft spending on number of jobs by region, 2007.

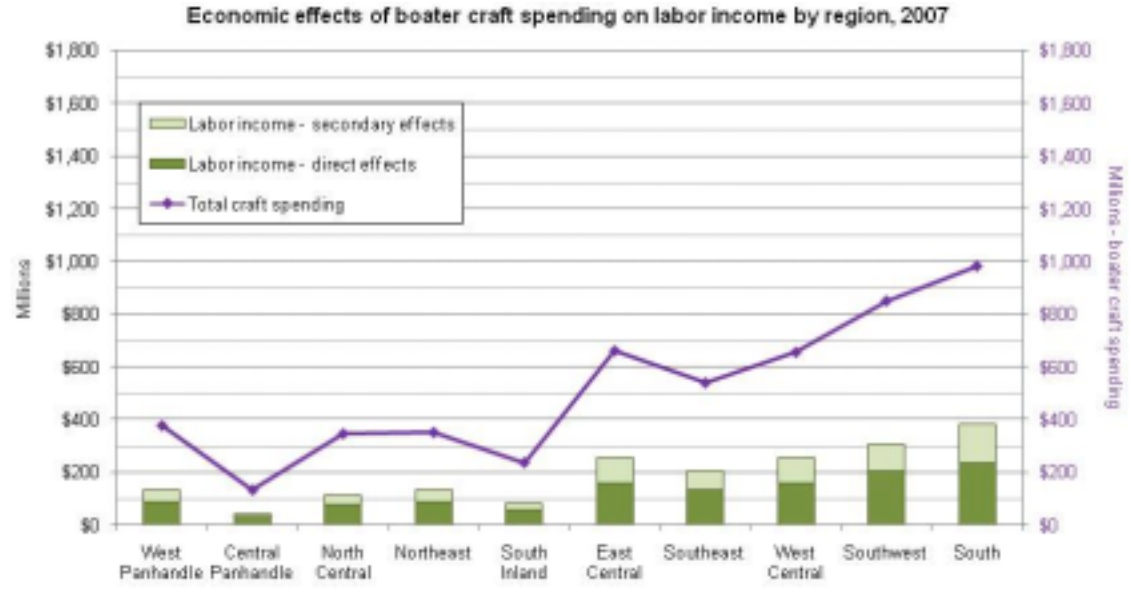


Figure 3.40: Economic effects of boater craft spending on labor income by region, 2007.

Table 3.32: Economic significance of registered boaters craft and trip spending by region, 2007.

Region	Direct effects				Total effects			
	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)
West Panhandle	353	5,075	129	207	559	7,123	192	329
Central Panhandle	139	2,197	50	80	207	2,868	71	120
North Central	354	5,617	125	201	545	7,529	181	309
Northeast	384	4,813	138	222	642	7,056	218	376
South Inland	257	3,471	93	149	409	4,934	137	237
East Central	652	8,235	245	393	1,078	12,008	375	645
Southeast	541	6,588	203	327	869	9,315	306	528
West Central	637	8,327	233	373	1,093	12,149	371	640
Southwest	830	10,211	310	500	1,308	14,530	463	790
South	1,024	12,333	372	599	1,715	18,095	592	1,013
State total	**5,254**	**64,980**	**1,940**	**3,106**	**9,012**	**97,112**	**3,097**	**5,321**

Note: Region totals will not sum to state totals due to distinct capture rates and multipliers at regional level versus state level.

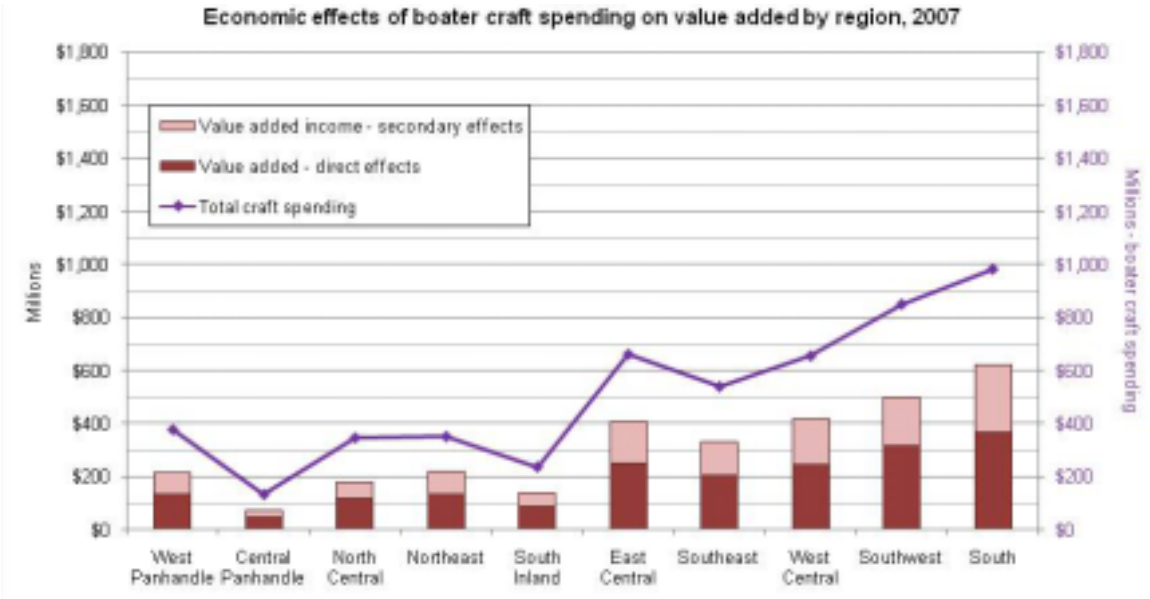


Figure 3.41: Economic effects of boater craft spending on value added by region, 2007.

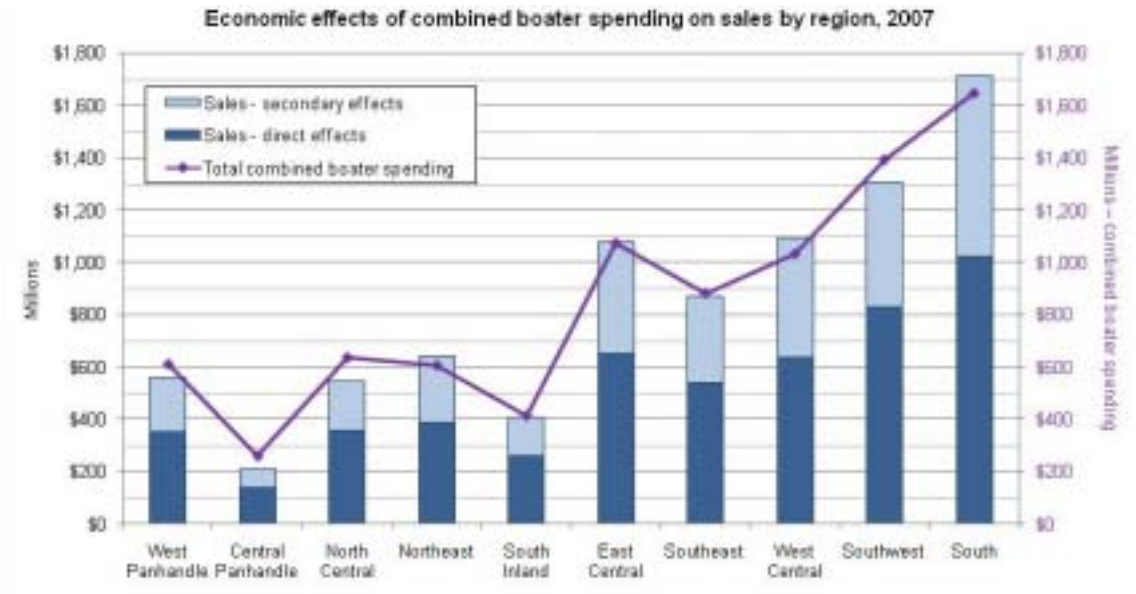


Figure 3.42: Economic effects of combined boater spending on sales by region, 2007.

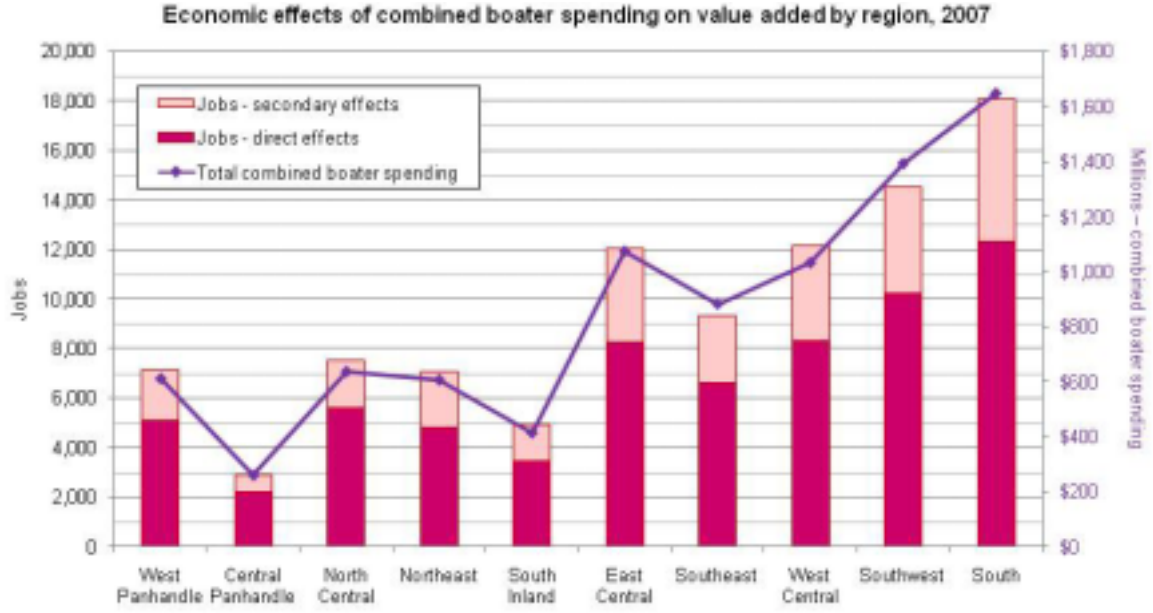


Figure 3.43: Economic effects of combined boater spending on value added by region, 2007.

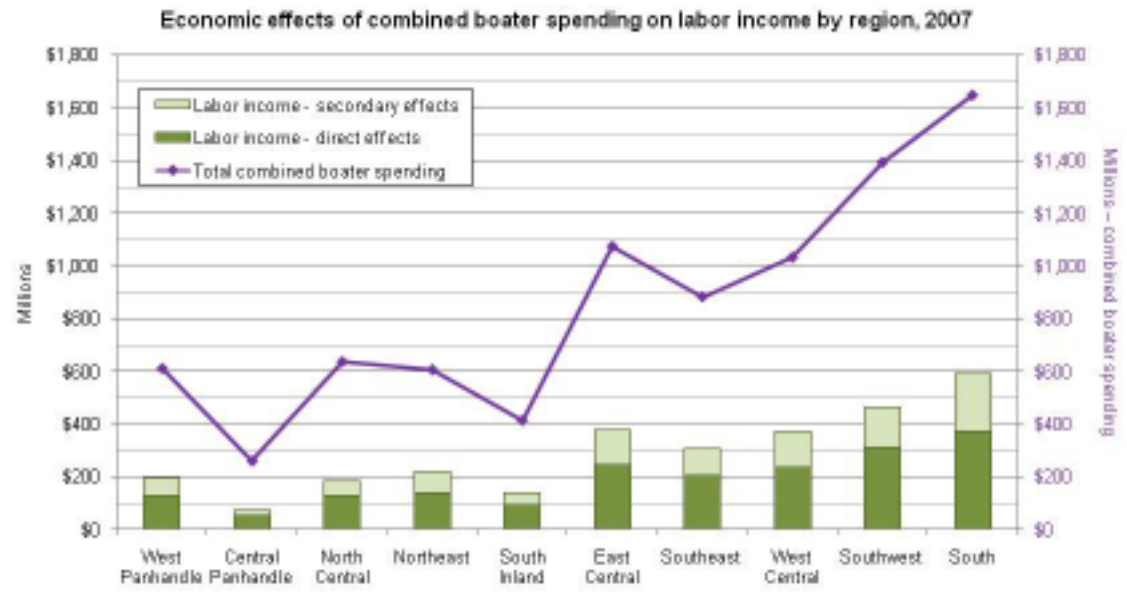


Figure 3.44: Economic effects of combined boater spending on labor income by region, 2007.

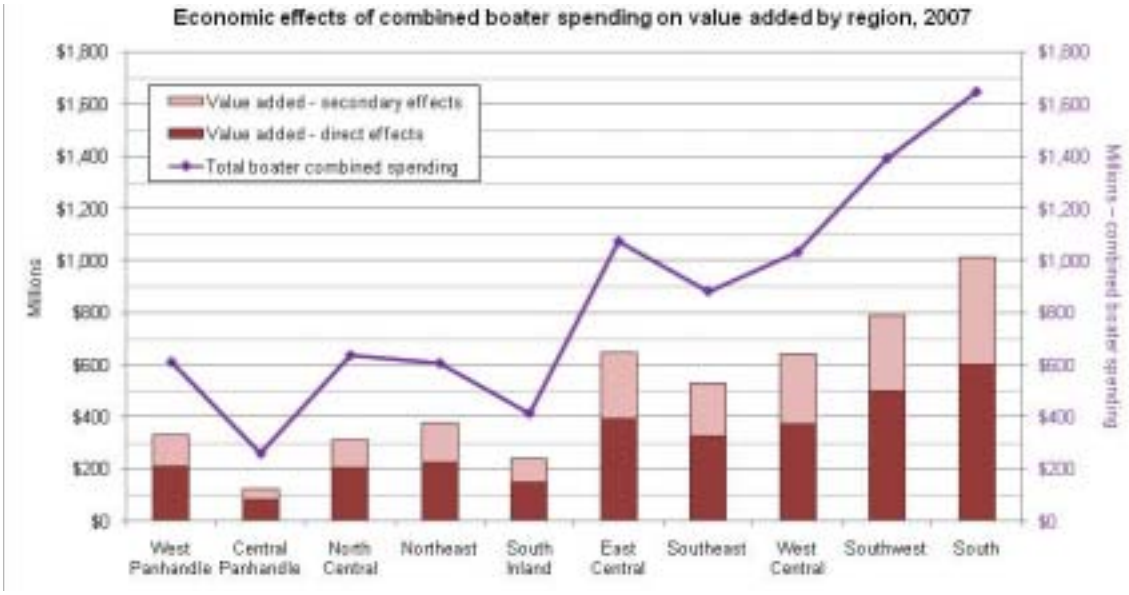


Figure 3.45: Economic effects of combined boater spending on value added by region, 2007.

County-Level Impacts: All Registered Boats and a Sample Marina and Launch Site

The spending averages and trip estimates can be used to estimate impacts at the county level or to estimate impacts of particular facilities. For these analyses we assume that the number of trips per boat and the trip and craft-related spending averages within particular boat size and type segments do not vary from county to county. Lee County multipliers are used to illustrate local economic effects (for information on economic effects in other counties, see Appendix L). The three examples are: 1) impacts of boating in Lee County by registered boats; 2) impacts of a typical marina on the county economy; and 3) impacts of launch ramps on the county economy.

An online model is available to make similar impact estimates for individual counties, marinas, or launch ramps (www.floridaboatingeconomics.com).

Impacts of Registered Boaters in Lee County

There were 45,636 boats registered in Lee County in 2006 (about one boat for every 10 people living in the county). These boats were used on 1.079 million trips in 2007, 102,000 overnight trips and 977,000 day trips. Eighty-three percent of the day trips and 37% of overnight trips stayed within the county. The county received 61,000 more trips than it sent out. Boaters spent $192 million in Lee County on boating trips. The owners of boats registered in Lee County spent $310 million on annual craft expenses.

Economic impacts of this spending were estimated by applying the spending to multipliers for the Lee County economy. Multipliers were extracted from an input-output model of the Lee County economy using the IMPLAN system with 2006 economic data. The overall sales multiplier for boater spending in Lee County is 1.56, which means that for every dollar of direct spending, another $0.56 in local sales is generated through secondary effects

Trip spending supported over 2,000 jobs (Table 3.33) while craft-related spending supported 3,200 jobs (Table 3.34). The overall economic contribution to the Lee county economy of trip and craft spending in 2007 was over 5,200 jobs, $168 million labor income and $287 million value added (Table 3.35).

Table 3.33: Contribution of boater trip spending to Lee county economy, 2007.

Sector/Spending category	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)
Direct effects				
Lodging	25	276	9	16
Marina services	9	86	3	6
Restaurant	28	492	10	14
Recreation/entertainment	6	54	2	4
Grocery stores [a]	6	106	3	4
Gas service [a]	19	249	6	13
Sporting goods [a]	4	97	2	3
Other retail trade [a]	2	28	1	1
Wholesale trade [a]	10	64	4	7
Local manufacturing	2	9	0	0
Total direct effects	**111**	**1,459**	**40**	**67**
Secondary effects	**62**	**554**	**16**	**38**
Total effects	**173**	**2,013**	**56**	**106**
Multiplier	**1.56**	**1.38**	**1.41**	**1.57**

[a] Sales in the retail and wholesale trade sectors are the margins on goods sold. Only a small portion of the producer portion (cost of goods sold) of these sales appears as local manufacturing. This is why total direct sales is considerably less than the $192 million in trip spending.

Table 3.34: Contribution of boater craft spending to Lee county economy, 2007.

Sector/Spending category	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)
Direct effects				
Slip	30	282	11	19
Repairs	65	783	24	31
Insurance	25	205	11	22
Credit intermediaries	3	22	1	2
Retail trade	51	844	21	30
Wholesale trade	18	109	7	12
Total direct effects	**192**	**2,245**	**75**	**116**
Secondary effects	**106**	**955**	**37**	**66**
Total effects	**298**	**3,200**	**112**	**182**
Multiplier	**1.55**	**1.43**	**1.49**	**1.57**

Table 3.35: Overall contribution of boater spending to Lee county economy, 2007.

Sector/Spending category	Sales ($millions)	Jobs	Labor income ($millions)	Value added ($millions)
Direct effects				
Lodging	25	276	9	16
Marina services	39	367	14	24
Restaurant	28	492	10	14
Recreation/entertainment	6	54	2	4
Repair/maintenance	65	783	24	31
Insurance and credit	29	227	12	24
Gas service	19	249	6	13
Other retail trade	63	1,075	27	37
Wholesale trade	28	173	11	19
Other local production	3	10	1	1
Total direct effects	**303**	**3,704**	**115**	**183**
Secondary effects	**168**	**1,508**	**53**	**104**
Total effects	**471**	**5,213**	**168**	**287**
Multiplier	**1.56**	**1.41**	**1.46**	**1.57**

Economic Significance of a 100-Boat Marina on the Lee County Economy

For this example, we assume a marina with 100 occupied seasonal slips with boats distributed the same as the overall state average of boats in marinas by size and type[3]. The average trip spending for boats

[3] Number of boats by size and type: 41 power boats <23' long, 26 power boats 23-28' long, 17 power boats 29-40' long, 6 power boats 41'+ long, 6 sailboats <36', and 4 sailboats ≥36' long.

stored at marinas is $206 per trip, including both day and overnight trips (Table 3.36). Boater trip spending varies somewhat by the size and type of boat, especially spending on boat fuel.

Table 3.36: Trip spending by owners storing their boat at a marina ($ per trip); by boat segment.

Category	Power boats				Sailboats		All boats weighted average ($ /trip)
	< 23' ($ /trip)	23-28' ($ /trip)	29-40' ($ /trip)	≥ 41' ($ /trip)	< 36' ($ /trip)	≥ 36' ($ /trip)	
Lodging	10.12	4.53	12.02	7.89	2.30	4.66	8.10
Marina services	2.68	10.02	30.44	110.23	44.45	26.75	19.69
Restaurant	16.75	24.45	42.19	107.09	47.51	39.88	31.62
Groceries	12.75	21.36	39.44	70.00	39.10	40.00	25.94
Boat fuel	35.52	83.33	156.54	309.36	16.57	56.20	84.34
Auto fuel	8.64	5.86	6.49	7.69	7.06	7.49	7.36
Marine supplies	9.51	10.36	16.65	56.42	37.79	24.27	16.35
Recreation/entertainment	3.98	3.18	8.53	24.35	10.37	9.30	6.45
Shopping	2.86	4.24	6.72	21.69	8.02	11.23	5.75
Total	**102.81**	**167.33**	**319.01**	**714.73**	**213.18**	**219.77**	**205.59**

A typical boat stored at a marina spends an additional $14,000 dollars a year in annual craft-related expenses (Table 3.37). Craft-related expenses vary even more by boat size and type, so the overall average will depend on the mix of boats in the marina.

Table 3.37: Annual craft spending by owners storing their boat at a marina ($ per boat per year); by boat segment.

Category	Power boats				Sailboats		All boats weighted average ($ /trip)
	< 23' ($ /trip)	23-28' ($ /trip)	29-40' ($ /trip)	≥ 41' ($ /trip)	< 36' ($ /trip)	≥ 36' ($ /trip)	
Slip	1,775	5,671	4,628	6,228	3,172	5,241	3,294
Loan payments	584	2,497	5,029	9,457	339	3,131	2,063
Motors	299	536	331	67	94	143	328
Trailers	0	124	0	0	0	35	28
Insurance	321	852	2,234	4,877	780	2,369	994
Repairs	714	2,582	5,679	13,111	2,575	6,276	2,648
Accessories	2,420	3,932	8,165	14,694	4,301	8,906	4,412
Taxes	57	253	280	1,102	71	279	185
Total	**6,170**	**16,447**	**26,347**	**49,534**	**11,332**	**26,380**	**13,953**

To illustrate the impacts of a 100 boat marina, we assume the average statewide distribution of boats in marinas – 41% power boats under 23 feet, 26% power boats 23-28 feet, 17% power boats 29-40 feet, 6% power boats 41 foot or more, 6% sail boats under 36 feet, and 4% sail boats 36 foot or more.

Based on the statewide averages (Table 3.7), these boats would take a total of 2,500 trips in 2007, spending a total of $462,000 on their trips and $1.6 million in annual craft-related expenses (Table 3.38).

Table 3:38: Total spending from a 100-boat marina in 2007 ($000s).

Trip spending ($000s)	
Lodging	20
Marina services	39
Restaurant	71
Groceries	59
Boat fuel	192
Auto fuel	18
Marine supplies	36
Recreation/entertainment	14
Shopping	13
Total	**462**

Craft-related spending ($000s)	
Slip	376
Loan payments	246
Insurance	117
Repairs	312
Equipment/accessories	527
Taxes	22
Total	**1,599**

To estimate impacts on the Lee county economy, we assume all trip and craft-related expenses occur within the county. While many trips will go outside the county, we assume here that the loss of this spending would be offset by other boats coming into Lee County and using dockage or services provided by the marina. Lee County multipliers are used to estimate economic impacts of this spending.

Including secondary effects, the $462,000 in trip spending contributes $129,000 in labor income to the county and $245,000 in value added (Table 3.39). It supports 5 jobs. Since the largest trip expense is boat fuel, only 56% of trip spending is captured by the local economy. That is, only the retail margins on fuel purchases accrue to local businesses, as the fuel is produced elsewhere.

Table 3.39: Economic impacts of boater trip spending, 100-boat marina.

Sector/Spending category	Sales ($000s)	Jobs	Labor income ($000s)	Value added ($000s)
Direct effects				
Lodging	20	0.2	7	13
Marina services	39	0.4	14	25
Restaurant	71	1.3	26	36
Recreation/entertainment	14	0.1	5	9
Grocery stores [a]	15	0.3	6	9
Gas service [a]	47	0.6	15	32
Sporting goods [a]	15	0.3	6	9
Other retail trade [a]	4	0.1	2	3
Wholesale trade [a]	27	0.2	10	18
Local manufacturing	6	0.0	1	1
Total direct effects	**258**	**3.5**	**92**	**156**
Secondary effects	**145**	**1.3**	**37**	**89**
Total effects	**403**	**4.8**	**129**	**245**
Multiplier	**1.6**	**1.4**	**1.4**	**1.6**

[a] Sales in the retail and wholesale trade sectors are the margins on goods sold. Only a small portion of the producer portion (cost of goods sold) of these sales appears as local manufacturing.

The $1.6 million in craft-related spending generates $630,000 in labor income and one million dollars in value added for the county. Craft-related spending supports nearly four jobs each from slip fees, repairs, and retail purchases for a total of 12 direct jobs and 18 jobs including secondary effects (Table 3.40).

The combined effects of trip and craft spending supports 23 jobs and contributes $1.25 million in value added to the county economy. Since the model is linear, the impacts of a marina with 200 boats would be twice these figures and a 50-boat marina would generate half as much in economic activity.

Table 3.40: Economic impacts of craft expenses, 100-boat marina.

Sector/Spending category	Sales ($000s)	Jobs	Labor income ($000s)	Value added ($000s)
Direct effects				
Slip	376	3.6	133	238
Repairs	312	3.8	116	151
Insurance	117	0.9	50	100
Credit intermediaries	16	0.1	6	10
Retail trade	205	3.5	87	122
Wholesale trade	71	0.4	27	48
Total direct effects	**1,097**	**12.3**	**420**	**667**
Secondary effects	**607**	**5.5**	**211**	**377**
Total effects	**1,704**	**17.8**	**630**	**1,044**
Multiplier	**1.6**	**1.5**	**1.5**	**1.6**

Economic Significance of Launch Ramps to the Lee County Economy

The local economic contribution of launch ramps can be illustrated with a hypothetical launch site serving 20,000 launch trips in 2007. This equates to roughly 30 launches per day on weekdays and 120 per day on weekend days. Since spending depends considerably on the relative proportions of day and overnight trips, we present three scenarios: one with all day trips, one assuming 10% of launches are on overnight trips, and one with 50% overnight trips.

A boater on a day trip using a launch site averages $63 in spending, the majority for boat or auto fuel. Boaters using a launch site on an overnight trip spent $656 on their trip, or $187 per day for an average trip lasting 3.5 days. A larger percentage of the spending on overnight trips goes for lodging, auto fuel, restaurants, and groceries. For overnight trips we assume one launch per day the boat was in the water (Table 3.41).

Total spending associated with 20,000 launches is $1.25 million if the launches are all day trips and about twice this amount if half of the launches are associated with overnight trips (Table 3.42). Statewide about 10% of launches are on overnight trips, but the proportions of day versus overnight trips will vary considerably across different launch sites.

Using Lee County multipliers, the $1.25 million in boater spending associated with 20,000 launch day trips yields a contribution of $276,000 in labor income, $551,000 in value added and 11 jobs, including secondary effects (Table 3.43). A launch site attracting 10% overnight trips supports 13 local jobs (Table 3.44), while one attracting 50% overnight trips supports 30 local jobs (Table 3.45). The additional overnight trips add several jobs in hotels and restaurants.

Table 3.41: Average spending on boating trips involving a launch.

Spending category	Day trip	Overnight trip	Overnight trip per day	10% overnight trips	50% overnight trips
Lodging	0.00	241.99	69.14	3.46	34.57
Marina services	1.28	17.73	5.07	1.47	3.17
Restaurant	8.86	88.98	25.42	9.68	17.14
Groceries	8.86	70.11	20.03	9.42	14.45
Boat fuel	27.47	84.60	24.17	27.31	25.82
Auto fuel	9.71	83.90	23.97	10.42	16.84
Marine supplies	4.75	30.76	8.79	4.95	6.77
Recreation/entertainment	1.27	12.63	3.61	1.39	2.44
Shopping	0.60	25.46	7.27	0.94	3.94
Total	**62.80**	**656.16**	**187.47**	**69.04**	**125.14**

Table 3.42: Total spending for 20,000 launches ($000s).

Spending category	All day trips ($000s)	10% overnight trips ($000s)	50% overnight trips ($000s)
Lodging	0	69	691
Marina services	26	29	63
Restaurant	177	194	343
Groceries	177	188	289
Boat fuel	549	546	516
Auto fuel	194	208	337
Marine supplies	95	99	135
Recreation/entertainment	25	28	49
Shopping	12	19	79
Total	**1,256**	**1,381**	**2,503**

Table 3.43: Economic impacts of 20,000 launches, all day trips.

Sector/Spending category	Sales ($000s)	Jobs	Labor income ($000s)	Value added ($000s)
Direct effects				
Lodging	0	0.0	0	0
Marina services	26	0.2	9	16
Restaurant	177	3.2	64	91
Recreation/entertainment	25	0.2	9	16
Grocery stores [a]	45	0.8	20	28
Gas service [a]	166	2.1	52	113
Sporting goods [a]	40	0.9	16	24
Other retail trade [a]	4	0.1	2	3
Wholesale trade [a]	84	0.5	32	56
Local manufacturing	16	0.1	3	3
Total direct effects	**582**	**8.1**	**206**	**351**
Secondary effects	**323**	**2.9**	**70**	**200**
Total effects	**905**	**11.0**	**276**	**551**
Multiplier	**1.6**	**1.4**	**1.3**	**1.6**

[a] Sales in the retail and wholesale trade sectors are the margins on goods sold. Only a small portion of the producer portion (cost of goods sold) of these sales appears as local manufacturing.

Table 3.44: Economic impacts of 20,000 launches, 10% overnight trips.

Sector/Spending category	Sales ($000s)	Jobs	Labor income ($000s)	Value added ($000s)
Direct effects				
Lodging	69	0.8	25	45
Marina services	29	0.3	10	19
Restaurant	194	3.5	70	99
Recreation/entertainment	28	0.3	10	18
Grocery stores [a]	48	0.8	21	30
Gas service [a]	168	2.2	52	115
Sporting goods [a]	41	0.9	17	25
Other retail trade [a]	6	0.1	3	4
Wholesale trade [a]	87	0.5	33	58
Local manufacturing	17	0.1	3	4
Total direct effects	**687**	**9.4**	**244**	**416**
Secondary effects	**384**	**3.4**	**89**	**237**
Total effects	**1,072**	**12.8**	**334**	**653**

[a] Sales in the retail and wholesale trade sectors are the margins on goods sold. Only a small portion of the producer portion (cost of goods sold) of these sales appears as local manufacturing.

Table 3.45: Economic impacts of 20,000 launches, 50% overnight trips.

Sector/Spending category	Sales ($000s)	Jobs	Labor income ($000s)	Value added ($000s)
Direct effects				
Lodging	691	7.8	253	447
Marina services	63	0.6	23	40
Restaurant	343	6.1	124	176
Recreation/entertainment	49	0.5	17	31
Grocery stores [a]	73	1.3	32	45
Gas service [a]	190	2.5	59	130
Sporting goods [a]	56	1.3	23	35
Other retail trade [a]	27	0.5	12	16
Wholesale trade [a]	115	0.7	43	77
Local manufacturing	30	0.1	5	6
Total direct effects	**1,637**	**21.2**	**591**	**1,003**
Secondary effects	**937**	**8.3**	**264**	**571**
Total effects	**2,574**	**29.5**	**855**	**1,575**

[a] Sales in the retail and wholesale trade sectors are the margins on goods sold. Only a small portion of the producer portion (cost of goods sold) of these sales appears as local manufacturing.

3.3.8 Florida Online Economic Impact Model

This study also produced a system of three web-based models which allows users to estimate boater spending and the associated economic impacts in terms of jobs, sales, income, and value added resulting from the ownership (e.g., craft spending) and use (e.g., trip spending) of recreational boats of different sizes and types in Florida. The models can be accessed at www.floridaboatingeconomics.com. Data used to develop the models came from both the Florida Boating Access Inventory and the Economic Analysis of Recreational Boating in Florida presented in detail in this report.

The economic impact models use distinct spending profiles for boats of different types and sizes that are registered in counties/regions, kept at marinas, and trailered to launch sites. The annual craft-related spending is analyzed in eight categories, and trip spending in ten categories. Employment and income effects are reported for a dozen economic sectors. Economic impacts are estimated by applying estimates of annual craft and trip spending to 2006 county or regional multipliers representing the structure of the county/region where registered boat owners reside and where marinas or boat access/launch sites are located.

The multipliers convert boater trip and craft spending in different sectors of the economy into the associated jobs, income, and value added in boat-related and tourism-related businesses. Multipliers also estimate the indirect and induced effects as boater spending flows throughout the local economy. Multipliers for twenty economic sectors directly impacted by boater spending were estimated for Florida counties and ten regions using the IMPLAN system with 2006 economic data. Sector-specific multipliers are applied to estimates of boater spending totals to estimate direct and secondary impacts in terms of sales, income, jobs, and value added. Since much of the boating activity and spending occurs within the boater's region of residence, results should be interpreted as economic significance rather than impacts in a with-versus-without sense. Much of the spending does not constitute export activity

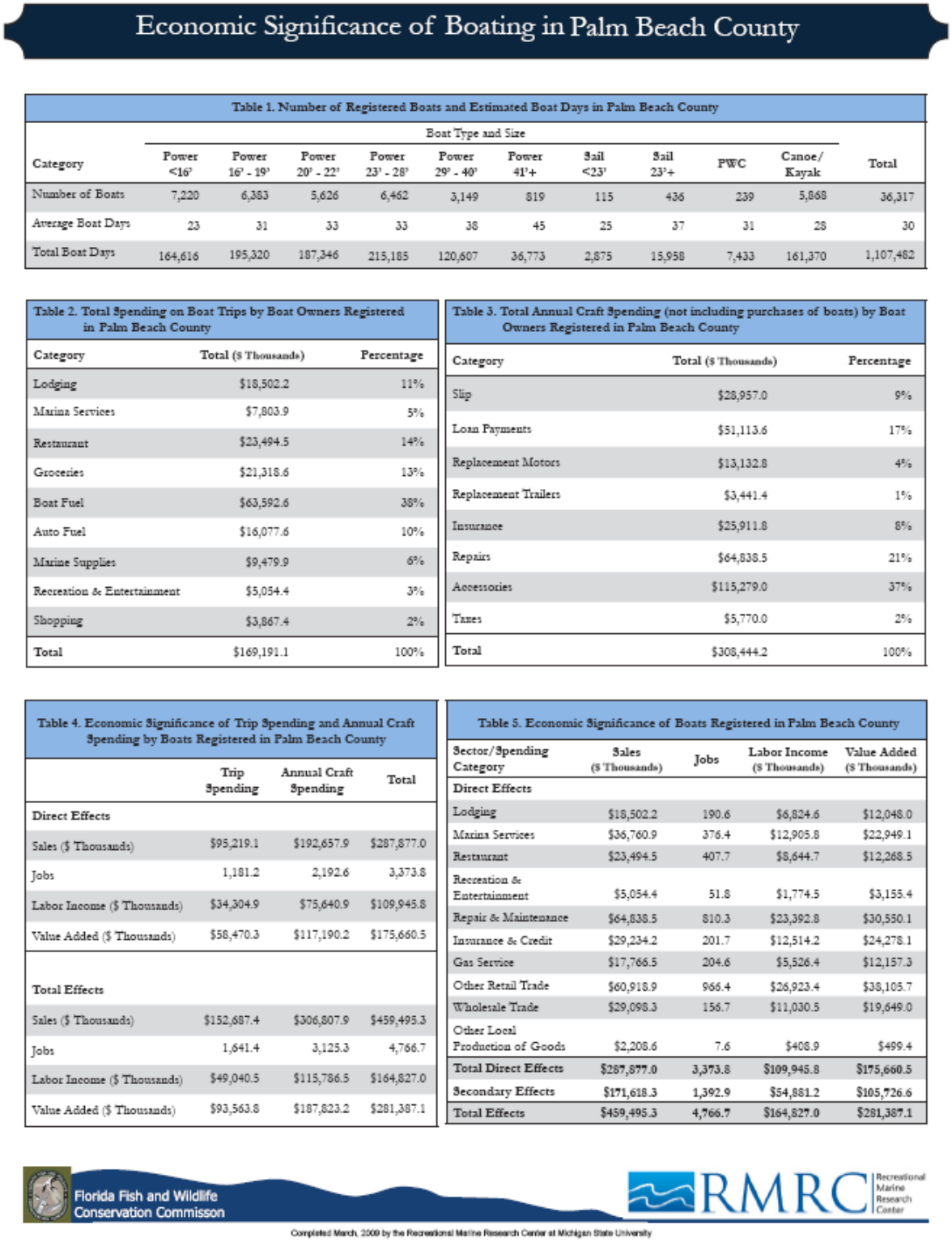
or "new dollars" to the region, so a large proportion of the spending would likely stay in the region in the absence of boating, but would shift to other sectors of the economy. The economic results demonstrate the contribution of boater spending to economic activity in the region and identify those sectors that benefit from it.

One of the online models allow users to estimate the economic impacts of power and sail boats registered in different counties and regions of Florida. The results from the model include: numbers of power and sail boats of various lengths registered in counties and regions, estimated number of boating days by boats of different type and size, amount their owners spend on boating trips (e.g., restaurants, lodging, auto and boat fuel) and annual craft-related spending (e.g., storage, repairs, accessories), as well as the direct and secondary effects including sales, jobs, income and value added. This model can be used to estimate the change in economic impacts associated with forecasted change in the number and type of registered power and sailboats in a county or region.

To estimate impacts of registered boats in counties and regions, the only information the online economic model user has to identify is a Florida county or one of 10 Florida regions. These ten regions are: 1) West Panhandle: Bay, Escambia, Holmes, Okaloosa, Santa Rosa, Walton, and Washington counties; 2) Central Panhandle: Calhoun, Franklin, Gadsden, Gulf, Jackson, Leon, Liberty, and Wakulla counties; 3) North Central: Alachua, Baker, Bradford, Citrus, Columbia, Dixie, Gilchrist, Hamilton, Hernando, Jefferson, Lafayette, Levy, Madison, Marion, Sumter, Suwannee, Taylor, and Union counties; 4) Northeast: Clay, Duval, Nassau, Putnam, and St. Johns counties; 5) South Inland: Desoto, Glades, Hardee, Hendry, Highlands, Okeechobee, Osceola, and Polk counties; 6) East Central: Brevard, Flagler, Lake, Orange, Seminole, Volusia counties; 7) Southeast: Indian River, Martin, Palm Beach, and St. Lucie counties; 8) West Central: Hillsborough, Pasco, and Pinellas counties; 9) Southwest: Charlotte, Collier, Lee, Manatee, and Sarasota counties; and 10) South: Broward, Miami-Dade, and Monroe counties. The numbers of registered boats in these counties and regions will be updated annually.

The results from this model for Palm Beach County in the Southeast Region are shown in Figure 3.46. There are about 36,000 boats registered to persons living in the county. These boats represent about 1.1 million boat days annually. Their owners spend about $191 million a year on boating trips and $308 million on annual craft upkeep and maintenance, payments, etc. This spending of $599 million supports 4,760 jobs in businesses that sell products and services directly to boaters, and also in businesses that supply products and services to businesses servicing boaters. This spending by boaters produces $459 million in sales and almost $165 million in wages and salaries. The results include the economic effects by different economic sectors.

Another online model can be used to estimate the economic impacts of existing and proposed marinas in Florida. The model estimates the trip (e.g., restaurants, lodging, auto and boat fuel) and annual craft-related spending (e.g., storage, repairs, accessories) of boats kept in seasonal slips and moorings, dry stack storage, and those kept in rented transient slips. The model produces estimates of boating days by the boats stored in a marina, trip and craft spending by the owners of the marina boats, and the associated direct and indirect economic impacts. The model can be used to estimate the spending and direct and indirect economic impacts of an entirely new marina, the loss of a marina or changes in the storage capacity (e.g., number and sizes of slips) of marinas. For example, if dredging of a recreational harbor is not maintained and a marina becomes inaccessible to larger sail and power boats or inaccessible completely, the model can be used to estimate the loss in boater spending and associated direct and secondary effects on the local economy.



Economic Significance of Boating in Palm Beach County

Table 1. Number of Registered Boats and Estimated Boat Days in Palm Beach County

Category	Boat Type and Size										Total
	Power <16'	Power 16' - 19'	Power 20' - 22'	Power 23' - 28'	Power 29' - 40'	Power 41'+	Sail <23'	Sail 23'+	PWC	Canoe/ Kayak	
Number of Boats	7,220	6,383	5,626	6,462	3,149	819	115	436	239	5,868	36,317
Average Boat Days	23	31	33	33	38	45	25	37	31	28	30
Total Boat Days	164,616	195,320	187,346	215,185	120,607	36,773	2,875	15,958	7,433	161,370	1,107,482

Table 2. Total Spending on Boat Trips by Boat Owners Registered in Palm Beach County

Category	Total ($ Thousands)	Percentage
Lodging	$18,502.2	11%
Marina Services	$7,803.9	5%
Restaurant	$23,494.5	14%
Groceries	$21,318.6	13%
Boat Fuel	$63,592.6	38%
Auto Fuel	$16,077.6	10%
Marine Supplies	$9,479.9	6%
Recreation & Entertainment	$5,054.4	3%
Shopping	$3,867.4	2%
Total	$169,191.1	100%

Table 3. Total Annual Craft Spending (not including purchases of boats) by Boat Owners Registered in Palm Beach County

Category	Total ($ Thousands)	Percentage
Slip	$28,957.0	9%
Loan Payments	$51,113.6	17%
Replacement Motors	$13,132.8	4%
Replacement Trailers	$3,441.4	1%
Insurance	$25,911.8	8%
Repairs	$64,838.5	21%
Accessories	$115,279.0	37%
Taxes	$5,770.0	2%
Total	$308,444.2	100%

Table 4. Economic Significance of Trip Spending and Annual Craft Spending by Boats Registered in Palm Beach County

	Trip Spending	Annual Craft Spending	Total
Direct Effects			
Sales ($ Thousands)	$95,219.1	$192,657.9	$287,877.0
Jobs	1,181.2	2,192.6	3,373.8
Labor Income ($ Thousands)	$34,304.9	$75,640.9	$109,945.8
Value Added ($ Thousands)	$58,470.3	$117,190.2	$175,660.5
Total Effects			
Sales ($ Thousands)	$152,687.4	$306,807.9	$459,495.3
Jobs	1,641.4	3,125.3	4,766.7
Labor Income ($ Thousands)	$49,040.5	$115,786.5	$164,827.0
Value Added ($ Thousands)	$93,563.8	$187,823.2	$281,387.1

Table 5. Economic Significance of Boats Registered in Palm Beach County

Sector/Spending Category	Sales ($ Thousands)	Jobs	Labor Income ($ Thousands)	Value Added ($ Thousands)
Direct Effects				
Lodging	$18,502.2	190.6	$6,824.6	$12,048.0
Marina Services	$36,760.9	376.4	$12,905.8	$22,949.1
Restaurant	$23,494.5	407.7	$8,644.7	$12,268.5
Recreation & Entertainment	$5,054.4	51.8	$1,774.5	$3,155.4
Repair & Maintenance	$64,838.5	810.3	$23,392.8	$30,550.1
Insurance & Credit	$29,234.2	201.7	$12,514.2	$24,278.1
Gas Service	$17,766.5	204.6	$5,526.4	$12,157.3
Other Retail Trade	$60,918.9	966.4	$26,923.4	$38,105.7
Wholesale Trade	$29,098.3	156.7	$11,030.5	$19,649.0
Other Local Production of Goods	$2,208.6	7.6	$408.9	$499.4
Total Direct Effects	$287,877.0	3,373.8	$109,945.8	$175,660.5
Secondary Effects	$171,618.3	1,392.9	$54,881.2	$105,726.6
Total Effects	$459,495.3	4,766.7	$164,827.0	$281,387.1

Figure 3.46: Economic significance of boating in Palm Beach County.

To generate marina economic impact estimates, model users need to provide: (1) some information about the type of marina; (2) the numbers of different type (e.g., sail, power) and size of boats stored in

the marina; (3) the number of transient rental nights if the marina rents transient slips; (4) the Florida county where the marina is located; and (5) whether the local area where the marina is located is a high, medium, or low spending area. A high spending area is one having many different spending opportunities (e.g., restaurants, entertainment, shopping) for boaters and above-average prices compared to other areas. A medium spending area is characterized as having average spending opportunities and prices, and a low spending area has a limited number of opportunities for boaters to spend money and below average prices.

If the model user has current and reliable information about spending and boating activity by boaters in a marina, the average spending profiles built into the model may be modified to fit a particular application. For example, the marina's actual slip or storage fees can be substituted for the average slip fees.

Figure 3.47 shows model inputs for a “made-up” marina located in Palm Beach County. The 100-slip marina includes 4 slips reserved for transient boats. The remainder slips are rented on a seasonal/annual basis. Most (79) of the slips are occupied by power boats 41’and longer and 10 slips are occupied by smaller power boats. Only 7 slips are occupied by sail boats, all 36’ and longer. The marina rented transient slips 1,000 nights to visiting power boats and 300 nights, to sailboats.

Figure 3.48 shows the extensive results that the model produces for this marina. They include the number of boating days; the average trip spending and annual craft spending by boats of different types and sizes stored at the marina; and the economic impacts of the spending by boats stored at the marina, and of trip spending by boats stored at the marina and transient boats. Spending by the owners of boats, both transient and seasonal/annual renters generate $4.8 million in sales, support 49 direct (35) and indirect (14) jobs and produce about $1.8 million in salaries and wages.

The third online economic model enables users to estimate the economic impacts of boating trips on which boats are trailered to launch sites. This is limited to power boats because they are the predominate type of boats launched from access/launch sites. The model produces information including, the average spending per launch, total annual trip spending by boaters who launch at a site, and the economic impacts of this annual trip spending. This model can estimate the economic effects of developing a new launch site, increasing the capacity (e.g., parking area, number of launch ramps, size of the ramps) of an existing launch site, or the loss or decreasing the capacity of an existing site.

To run the model, users need to enter information on: (1) the type of boat launch site (e.g., government for public use, private for public use), 2) the estimated number of launches annually, (3) the county where it is located, 4) whether the launch site is located in a high, medium, or low spending area, and (5) whether the site is used almost exclusively by locals, mostly by locals but some non-locals (tourists) use it too, or heavily by non-locals. Non-locals are more likely to launch their boats while on overnight trips, and overnight trips are characterized by higher and different spending patterns.

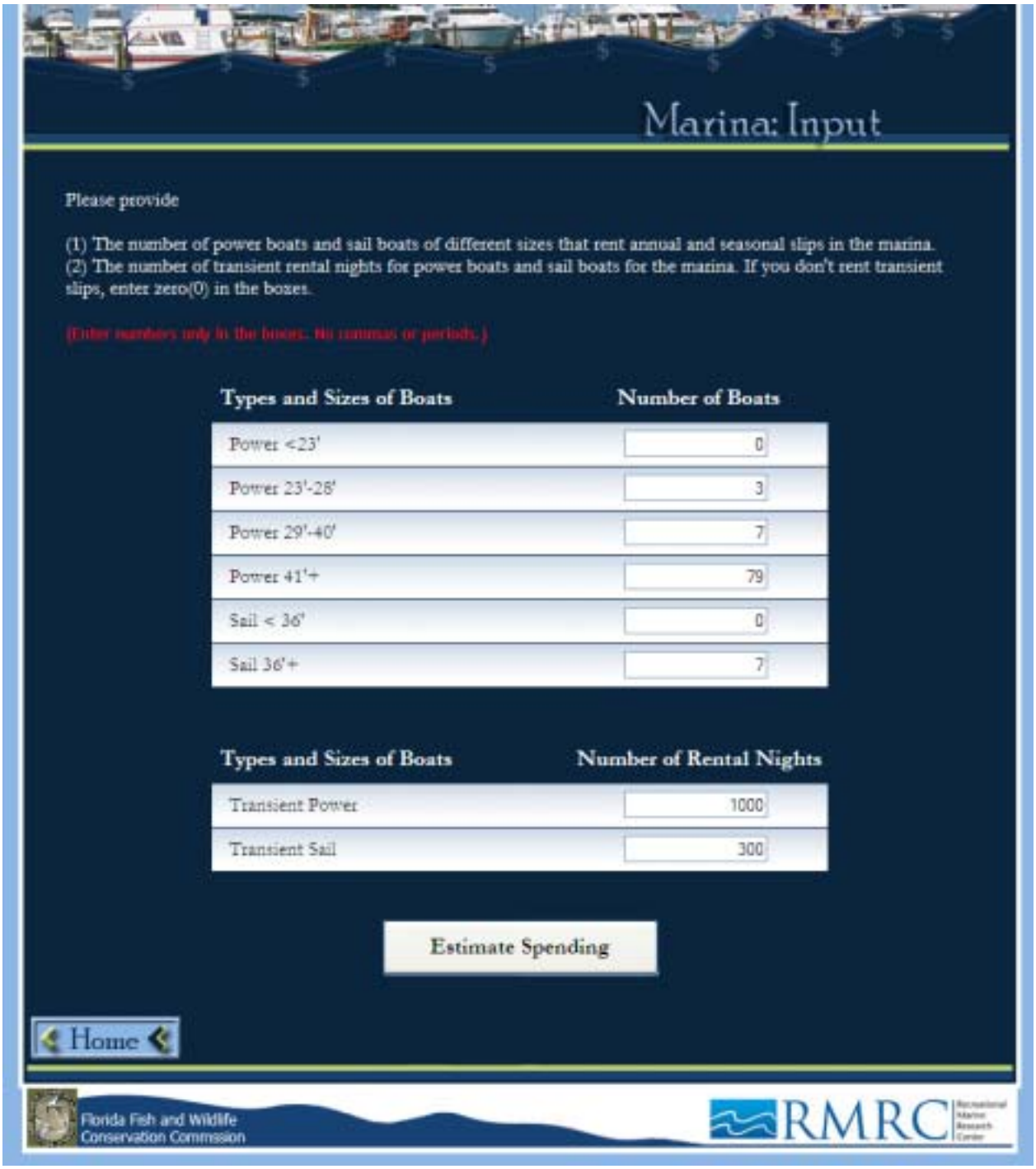


Figure 3.47: Model inputs for a "made-up" marina in Palm Beach County.

Economic Impact Report

Marina Information

Marina Name	Palm Beach Marina
Type of Marina	Privately-owned / Commercial Marina
Type of Slips	Seasonal, Annual, or Condominium Slips and Transient Slip Rentals
County	PALM BEACH
Spending Area	High Spending Area

Inputs to the Model

Table 1 - Number of Different Type and Size Boats Kept at the Marina

Boat Type and Size	Number of Boats	Average Days per Boat	Total Marina Boat Days
Power <23'	-	27	-
Power 23'-28'	3	29	87
Power 29'-40'	7	21	147
Power 41'+	79	15	1,185
Sail <36'	-	24	-
Sail 36'+	7	15	105
Transient Power	1,000	-	1,000
Transient Sail	300	-	300
Total	1,396	-	2,824

Figure 3.48: Economic impact of a “made-up” marina in Palm Beach County.

Spending Profiles by Boats Kept at the Marina

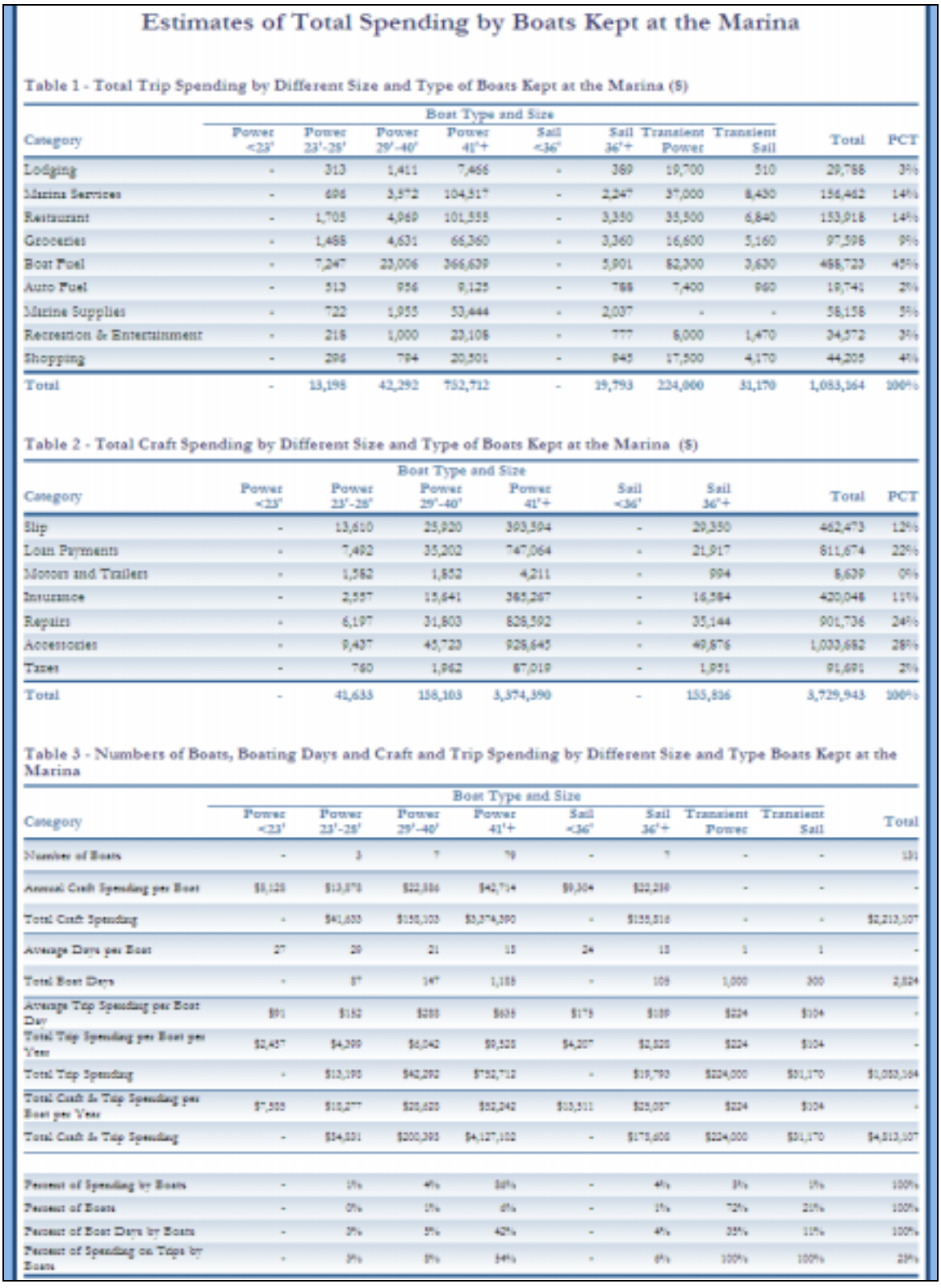
Table 1 - Average Spending on Boat Trip by Boats Kept at the Marina ($ per Boat Day)

Category	Boat Type and Size							
	Power <23'	Power 23'-28'	Power 29'-40'	Power 41'+	Sail <36'	Sail 36'+	Transient Power	Transient Sail
Lodging	8.1	3.6	9.6	6.3	1.8	3.7	19.7	1.7
Marina Services	2.1	8.0	24.3	88.2	35.6	21.4	37.0	28.1
Restaurant	13.4	19.6	33.8	85.7	38.0	31.9	35.5	22.8
Groceries	10.2	17.1	31.5	56.0	31.3	32.0	16.6	17.2
Boat Fuel	35.5	83.3	156.5	309.4	16.6	56.2	82.3	12.1
Auto Fuel	8.6	5.9	6.5	7.7	7.1	7.5	7.4	3.2
Marine Supplies	7.6	8.3	13.3	45.1	30.2	19.4	-	-
Recreation & Entertainment	3.2	2.5	6.8	19.5	8.3	7.4	8.0	4.9
Shopping	2.3	3.4	5.4	17.3	6.4	9.0	17.5	13.9
Total	91	152	288	635	175	189	224	104

Table 2 - Average Annual Craft Spending by Boats Kept at the Marina ($ per Boat per Year)

Category	Boat Type and Size					
	Power <23'	Power 23'-28'	Power 29'-40'	Power 41'+	Sail <36'	Sail 36'+
Slip	1,420.3	4,536.7	3,702.8	4,982.2	2,537.8	4,192.8
Loan Payments	583.9	2,497.2	5,028.9	9,456.5	338.9	3,131.0
Motors and Trailers	239.3	527.3	264.6	53.3	75.5	142.0
Insurance	321.1	852.2	2,234.4	4,876.8	779.7	2,369.1
Repairs	571.0	2,065.6	4,543.3	10,488.5	2,059.9	5,020.6
Accessories	1,935.8	3,145.6	6,531.9	11,755.0	3,441.1	7,125.2
Taxes	56.6	253.2	280.3	1,101.5	70.7	278.7
Total	5,128	13,878	22,586	42,714	9,304	22,259

Figure 3.48: Economic impact of a “made-up” marina in Palm Beach County (continued).



Estimates of Total Spending by Boats Kept at the Marina

Table 1 - Total Trip Spending by Different Size and Type of Boats Kept at the Marina ($)

	Boat Type and Size									
Category	Power <23'	Power 23'-28'	Power 29'-40'	Power 41'+	Sail <36'	Sail 36'+	Transient Power	Transient Sail	Total	PCT
Lodging	-	313	1,411	7,466	-	389	19,700	510	29,788	3%
Marina Services	-	696	3,572	104,317	-	2,247	37,000	8,430	156,462	14%
Restaurant	-	1,705	4,969	101,555	-	3,350	35,500	6,840	153,918	14%
Groceries	-	1,488	4,631	66,360	-	3,360	16,600	5,160	97,598	9%
Boat Fuel	-	7,247	23,006	366,639	-	5,901	82,000	3,630	488,723	45%
Auto Fuel	-	513	956	9,125	-	788	7,400	960	19,741	2%
Marine Supplies	-	722	1,955	53,444	-	2,037	-	-	58,158	5%
Recreation & Entertainment	-	218	1,000	23,108	-	777	8,000	1,470	34,572	3%
Shopping	-	296	794	20,501	-	945	17,500	4,170	44,205	4%
Total	-	13,198	42,292	752,712	-	19,793	224,000	31,170	1,083,164	100%

Table 2 - Total Craft Spending by Different Size and Type of Boats Kept at the Marina ($)

	Boat Type and Size							
Category	Power <23'	Power 23'-28'	Power 29'-40'	Power 41'+	Sail <36'	Sail 36'+	Total	PCT
Slip	-	13,610	25,920	393,594	-	29,350	462,473	12%
Loan Payments	-	7,492	35,202	747,064	-	21,917	811,674	22%
Motors and Trailers	-	1,582	1,852	4,211	-	994	8,639	0%
Insurance	-	2,557	15,641	385,267	-	16,584	420,048	11%
Repairs	-	6,197	31,803	828,592	-	35,144	901,736	24%
Accessories	-	9,437	45,720	928,645	-	49,876	1,033,682	28%
Taxes	-	760	1,962	87,019	-	1,951	91,691	2%
Total	-	41,633	158,103	3,374,390	-	155,836	3,729,943	100%

Table 3 - Numbers of Boats, Boating Days and Craft and Trip Spending by Different Size and Type Boats Kept at the Marina

	Boat Type and Size								
Category	Power <23'	Power 23'-28'	Power 29'-40'	Power 41'+	Sail <36'	Sail 36'+	Transient Power	Transient Sail	Total
Number of Boats	-	3	7	79	-	7	-	-	131
Annual Craft Spending per Boat	$8,128	$13,878	$22,586	$42,714	$9,304	$22,269	-	-	-
Total Craft Spending	-	$41,633	$158,103	$3,374,390	-	$155,836	-	-	$2,212,107
Average Days per Boat	27	20	21	13	24	15	1	1	-
Total Boat Days	-	57	147	1,188	-	109	1,000	300	2,824
Average Trip Spending per Boat Day	$91	$152	$288	$635	$179	$189	$224	$104	-
Total Trip Spending per Boat per Year	$2,457	$4,299	$6,042	$9,528	$4,207	$2,828	$224	$104	-
Total Trip Spending	-	$13,198	$42,292	$752,712	-	$19,793	$224,000	$31,170	$1,083,164
Total Craft & Trip Spending per Boat per Year	$7,585	$18,177	$28,628	$52,242	$13,511	$25,097	$224	$104	-
Total Craft & Trip Spending	-	$54,831	$200,395	$4,127,102	-	$175,630	$224,000	$31,170	$4,813,107
Percent of Spending by Boats	-	1%	4%	86%	-	4%	5%	1%	100%
Percent of Boats	-	2%	5%	60%	-	5%	72%	24%	100%
Percent of Boat Days by Boats	-	2%	5%	42%	-	4%	35%	11%	100%
Percent of Spending on Trips by Boats	-	1%	4%	34%	-	1%	100%	100%	23%

Figure 3.48: Economic impact of a "made-up" marina in Palm Beach County (continued).

Economic Impact of Boats Kept at the Marina

Table 1 - Economic Impacts of Trip Spending by Boats Kept at the Marina

Sector/Spending category	Sales ($ thousand)	Jobs	Labor Income ($ thousand)	Value Added ($ thousand)
Direct Effects				
Lodging	29.8	0.3	11.0	19.4
Marina Services	156.5	1.6	54.8	97.0
Restaurant	153.9	2.7	56.9	80.0
Recreation & Entertainment	34.6	0.4	12.1	21.4
Grocery Stores*	24.7	0.4	10.9	15.6
Gas Service Stations*	113.4	1.3	35.2	77.1
Sporting Goods / Equipment Retail Margins	24.2	0.4	10.6	15.7
Other Retail Trade*	15.2	0.2	6.7	9.4
Wholesale Trade*	62.7	0.3	23.8	42.6
Local Production of Goods	8.7	0.0	1.5	1.7
Total Direct Effects	623.6	7.7	223.4	380.0
Secondary Effects	374.8	3.0	99.7	231.3
Total Effects	998.4	10.8	323.1	611.3

* Retail Margins on Sales

Table 2 - Economic Impacts of Craft Spending by Boats Kept at the Marina

Sector/Spending category	Sales ($ thousand)	Jobs	Labor Income ($ thousand)	Value Added ($ thousand)
Direct Effects				
Boat Manufacture	-	-	-	-
Slip	462.5	4.7	161.9	286.7
Repairs	901.7	11.3	324.6	423.8
Insurance	420.0	3.0	180.6	357.0
Credit Intermediacies	52.8	0.3	22.7	34.3
Retail Margins	415.6	6.7	182.9	257.8
Wholesale Trade	156.9	0.8	59.6	106.7
Manufacturer (Motors, Trailers & Accessories)	4.5	0.0	1.7	2.0
Total Direct Effects	2,414.1	26.8	934.1	1,468.4
Secondary Effects	1,396.0	11.4	488.7	869.2
Total Effects	3,810.1	38.3	1,422.8	2,337.9

Figure 3.48: Economic impact of a “made-up” marina in Palm Beach County (continued).

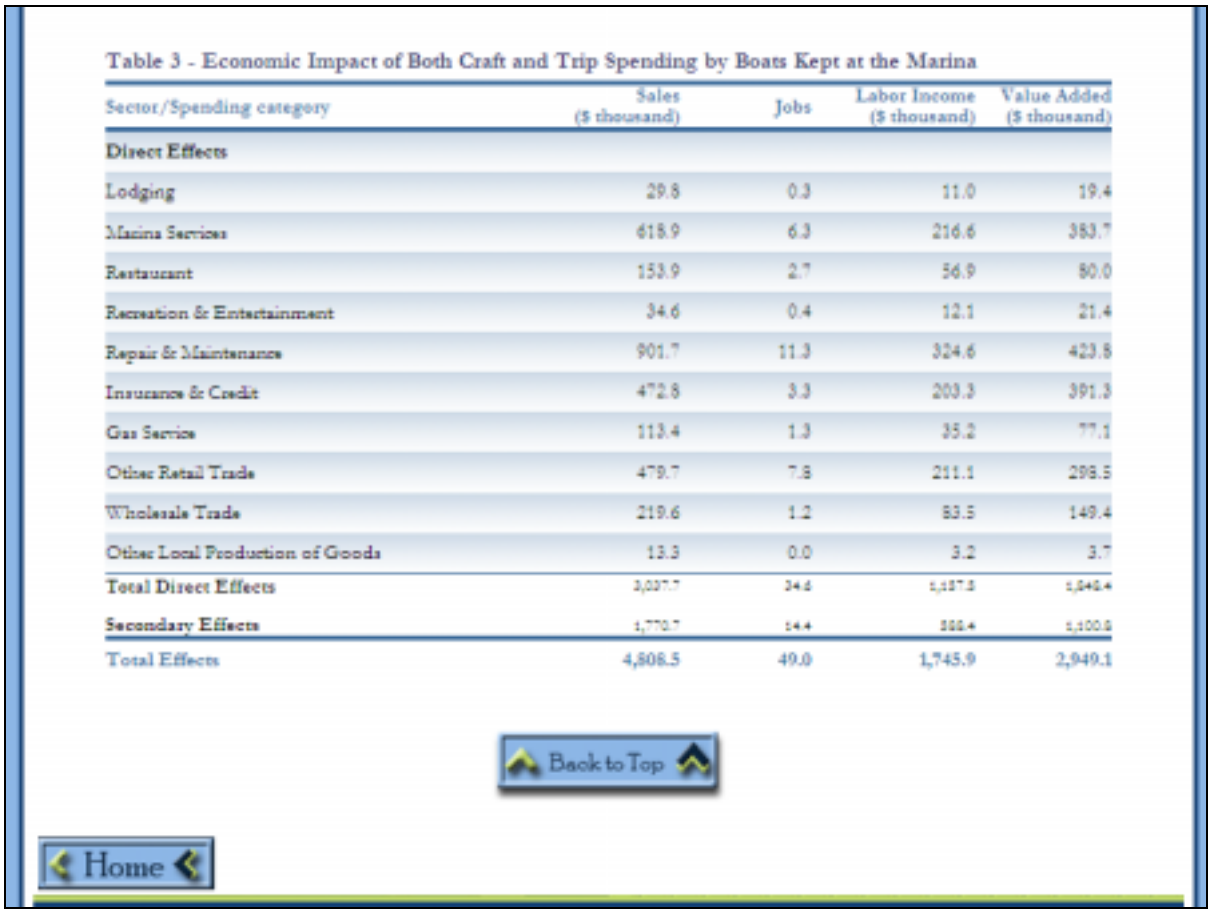


Table 3 - Economic Impact of Both Craft and Trip Spending by Boats Kept at the Marina

Sector/Spending category	Sales ($ thousand)	Jobs	Labor Income ($ thousand)	Value Added ($ thousand)
Direct Effects				
Lodging	29.8	0.3	11.0	19.4
Marina Services	618.9	6.3	216.6	383.7
Restaurant	153.9	2.7	56.9	80.0
Recreation & Entertainment	34.6	0.4	12.1	21.4
Repair & Maintenance	901.7	11.3	324.6	423.8
Insurance & Credit	472.8	3.3	203.3	391.3
Gas Service	113.4	1.3	35.2	77.1
Other Retail Trade	479.7	7.8	211.1	298.5
Wholesale Trade	219.6	1.2	83.5	149.4
Other Local Production of Goods	13.3	0.0	3.2	3.7
Total Direct Effects	3,037.7	34.4	1,157.5	1,848.4
Secondary Effects	1,770.7	14.4	588.4	1,100.8
Total Effects	4,808.5	49.0	1,745.9	2,949.1

Back to Top

Home

Figure 3.48: Economic impact of a “made-up” marina in Palm Beach County (continued).

Figure 3.49 shows the input for a “made up” boat launch located in Palm Beach County. In this case, the launch site is operated by the county government, is located in a high spending area and 50% of the launches are by persons residing out of the county (tourists). There are 29,100 launches annually from the site including, an average of 150 on Friday, Saturday and Sunday throughout the year and an average of 50 for midweek days. Figure 3.50 shows how the results from the economic model are presented. It is estimated that the owners of boats launched at the site spend $3.64 million including about $1 million in lodging and $421,000 at restaurants. This spending supports 29 jobs in businesses that sell products and services to these boaters and another 11 jobs in businesses that sell products and services to businesses serving boaters. The total sales impact of the launch site is $3.85 million.

The models will be estimated using consumer price indexes in 2010 and 2011. Then a new survey will need to be undertaken to again collect trip spending and craft spending.

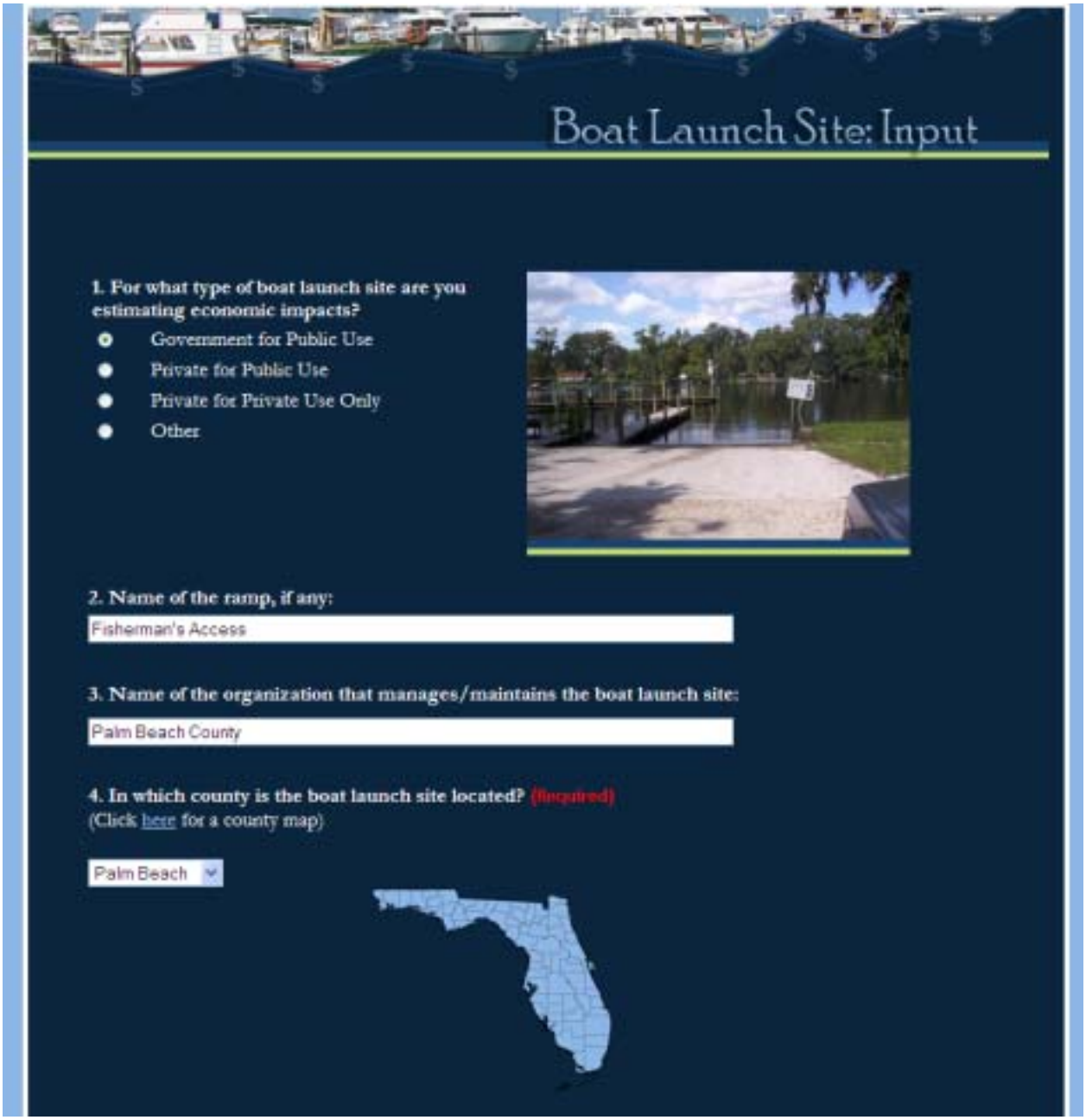


Figure 3.49: Input for a "made-up" boat launch in Palm Beach County.

Figure 3.49: Input for a "made-up" boat launch in Palm Beach County (continued).

Economic Impact Report

The Input and Results of Launch Site Economic Impact Estimates

Table 1 - Model Input

Launch Site Name	Fisherman's Access
Type of Launch Site	Government for Public Use
County	PALM BEACH
Spending Area	Medium Spending Area
Local vs. Tourists	Heavily tourist (50% local, 50% tourist)
Estimated Number of Launches per Year	29120

Table 2 - Spending on Boat Trip by Boats Launched at This Launch Site ($)

Category	Average Spending per Launch	Total Spending per Year at This Site
Lodging	34.6	1,006,678
Marina Services	3.2	92,310
Restaurant	17.1	499,117
Groceries	14.5	420,784
Boat Fuel	25.8	751,878
Auto Fuel	16.8	490,381
Marine Supplies	6.8	197,142
Recreation & Entertainment	2.4	71,053
Shopping	3.9	114,733
Total	125	3,644,077

Figure 3.50: Output for a “made-up” boat launch in Palm Beach County.

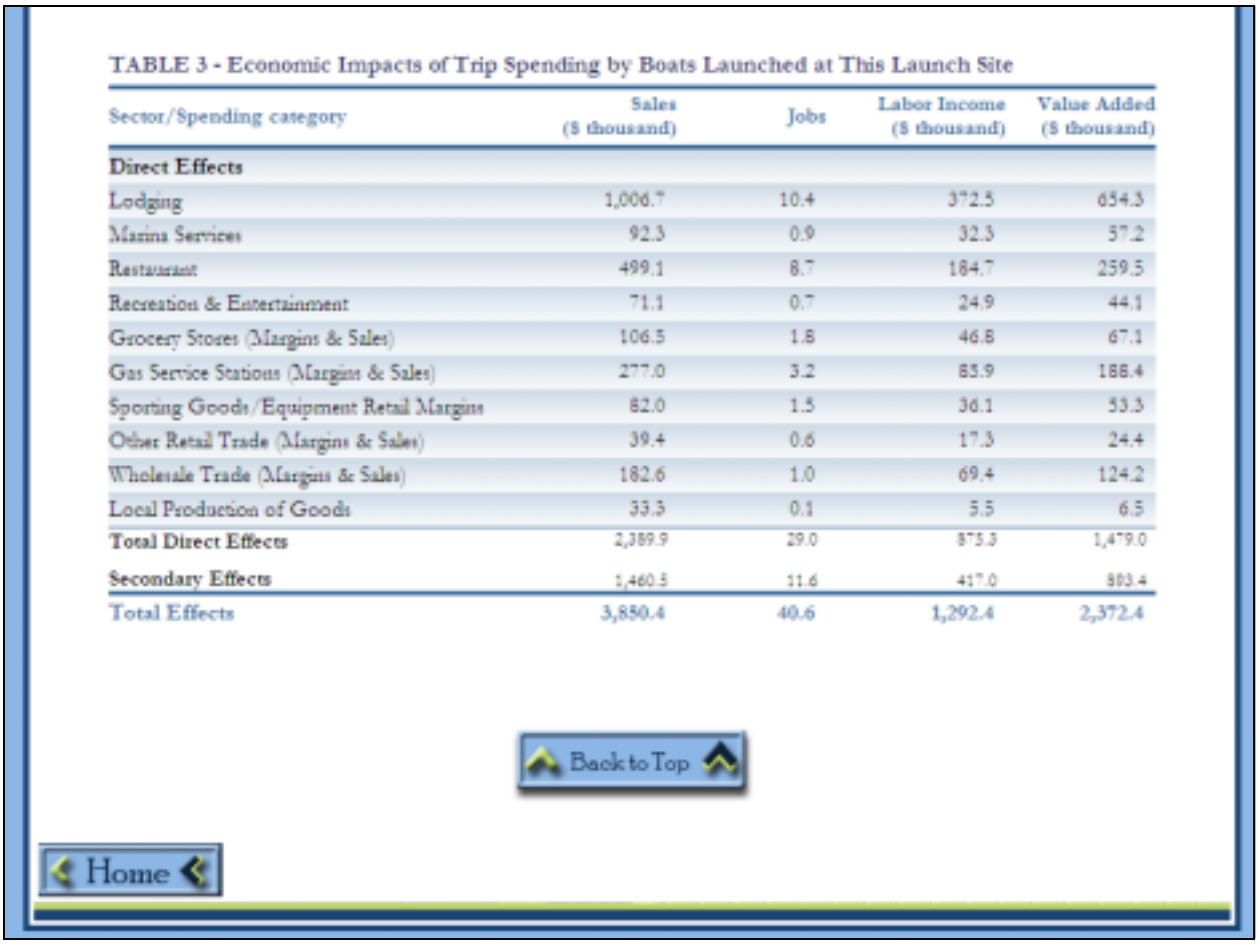


TABLE 3 - Economic Impacts of Trip Spending by Boats Launched at This Launch Site

Sector/Spending category	Sales ($ thousand)	Jobs	Labor Income ($ thousand)	Value Added ($ thousand)
Direct Effects				
Lodging	1,006.7	10.4	372.5	654.3
Marina Services	92.3	0.9	32.3	57.2
Restaurant	499.1	8.7	184.7	259.5
Recreation & Entertainment	71.1	0.7	24.9	44.1
Grocery Stores (Margins & Sales)	106.5	1.8	46.8	67.1
Gas Service Stations (Margins & Sales)	277.0	3.2	85.9	188.4
Sporting Goods/Equipment Retail Margins	82.0	1.5	36.1	53.3
Other Retail Trade (Margins & Sales)	39.4	0.6	17.3	24.4
Wholesale Trade (Margins & Sales)	182.6	1.0	69.4	124.2
Local Production of Goods	33.3	0.1	5.5	6.5
Total Direct Effects	2,389.9	29.0	875.3	1,479.0
Secondary Effects	1,460.5	11.6	417.0	893.4
Total Effects	3,850.4	40.6	1,292.4	2,372.4

Figure 3.50: Output for a “made-up” boat launch in Palm Beach County (continued).

3.4 ECONOMIC VALUE

3.4.1 Overview

Florida contains a variety of boating infrastructure, including boat ramps that are open to the public. These boat ramps provide economic benefits to boaters that use them to access Florida’s waters. These economic benefits accrue to the boater’s themselves, in the form of increased well-being and satisfaction from boating, and these benefits are above and beyond the direct costs of boating. Economists refer to such benefits as economic surplus. These benefits form the basis for benefit-cost analyses that are conducted in accordance with the norms of economic science. In this report, we present the results and application of models capable of estimating such benefits.

The economic models developed here are models of the demand for access to boating sites and are suitable for valuing access as well as the characteristics of boating sites. The methods use Random Utility Models (RUMs) as the basis of the economic demand models. RUMs use data on individual trips and statistical techniques to explain boaters' site choices and to relate these choices to the costs and characteristics of alternative boating sites (Morey, 1999). Boaters’ optimizing choices reveal their relative preferences for site characteristics and travel costs, i.e., the boaters' willingness to trade costs (or money) for site characteristics. Through this linkage, RUMs can value changes in site characteristics such as capacity.

3.4.2 Background

Recreational behavior based on boating may be termed a non-market or public good because, boat launch fees aside, there is no direct charge to recreational boaters for access to Florida's waters. Yet, boating is not without costs, sometimes substantial: the purchase of a boat, licensing and registration, operation and maintenance costs, the costs of mooring the boat or of travel to the site, and the opportunity cost of time, to name some of the more obvious. Costs related to travel can be used to estimate the demand for recreational boating and evaluate the potential changes in welfare resulting from proposed polices.

This project addresses the Fish and Wildlife Conservation Commission's objective of developing an integrated system of "…economic models necessary to predict the marginal social benefits of adding or reconstructing boating access facilities", by developing a series of individual-based random utility models (RUM) of consumer choice. Marginal social benefit (or marginal economic value) refers to the *change* in the social benefits provided by access to boating sites that is due to a change in either the characteristics of boating sites or access to boating sites. RUMs are state-of-the-art economic tools that are designed to measure the welfare implications of policy decisions that affect the provision and quality of public goods and services. They have been successfully employed by decision makers throughout the United States and Florida to measure the marginal economic value from policy changes for a wide variety of public goods and services (Milon, 1988; Bockstael, McConnell, and Strand, 1989; Morey, Rowe, and Watson. 1993; Greene, Moss, and Spreen, 1997; Thomas and Stratis, 2002).

When estimating a model of demand for public goods such as boat ramps, anchorages and beaches, the RUM approach is particularly well suited when there are many identifiable substitutes from which to choose. In the mid-1990's, the Florida Department of Environmental Protection (FDEP) successfully used a RUM to estimate the recreational value that was lost to beach visitors following the 1993 Tampa Bay oil spill (Tomasi and Thomas, 1998). Bockstael, Hanemann, and Strand (1989); Milon (1988); Morey, Rowe, and Watson (1993), Greene, Moss, and Spreen (1997) Chen, Lupi and Hoehn (1999), and Lupi, Hoehn and Christie (2003) have applied RUMs to estimate marginal changes in welfare resulting from perturbations in recreational fishing and boating. More recently, FWC has used a RUM to evaluate the welfare lost to boaters from policies designed to protect the West Indian manatee in Lee County (restricted boating speeds and waterway access) and later they extended their modeling efforts to Brevard County in 2003 (Thomas and Stratis, 2002; FWC, 2003).

3.4.3 Random Utility Model

In our application, it is assumed that a boater will choose a combination of a launch ramp and water destination among many possible alternatives each time he wants to make a trip. The factors that affect his choice include the cost of traveling to the ramp and the cost of boating to the water destination, and the characteristics of the ramp and water site. We can model the individual's conditional indirect utility from site j as a linear function of trip costs and site characteristics given by tc_j and q_j.

$$v_j = \beta_{tc} tc_j + \beta_q q_j + \varepsilon_j \qquad [1]$$

where tc_j is the cost of traveling to the site j, q_j is a vector of the site j characteristics, ε_j is a random error term accounting for factors that remain unobservable for the researchers, and the βs are parameters. The absolute value of the travel cost parameter β_{tc} is hypothesized to be negative and serves as a measure of the marginal utility of income. The elements of vector β_q are the marginal utilities of site characteristics and are expected to be positive if the characteristics are desirable and

negative if undesirable. Following RUM theory, a person is assumed to select the site with highest utility. Thus, the probability of an individual choosing site i is given by

$$\Pr(\beta_{tc} tc_i + \beta_q q_i + \varepsilon_i > \beta_{tc} tc_j + \beta_q q_j + \varepsilon_j) \qquad \text{for all } i \neq j \qquad [2]$$

Assuming the random errors to be independently identically distributed type l extreme value distributed, the equation [2] can be estimated by a conditional logit model. In our case we expect that the errors associated with the water destinations are more correlated with one another than they are with ramp error terms, so we adopt a nested logit model in which the water destination sites are nested below ramp sites. Also, we expect that ramps within a county may be better substitutes for one another than ramps across counties. Further, we expect that ramps with marine access are closer substitutes to other marine ramps than they are to freshwater ramps. Likewise, we expect the converse to hold true for freshwater ramps. Although the decision between freshwater versus marine ramp and water site are assumed to be made simultaneously, this multi-level nesting structure is akin to an individual choosing type of water access and then a ramp and then choosing the water site conditional upon the selected ramp (Figure 3.51).

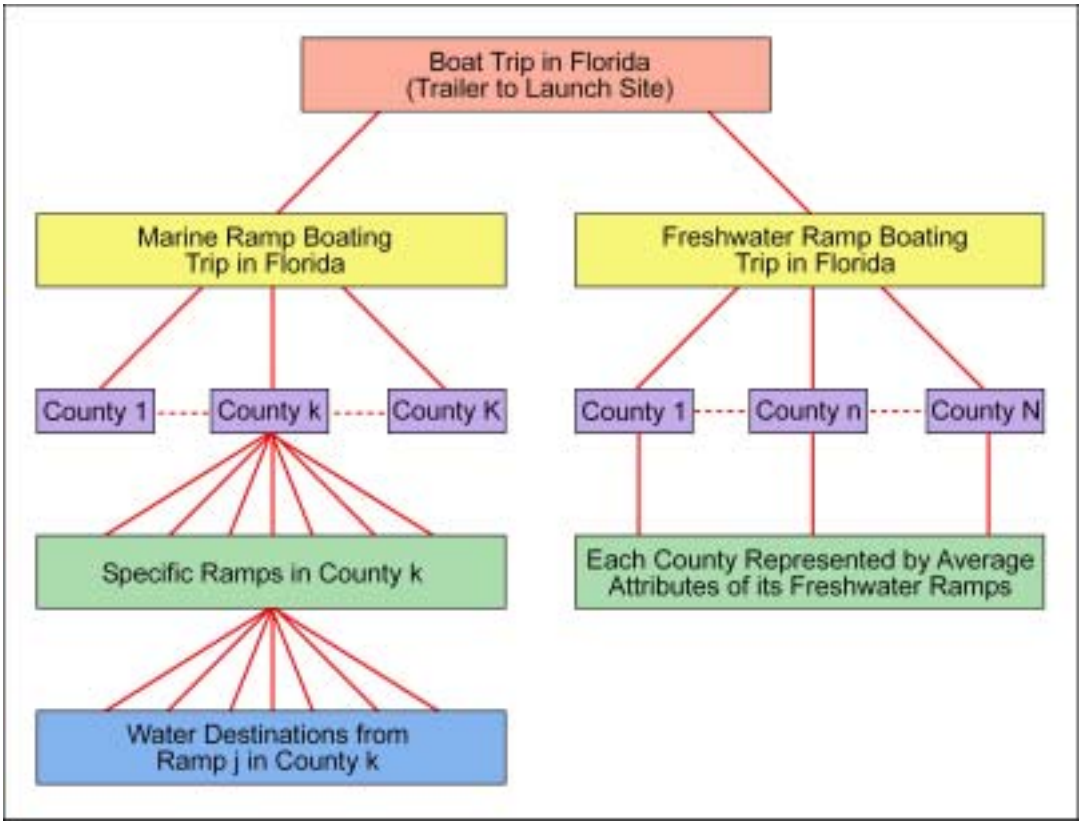


Figure 3.51: Illustration of Multi-Level Nested Logit Model Structure.

Figure 3.51 depicts the nesting structure for the nested-logit RUM for boating trips that trailer a boat to a publically accessible launch site in Florida. For boaters that use publically accessible ramps, the figure depicts the choice structure being modeled for boats that are trailered and launched from a specific ramp along with the subsequent water site choice where applicable. For trips that accessed a marine ramp (the majority of those reported in the survey), the data are sufficient to model the choices at a very high level of spatial detail, yet do so for the entire state. Specifically, boaters are posited to choose a combination of a marine ramp and water site destination and these combinations are nested with

counties. The nesting structure allows for the possibilities that ramps nearby one another (in the same county) are closer substitutes for one another than are ramps further away. For freshwater choices, the available data allow us to model choices of ramps aggregated at the county level.

To illustrate the choice probabilities for the nested RUMs, we start with the probabilities for a two level nest. The formulations and logic easily extend to any additional levels of nesting as well. Let k represent ramps and j represent the on-the- water sites. A water destination from a ramp is represented by combination of (j, k). The equations can be rewritten as

$$v_{jk} = \beta_{tc} tc_{jk} + \beta q_{jk} + \varepsilon_{jk} \qquad [3]$$

$$\Pr(\beta_{tc} tc_{il} + \beta_q q_{il} + \varepsilon_{il} > \beta_{tc} tc_{jk} + \beta_q q_{jk} + \varepsilon_{jk}) \quad \text{for all } i \neq j \text{ and } l \neq k \qquad [4]$$

Let Pr(j, k) be the probability of choosing site (j, k) from among all feasible combinations, that is the probability that indirect utility from site (j, k) exceeds the indirect utility from any other site. Assuming error terms ε_{jk} is distributed as generalized extreme value, then following Haab and McConnell (2002), the probability of choosing site (j, k) is

$$\Pr(j,k) = \frac{\exp(v_{jk})[\sum_{j=1}^{J_k} \exp(v_{jk})]^{\theta_k - 1}}{\sum_{k=1}^{K} [\sum_{j=1}^{J_k} \exp(v_{jk})]^{\theta_k}} \qquad [5]$$

where $\theta_k \ \forall k$ are nested logit distributional parameters to be estimated. To clarify our estimation approach, write Pr(j, k) as the product of the conditional probability of choosing site j, given ramp k, Pr(j|k), times the marginal probability of choosing ramp k, Pr(k). That is,

$$\Pr(j,k) = \Pr(j \mid k) \Pr(k) = \frac{\exp(v_{jk})}{\sum_{j=1}^{J_k} \exp(v_{jk})} * \frac{\sum_{k=1}^{J_k} \exp(v_{jk})}{\sum_{k=1}^{K} \sum_{j=1}^{J_k} \exp(v_{jk})} \qquad [6]$$

where Pr(j|k) and Pr(k) are given by

$$\Pr(j \mid k) = \frac{\exp(v_{jk})}{\sum_{j=1}^{J_k} \exp(v_{jk})} \qquad \text{and} \qquad [7]$$

$$\Pr(k) = \frac{\sum_{k=1}^{J_k} \exp(v_{jk})}{\sum_{k=1}^{K} \sum_{j=1}^{J_k} \exp(v_{jk})} \qquad [8]$$

A common expression for Pr(*k*) is

$$\Pr(k) = \frac{\exp(\theta_k IV_k)}{\sum_{k=1}^{K} \exp(\theta_k IV_k)} \qquad [9]$$

where $IV_k = \ln(\sum_{j=1}^{J_k} \exp(v_{jk}))$ is known as the inclusive value for nest *k* and θ_k is the inclusive value parameter. Note too that if the utility function contains characteristics that do not vary across water sites but do vary across ramps, we can re-write equation [9] as

$$P_{ijk} = \exp(\beta Z_k + \theta IV_{j|k}) / \sum_{k}^{n} \exp(\beta Z_k + \theta IV_{j|k}) \qquad [10]$$

Note that the two choice probabilities take the conditional logit form. A consistent estimation strategy for nested logit is to estimate two conditional logits, linked by the lower level inclusive value index. We present the sequentially estimated model below with the lower part corresponding to water site choices conditional on a marine ramp and the second part corresponding to the marine ramp choices as a function of the inclusive value of the water sites available from each ramp. Upper level choices are then made for the marine or freshwater ramp selection conditional on the quality of the ramps available from each county.

The resulting estimated model can be used for policy analysis. The measure of welfare change (benefits or damages) follows the earlier work of Small and Rosen (1982) and Morey (1999). The post-policy welfare can then be calculated as equivalent variation. For a policy that adds a site,

$$EV = -\frac{1}{\beta_1}\left[\ln\sum_{k=1}^{n+1} e^{V_{post\ policyy}} - \ln\sum_{k=1}^{n} e^{V_{prepolicyy}}\right] \qquad [11]$$

where $V_{prepolicy}$ is the utility derived from the pre-policy, the current status quo, with n sites available, and $V_{postpolicy}$ is the utility derived from the addition of one site and β_1 is the parameter for travel cost that represents the marginal value of money. The welfare measure is computed in nested models by subsuming the lower level IV's in the indirect utilities shown in [11] and adjusting the summation accordingly. In [11], any change in site characteristics can easily be accommodated by modifying the calculation of the pre-policy and post policy utilities. Similarly, values for the removal or loss of access for one or more sites can be computed by adjusting the summation of sites to include in the choice set. Thus, variants of this welfare measure are suitable for the estimation of the benefits of changes in any of the site attributes or can even be used to evaluate the addition or removal of a site (e.g., what happens when a ramp is closed).

3.4.4 Estimation Results

The first step in estimating the choice model is to define those ramps that are available to the boating public. Ramps that are closed to public access are excluded from the analysis. Next, the juxtaposition of ramps to one another was considered. When choosing an access point, boaters likely consider ramps in close proximity to one another as members of a larger group or aggregate. For example, if the parking lot of one site is full, the boater could easily move along to the nearby neighboring ramp with no significant increase in travel time or cost. Nearby ramps should be lumped together to capture this choice behavior, therefore ramps within 1.5 road miles of each other were grouped and considered single aggregated facilities. For most counties, the vast majority of ramps are not grouped together.

With the ramps selected, the next step in preparing the data involved identifying on-the-water destination sites. FWC constructed a statewide GIS grid overlay comprised of 73,485 cells equal to one-minute of latitude by one-minute of longitude. Each grid cell contained at least 30 variables representing cell attributes including: the presence or absence of salt and/or freshwater; natural and/or artificial reefs; seagrass; navigational aids; manatee protection status and marine protection/conservation status. Information also included bathymetry data and lake acreage among other variables. The one-minute grid cells were aggregated into 12 cell polygons and cell attributes were statistically averaged for each polygon. In the boating survey, boaters were asked to identify their on-the-water destination using a geo-referenced mapping system. Their choice was then linked to the correct polygon with its aggregated site attributes. To avoid long distance trips, those clearly beyond a "normal" day trip, a 10% distance trim was employed. In the data the average number of water sites available from a ramp was about 20 with a maximum of 99.

Statewide there were 26,771 trip-level responses during the 12 month sampling period. Of this number, 6,690 (25%) reportedly used a boat ramp during their trip. Some of these trips used private access (not valid for a public access model) and others failed to select an inventoried and validated boat ramp so were removed from the analysis. After accounting for missing data, a total of 3,442 observations were available for the water site choice level conditional on using a marine ramp and for the marine ramp choice model. For freshwater ramps trips a total of 1,061 site choice observations were available.

On-the-water Destination Choices

For marine ramps, we modeled the choice of water site destination that was visited by the boater among the possible water sites available from the ramp from which they launched. The set of available water sites differs depending on the ramp that was visited. The sites in the water choice level are the grid groups as mentioned above. The water sites are characterized by a set of variables that describe the attributes of the water sites. These include features such as whether or not there are navigation aids or marine protected areas in the grid. Each water site is also characterized by the boating travel cost of accessing the site from a particular ramp. The on-the-water boating travel cost variable is computed as in the Lee County study and is a function of the size of the boat.

Table 3.46 presents results from the estimation of the water site choice RUMs. The parameters associated with the attributes of the water sites were separated depending on whether a water site is accessed from a ramp on the East or West part of the state. This interaction allows the water site attributes to have a different influence on water site selection within these two regions. We see from Table 3.46 that the cost of accessing a site matters. Moreover, the separation of parameters by the East and the West was also significant. The attribute indicating the presence of navigation aids in a grid has a significant and positive effect on site choice in both regions, though somewhat more so in the East. For the presence of seagrass in a grid, positive effects are seen in both regions with the larger effect in the West. The presence of seagrass is significant at the 5% level in both regions, but is not significant in the East at levels below 1.8%. In both regions, artificial reefs had significant and positive effects on water site choices. For the mean depth of the grid, there was not a significant effect in the East, but there was a significant and positive effect of increased depth in the West. For the distance a water grid is to the nearest ramp (a possible safety concern), no significant effect was found in the West, but in the East, water sites closer to some ramp were more likely to be chosen. The presence of marine protected areas within a grid had a similar positive and significant effect on water site selection in both regions.

Table 3.46: Random Utility Model estimates for choice of water sites available from ramps with marine access.

Variable (Water Site Characteristic)	Estimated Parameter	t-stat.	p-value
Travel cost	-0.43361	-45.038	<0.0001
Eastern Coast Water Sites			
Navigation aids in grid	1.30452	7.693	<0.0001
Artificial reef in grid	2.97058	13.172	<0.0001
Marine protected or conservation zone in grid	0.6401	4.584	<0.0001
Manatee zone in grid	0.16093	1.259	0.2081
Seagrass present in grid	0.38875	2.365	0.0181
Mean depth	-0.00053	-0.56	0.5755
Nearest ramp distance	0.13095	11.439	<0.0001
Western Coast Water Sites			
Navigation aids in grid	1.08031	7.915	<0.0001
Artificial reef in grid	2.63699	7.248	<0.0001
Marine protected or conservation zone in grid	0.61504	6.205	<0.0001
Manatee zone in grid	-0.34115	-2.286	0.0223
Seagrass present in grid	0.58785	5.217	<0.0001
Mean depth	0.01424	4.482	<0.0001
Nearest ramp distance	0.00951	0.745	0.4562

N = 3442

LogL = -10,445

Model p-value<0.0001

McFadden R2 = 0.3396

Avg. of 20 water sites per ramp; Max of 99.

Marine Ramp Launch Destination Choices

Table 3.47 presents estimation results for the effect that various ramp characteristics have on the likelihood of a ramp being selected. Again, distinctions were made between the preference parameters depending on whether a ramp was on the East or West side of the state. The IV is the inclusive value index for the water site choices available from the ramp. The IV for water sites will vary for all ramp sites because the set of available water sites and their costs of access differ by location. In essence, the IV for water sites gives the relative utility that a set of water sites offers conditional upon launching from a particular ramp. Thus, the sign on the IV is expected to be positive, and they are. The number-of-launch-sites variable is included to reflect that fact that a handful of the ramps in any given county were grouped together as a common site. For such grouped alternatives, the RUM aggregation theory suggests a size measure be entered as a control for the aggregation, and we see that the number of ramps within a ramp group has the expected positive, and significant, effect on marine ramp selection probabilities.

For ramps with marine access on either side of the state, the total area of parking that is available is significant and positive. The parking condition variable was not significant in explaining ramp choices in the West, but parking condition did have a significant and positive effect in the East. The variable for the amount of staging area was not significant in either region. The number of lanes available at a ramp

had a positive effect on ramp selection in both regions (significant at the 5% level in the West and at the 1% level in the East), though the effect is about three times stronger in the East. The development index indicating how many facilities and amenities a ramp offered was positive in both regions – with the implication that more facilities increases the likelihood of selecting a ramp. The ramp condition variable had a larger effect in the West (a greater significance level and larger magnitude). In the East the ramp condition variable falls just outside the often-used 5% level for judging the significance of the parameter estimate. The presence of a marina at the ramp had a significant and positive effect on ramp selection in the East, but was not significant in the West. As with the on-water travel, here we see that higher travel costs have a significant and deterrent effect on ramp selection. Again too, the regional distinction between the effects of attributes proved to be very significant. Table 3.47 also presents the parameter estimate for the inclusive value index for ramps nested at the county level. The inclusive value for the ramps in a county varies across all counties and depends on a person's boat length and personalized travel costs. The county IV reflects the expected utility from visiting a ramp in that county. The estimated parameter is positive and significantly different than one, indicating the nesting structure is significantly better than an un-nested structure. The implication is that when access or quality at a ramp changes, ramp sites within a county serve as closer substitutes for ramps within the county as compared to ramps in other counties.

Freshwater Ramp Launch Destination Choices

Table 3.48 presents the estimation results for the Freshwater ramp branch of the model. The freshwater ramps are aggregated at the county level and represented by the average values of the attributes for the ramps within the different counties. As much as possible, the modeling used parallel variables as in the marine branches of the nested logit RUMs. As with the other model sections, the travel cost variable had a significant and negative effect on travel distances and hence site selection probabilities for sites far from one's home. Consistent with the aggregate nature of the freshwater sites, the number of sites within a county had a significant and positive effect on site selection. The average amount of parking at ramps within the counties had a positive effect on choices, although its significance lies just outside the 5% cut-off but well within the 10% level. Here, parking is represented by the average of all ramps to be consentient the averaged values for the other county level site characteristics. Unexpectedly, the average value of the parking index for sites in a county has a negative effect on the probability that a county is selected for a freshwater trip. Other capacity measures such as staging area and number of lanes did not have significant effects on the freshwater selection probabilities. Amenity factors such as the ramp condition index, the development index, and the presence of marina all had significant and positive effects on the freshwater ramps selections.

Table 3.47: Random Utility Model estimates for choice of marine ramps (nested within a county and across counties).

Variable (Ramp Characteristic)	Estimated Parameter	t-stat	p-value
Travel cost	-0.0419	0.003	<0.0001
Number of sites within ramp group	0.8701	0.138	<0.0001
Eastern Coast Ramps			
Inclusive value of water sites at ramp	0.80088	6.228	<0.0001
Total parking size (1000's)	0.01791	15.422	<0.0001
Parking condition index	0.58331	3.68	0.0002
Staging area	-0.08048	-0.874	0.3821
Number of lanes	0.08913	8.671	<0.0001
Ramp condition index	0.4552	1.941	0.0523
Ramp development index	1.06083	4.452	<0.0001
Marina	0.32273	2.807	0.005
Western Coast Ramps			
Inclusive value of water sites at ramp	1.96103	18.83	<0.0001
Total parking size (1000's)	0.00001	10.349	<0.0001
Parking condition index	-0.15429	-1.217	0.2237
Staging area	0.14167	1.556	0.1196
Number of lanes	0.02868	2.057	0.0397
Ramp condition index	1.94788	10.2	<0.0001
Ramp development index	0.34997	2.005	0.045
Marina	-0.08192	-0.895	0.3706
Inclusive value upper-level ramps per county	0.3798	6.535	<0.0001

N = 3,404

LogL = -7010

P-value for overall model<0.0001

McFadden R2 = 0.4813

600 ramps in each persons choice set

Table 3.48: Random Utility Model estimates for choice of freshwater ramp groups by counties

Variable (Avg. Ramp Characteristic)	Estimated Parameter	t-stat	p-value
Travel cost	-0.01948	-36.645	<0.0001
Number of sites within county	0.01381	10.954	<0.0001
Total parking size (avg.) (1000's)	0.01798	1.896	0.058
Parking condition index (avg.)	-1.1033	-2.669	0.0076
Staging area (avg.)	-0.39936	-1.335	0.1819
Number of lanes (avg.)	0.16463	1.353	0.1761
Ramp condition index (avg.)	1.95804	2.715	0.0066
Ramp development index (avg.)	2.9715	3.492	0.0005
Marina (avg.)	1.75478	3.592	0.0003

N = 1,061

LogL = -1,818

P-value for overall model<0.0001

McFadden R2 = 0.5894

All freshwater only ramps/county in choice sets

Ramp Values

Given the estimated model parameters, the formula in equation [11] can be used to estimate the value of changes in the site characteristics at one or more sites. The formula can also be used to compute the value of access to an existing ramp by computing the estimated loss in consumer surplus if the site is removed from boater's choice sets (closure). Such a computation is a common way of deriving the access value of a site. The values for access to a ramp represent the loss of consumer surplus that boaters would experience if they could no longer use a ramp. The losses are relative to the next best alternative in the choice set. Thus, ramps with many close substitutes will have relatively lower value than ramps with fewer substitutes. The values are also relative to use so that all else being equal ramps with higher visitation will be more valuable than ramps with less visitation.

For ramps with marine access, individual ramp values are reported in appendix N. The ramps that are predicted to receive more trips generate larger consumer surplus values. The values are in year 2006 dollars and represent the values per year of closure. Each of the ramp values in appendix N is relevant for use when access to all other available ramps remains open. When access to more than one ramp is lost, the relevant welfare measure would be larger than the sum of the values in tables because as sites are removed from boater's choice sets the relative value of the remaining sites increases. Thus, the values can be added together for policy and analysis purposes when it is understood that only a few ramps would be lost (or gained) on the margin. For policies involving more complicated multi-site closures or for changes in the characteristics of ramps, the welfare formula in equation [11] should be used.

For planning purposes, one multi-ramp welfare measure that may be of interest is the value of all the ramps in a county. Such measures have also been computed for each of the marine counties (Table 3.49). As expected, the access values for all the ramps within a county are higher than the sum of the individual ramp access values because the latter are calculated assuming all but the one ramp are still available.

Table 3.49: Access values (consumer surplus) for publicly accessible ramps within a county.

	County	Ramp Access Values per County for Ramp groups with only Freshwater Access (2006$/yr)	Ramp Access Values per County for Ramp groups with any Marine Access (2006$/yr)	Ramp Access Values for all publically accessible ramps in county (2006$/yr)
1	Alachua	3757000	0	3757000
2	Baker	849000	0	849000
3	Bay	2658000	22193000	24851000
4	Bradford	564000	0	564000
5	Brevard	10029000	40597000	50625000
6	Broward	16770000	31685000	48455000
7	Calhoun	507000	0	507000
8	Charlotte	4399000	17659000	22058000
9	Citrus	2263000	34586000	36849000
10	Clay	2242000	0	2242000
11	Collier	14743000	16487000	31230000
12	Columbia	708000	0	708000
13	Desoto	1354000	0	1354000
14	Dixie	579000	8185000	8764000
15	Duval	7775000	26383000	34158000
16	Escambia	2028000	10783000	12811000
17	Flagler	930000	8373000	9303000
18	Franklin	672000	8445000	9116000
19	Gadsden	1628000	0	1628000
20	Gilchrist	437000	0	437000
21	Glades	1637000	0	1637000
22	Gulf	1065000	4228000	5293000
23	Hamilton	239000	0	239000
24	Hardee	790000	0	790000
25	Hendry	2668000	0	2668000
26	Hernando	1246000	12279000	13525000
27	Highlands	2486000	0	2486000
28	Hillsborough	6857000	47012000	53868000
29	Holmes	482000	0	482000
30	Indian River	2639000	13189000	15828000
31	Jackson	1194000	0	1194000
32	Jefferson	412000	0	412000
33	Lafayette	269000	0	269000
34	Lake	8615000	0	8615000

Table 3.49: Access values (consumer surplus) for publicly accessible ramps within a county (continued).

	County	Ramp Access Values per County for Ramp groups with only Freshwater Access (2006$/yr)	Ramp Access Values per County for Ramp groups with any Marine Access (2006$/yr)	Ramp Access Values for all publically accessible ramps in county (2006$/yr)
35	Lee	0	45099000	45099000
36	Leon	2749000	0	2749000
37	Levy	619000	23122000	23740000
38	Liberty	424000	0	424000
39	Madison	376000	0	376000
40	Manatee	2701000	14286000	16987000
41	Marion	3303000	0	3303000
42	Martin	2438000	12213000	14652000
43	Miami-Dade	12534000	45122000	57655000
44	Monroe	0	49161000	49161000
45	Nassau	1316000	8882000	10199000
46	Okaloosa	4263000	12614000	16877000
47	Okechobee	1553000	0	1553000
48	Orange	4438000	0	4438000
49	Osceola	2417000	0	2417000
50	Palm Beach	11327000	30226000	41553000
51	Pasco	5112000	22883000	27995000
52	Pinellas	9922000	73333000	83255000
53	Polk	19085000	0	19085000
54	Putnam	4338000	0	4338000
55	Santa Rosa	1873000	14644000	16517000
56	Sarasota	4423000	17434000	21857000
57	Seminole	7203000	0	7203000
58	St Johns	3583000	24217000	27800000
59	St Lucie	3156000	14618000	17773000
60	Sumter	3134000	0	3134000
61	Suwannee	679000	0	679000
62	Taylor	545000	9668000	10213000
63	Union	328000	0	328000
64	Volusia	9179000	48129000	57308000
65	Wakulla	998000	14159000	15158000
66	Walton	1714000	7074000	8788000
67	Washington	1075000	0	1075000
Total		**232294000**	**788968000**	**1021261000**

For ramps that only have access to freshwater, the finest level of the RUM models had the ramps aggregated at the county level. For freshwater, we can compute the consumer surplus per county for access to the ramps in each county. These values are reported in Table 3.49. As before, adding these values up gives a lower bound value of access to multiple counties. The county values for freshwater access can be compared to the values for county access for marine (Table 3.49). A rough comparison of the numbers reveals that if one divides the totals by the numbers of trips, then the rough value per trip for marine ramps is about $82 and for freshwater ramps it is about $77 dollars.

If we add up the county level values, we can derive a lower bound value for access to all ramps with public access for both freshwater and for marine. Doing so reveals that the estimated surplus value to boaters (i.e., the value above and beyond expenditures) is at least 232 million dollars per year for access to freshwater ramps and at least 788 million dollars per year for access to marine ramps. Taken together, the ramps that are publicly accessible provide benefits to boaters in excess of one billion dollars per year.

3.5 SITE SUITABILITY

3.5.1 Method

This approach to boating access site suitability has two elements: environmental/geographic conditions and economics. The emphasis of this approach is on incorporating economic information and data to build on the screening criteria employed through the boat facility siting plan method promulgated by FWC and endorsed by the Department of Community Affairs (DCA) for preparing countywide boating facility siting plans, which focuses primarily on environmental, physical, and regulatory conditions and constraints.

The economic models presented here are an enhancement of the existing siting methods. The economic models improve and reorient decision making on facility location and investment by adding economic information on optimizing location and investment decisions based on boater demand and preferences. Boating access sites should be located and designed where and how they will be most effective and efficient for boaters and have broad, positive community benefit, *as well as* adhering to land use and environmental considerations, policies and regulations.

It is the focus on economics—the incorporation and consideration of information on supply and demand, boater behavior and user needs and preferences—that distinguishes this site suitability method from others. It is, in essence, an enhancement of the method used by counties and municipalities over the past decade for preparing boat facility siting plans, which uses physical and environmental considerations such as endangered species and natural resource protection, characteristics of land and water resources, existing and future land use patterns, zoning, availability of infrastructure, etc.

Environmental, Physical and Regulatory Assessment

Florida Boating Facility Siting Plans

Florida counties and communities have been preparing boating facility siting plans for a number of years in response largely to requirements or incentives in state legislation.

In October, 1989, the Governor and Cabinet approved a set of recommendations by the Florida Department of Natural Resources, which included the provision for 13 "key" counties to develop manatee protection plans (MPP). The counties are Brevard, Broward, Citrus, Collier, Miami-Dade, Duval, Indian River, Lee, Martin, Palm Beach, Sarasota, St. Lucie, and Volusia Counties. As of 2007, all counties

had approved MPPs. The primary goal of a MPP is to establish guidelines and policies that direct new (or expanded) boating facilities to areas posing the least risk to manatees and away from areas of relatively high risk. A state-required MPP has several elements including speed zones, education, law enforcement habitat protection, and boat facility siting (Chapter 370.12(2)(t)(2), F.S.).

To assist with the development of the latter element, FWC's Bureau of Protected Species Management issued a "Boat Facility Siting Guide" in August 2000. This document defines a boat facility siting plan as a county-wide plan for the development of boat facilities (docks, piers, dry storage areas, marinas and boat ramps) which specifies preferred locations for boat facility development based on an evaluation of natural resources, manatee protection needs, and recreation and economic demands. The development of these plans by the county is done in cooperation with municipal governments. Florida law now requires the boating facility siting element of these MPPs to be adopted into the county's comprehensive plan (370.12(2)(t)3, F.S.).

The Local Government Comprehensive Planning and Land Development Regulation Act (Chapter 163, Part II, F.S.) requires all of Florida's 67 counties and 410 municipalities to adopt Local Government Comprehensive Plans to guide future growth and development. As an incentive for developing and adopting a boating facility siting plan or policy (or adopting the county siting plan) into the local comprehensive plan, Section 380.06(24)(k) of the Florida Statutes allows for the exemption of marinas from the Developments of Regional Impact (DRI) review process if the siting plan adequately incorporates appropriate criteria as referenced in the statute (see below). To assist municipalities with preparing these plans, the Florida DCA issued "Preparing a Boating Facilities Siting Plan: Best Management Practices for Marina Siting (A Guidebook to Assist Local Governments in Qualifying for the DRI Exemption for Marinas)" in March 2003.

The Florida Statutes and Florida Administrative Code provide further encouragement for and coordination of boating siting plans in the comprehensive planning done by coastal counties and municipalities. The comprehensive plan of the one hundred-ninety five coastal communities (35 coastal counties and 160 local governments) that border coastal waters (380.24, F.S.) must include a coastal management element (163.3177(6)(g)1, F.S.). Among the objectives of this element are the maintenance, restoration, and enhancement of the overall quality of the coastal zone environment; protection of wildlife and marine life; discouragement of development in high-hazard coastal areas; the orderly development of ports; and balanced use of coastal zone resources. (see also Rule 9J-5.012). The inventories and analyses conducted for the coastal management element are to be coordinated and consistent with the countywide marina siting plan. Further, local governments that participate in a countywide marina siting plan are required to include the marina siting plan as part of the coastal management element of their local comprehensive plans (Rule 9J-5.012(4)).

A boating facility siting plan guides the development of new or expanded marinas, boat ramps and other boating facilities to suitable locations that minimize impacts to marine resources and maximize user benefits (DCA 2003). The criteria guiding development of the Boating Facility Siting Plans whether for a MPP, to qualify for the DRI exemption for marinas, or for inclusion into a local comprehensive plan, is outlined in FWC's Boat Facility Siting Guide, August 2000, mentioned above. The guide suggests a number of "factors," "siting criteria," and "performance measures" that fall into the following three broad categories of criteria to be considered in siting facilities:

- Manatee protection;
- Natural resources protection; and
- Land use and upland considerations.

The criteria to be considered in selecting boating facility sites are:

Factors

- Proximity to inlets and/or the Intracoastal Waterway;
- Adequate water depths for clearance of vessels;
- Presence of seagrass and/or shellfish harvesting areas;
- Amount of manatee use;
- Proximity to popular boating destinations; and
- Distances of boat/manatee overlap.

Siting Criteria

- Expansion of existing facilities may be preferred over new facilities if environmentally sound;
- No impact to seagrass;
- Mitigation for seagrass should not be allowed;
- Areas with adequate water depth and good flushing sites which require no new dredging are preferable;
- Locations near inlets and popular destinations are preferable;
- Piling construction is preferred over dredge and fill techniques;
- Marinas should not be sited in essential habitats; and
- Marinas should not be situated in areas with high manatee mortality occurrences.

Performance Measures

- Dock density limits;
- Existing speed zones;
- Boat type and size limits;
- Demand considerations; and
- Design considerations.
- Comprehensive plan and zoning requirements

The guide's siting criteria can be used by (non-MPP) communities to screen proposed sites even in the absence of a boat facility siting plan, though other information required to be in the plan would certainly improve the basis for decision making. The information used for the screening is often available in state, county or municipal datasets, such as:

- Habitat inventories showing seagrass beds, submerged aquatic vegetation and shellfish;
- Existing water depths and circulation patterns;
- Outstanding Florida Waters, aquatic preserves, parks, reserves and wildlife refuges; and
- Land use and zoning.

Economics Assessment

The background of how economic demand models can be used to determine site suitability is described in Section 3.4 above. Ideally, after access sites are assessed on their environmental, physical and regulatory criteria, the policy assessment moves to an economic assessment. When two or more sites are under review, an economic analysis will permit one to compare the relative benefits each

prospective site provides society. Likewise, this approach allows one to estimate the economic losses resulting from site closure and/or site reconstruction/enhancement.

3.5.2 Case Studies – Lee County Random Utility Models for Boating

Overview

Lee County, Florida contains a variety of boating infrastructure, including boat ramps that are open to the public. These boat ramps provide economic benefits to boaters that use them to access Florida's waters. These economic benefits accrue to the boaters themselves, in the form of increased well-being and satisfaction from boating, and these benefits are above and beyond the direct costs of boating. Economists refer to such benefits as economic surplus. These benefits form the basis for benefit-cost analyses that are conducted in accordance with the norms of economic science. In this report, we present the results and application of models capable of estimating such benefits.

The economic models developed here are models of the demand for access to boating sites and are suitable for valuing access as well as the characteristics of boating sites. The methods use "Random Utility Models (RUMs)" as the basis of the economic demand models. RUMs use data on individual trips and statistical techniques to explain boaters' site choices and to relate these choices to the costs and characteristics of alternative boating sites (Morey, 1999). Boaters' optimizing choices reveal their relative preferences for site characteristics and travel costs (i.e., the boaters' willingness to trade costs (or money) for site characteristics). Through this linkage, RUMs can value changes in site characteristics such as capacity.

Results

The first step in estimating the choice model is to define those ramps that are available to the boating public. Ramps that are closed to public access are excluded from the analysis. Of the 97 Lee County inventoried ramps, 55 ramps are not available for public use for a variety of reasons including temporary closures, private or gated facilities and government ramps only open for official use. Included in the remaining 42 ramps are the obvious stand-alone public ramps and public access marinas with launch lanes.

Next, the juxtaposition of ramps to one another was considered. When choosing an access point, boaters likely consider ramps in close proximity to one another as members of a larger group or aggregate. For example, if the parking lot of one site is full the boater could easily move along to the nearby neighboring ramp with no significant increase in travel time or cost. Nearby ramps should be lumped together to capture this choice behavior, therefore ramps within 1.5 road miles of each other were grouped and considered single aggregated facilities. For Lee County, twelve ramps were aggregated into five groups leaving a total of 35 individual ramp choices (Table 3.50).

With the ramps selected, the next step in preparing the data involved identifying on-the-water destination sites. FWC constructed a statewide GIS one-minute grid overlay comprised of 73,485 cells equal to one-minute of latitude by one-minute of longitude. Each grid cell contained as many as 30 variables representing cell attributes including the presence or absence of salt and/or freshwater, natural and/or artificial reefs, seagrass, navigational aids, manatee protection status and marine protection/conservation status. Information also included bathymetry (depth) data and lake acreage among other variables. For Lee County, the one-minute grid cells were aggregated into 12 minute polygons and cell attributes were statistically averaged for each polygon. In the boating survey, boaters were asked to identify their on-the-water destination using a geo-referenced mapping system. Their choice was then linked to the correct polygon with its aggregated site attributes. To avoid long distance

trips, those clearly beyond a "normal" day trip, a 10% distance trim was employed, reducing the number of actual destination sites for Lee County boaters to 71.

Statewide there were 26,771 trip-level responses during the 12 month sampling period. Of this number, 6,690 (25%) reportedly used a boat ramp during their trip. Of those using a boat ramp, 195 (2.9%) used Lee County ramps. Some of these trips used private access (not valid for a public access model) and others failed to select a valid boat ramp so were removed from the analysis. After adjusting for a 10% distance trim, a total of 153 valid trips were available for the RUM analysis.

The estimation results for the model of water site choices, conditional upon a ramp, are presented in Table 3.51. The table gives the estimated parameters, their standard errors (S.E.), and the significance levels at which the parameters would become significant (p-values). A variable is referred to as "significant at the X% level" if we would reject the hypothesis that it is zero with a confidence that we were correct in all but X% of the cases. The dependent variable in the model reported in Table 3.51 is the water destination chosen by survey respondents. The overall model is significant based on a chi-squared test of the joint parameter values. The travel cost for boating on the water is significant and of the expected sign. Recall that the cost was computed using the statute miles computed between the ramp latitude longitude and the latitude longitude for water site grids. The distance for this was computed using the Haversine method accounting for the curvature of the earth.

The results indicate that the final water destinations chosen by survey respondents are less likely to be in grids with navigation aids (significant at 10% but not at 5%). Similarly, grids with artificial reefs were less likely to be selected as the water destination. Water sites with marine protected zones or with conservation zones within the grid were significantly more likely to be chosen. Alternatively, water grids with a manatee zone were significantly less likely to be selected as the water destination. The mean depth of a grid was positively associated with the water destination. Finally, the distance from the water site to the nearest ramp (defined as any ramp, not just the ramp they launched from) was negatively associated with the water destination. In sum, preferred water destinations had low travel costs, were close to a ramp, and near a conservation zone yet were in deeper water away from navigation aids, artificial reefs and manatee zones.

The estimation results for the model of ramp site choices are presented in Table 3.52. The table gives the estimated parameters, their standard errors (S.E.), and the significance levels at which the parameters would become significant (p-values). The overall model is significant based on a chi-squared test of the joint parameter values. The travel cost for getting to the ramp is significant and of the expected sign. This cost was computed using the miles traveled and the launch fees which vary by ramps. The miles traveled was derived from the PC-miler™ software (from ALK Technologies; www.alk.com/pcmiler/) by adding the road miles from the origin of the trip to the location the boat is kept (which are the same in many cases) to the road miles from there to the latitude longitude associated with each of the ramp groups. It is assumed ramps in close proximity to one another would be viewed by many boaters as close substitutes, therefore all ramps within 1.5 road miles of each other were aggregated into groups. Travel costs were then the sum of the launch fee, bridge tolls, the driving cost assuming towing ($0.50 per mile) and the time costs derived as the driving time (miles/45 mph) multiplied by the time value (annual income/2080 hours per year).[4]

[4] Travel times for two sites (Sanibel and Lovers Key) were adjusted downward to 20 mph for a portion of their travel distance to account for slower speeds on causeways and highly congested areas.

Table 3.50: List of Lee County public boat ramp choices used in RUM (n=35).

Group Number	Name
1000039	BMX Strausser
1000040	Alva Ramp
1000041	Burnt Store Ramp
1000043	Cape Coral Yacht Basin
1000044	Lover's Key / Carl E. Johnson Recreation Area
1000046	Ft. Myers Yacht Club
1000047	Fort Myers Shores (Davis Boat Ramp)
1000049	Franklin Locks North
1000050	Franklin Locks South
1000051	Bokeelia Boat Ramp & Cottages
1000052	Horton Park
1000053	Imperial River Ramp
1000056	Koreshan State Historic Site
1000057	Punta Rassa Ramp
1000058	Sanibel Island Ramp
1000078	Bonita Beach Resort Motel
1000079	Cape Harbour Marina
1000082	Ohio Avenue Ramp
1000099	Castaways Marina
1000100	Tween Waters Marina
1000101	Mullock Creek Marina
1000103	Fish Trap Marina
1000104	Riverside Park
1000119	Pine Island Commercial Marina
1000120	Leeward Yacht Club 2
1001593	Russell Ramp Park
3000965	Burnt Store Marina and Country Club
3001001	Pineland Marina
3001115	Terra Verde County Club
4000000	Judd Park
9350010*	Jug Creek Cottages, Malu Lani Inn, Bocilla Marina
9350020*	Monroe Canal Marina, St. James Marina
9350040*	Viking Marina, Matlacha Park, D&D Tackle
9350150*	Hickory Bait & Tackle, Coconut Point Marina
9350190*	Inlet Motel, Captain Con's Fish House

Note: * denotes aggregated ramps, comprised of two or more single ramps.

The inclusive value parameter for water sites is significant, and the parameter lies between 0 and 1 which is consistent with theory for nested logits (Morey, 1999). The parameter is also significantly

different than one which indicates the superiority of the nesting structure relative to a simple un-nested conditional logit model. The number of ramps within a group was positive and significantly different than zero. The theory of aggregation of sites with random utility models suggests that the number of elements in a group should have a parameter of one (Lupi and Feather, 1998), and our result is consistent with the aggregation theory since the parameter on the number of ramps in a group is not significantly different from one.

Table 3.51: Random Utility Model estimates for choice of water sites.

Variable (Water Site Characteristic)	Estimated Parameter	S.E.	p-value
Travel cost	-0.4609	0.0452	0.0000
Navigation aids in grid	-0.9250	0.4908	0.0595
Artificial reef in grid	-5.1340	2.3967	0.0322
Marine protected or conservation zone in grid	2.1276	0.3721	0.0000
Manatee zone in grid	-1.2558	0.4550	0.0058
Mean depth	0.3174	0.0672	0.0000
Nearest ramp distance	-0.4411	0.0904	0.0000

N=153

LogL = -516.65

McFadden R2 = 0.209

The average parking size is significant and positive, as is the index of parking condition. Ramps with higher levels of development (measured by average facility counts) were significantly preferred to those with lower levels of facilities. However, being a marina was less preferred by those trailering their boats to a ramp.

Table 3.53 presents information for the specific ramp groups. The second column shows the survey data on ramp choices (giving both the ramp shares and the frequencies). The third major column presents the predicted probability of selecting a ramp based on the RUM. We can see that the model fit roughly corresponds to the distribution of the sample shares. In particular, the model predicts the highest site visitation probability for our site with the most visits and similarly predicts relatively high visitation for sample sites with high visitation. Similarly, most of the sites that received low or no visits are predicted to have low probabilities of use.[5]

The final column shows the access value for each of the ramps using the equivalent variation calculation of equation (11). This value represents the lost economic value to boaters of losing access to the site, yet retaining access to the other Lee county sites. The value is in the range in the literature and higher than the recently reported values for access to Hawaii ramps (Haab, Hamilton and McConnell, 2008). It important to note that the values reported in Table 3.53 are values that accrue to all ramp boating trips made to Lee County (i.e., the scope of choices in the model). These are not the values for a specific visitor that has visited a ramp for which access is lost. Such values are commonly reported in the

[5] Although the model fits the sample data extremely well, our sample predicts a high share of boat launches from Matlacha Park. Local knowledge suggests that Matlacha does not receive such high visitation, perhaps because the waterways around Matlacha are difficult to maneuver and benefit from local knowledge. As such, it is possible that few out-of-state boaters visit these sites (personal correspondence, Steve Boutelle, Lee County). We note that our sample does not include out-of-state boaters so we cannot capture this effect with our data.

literature that uses single site models. In the RUM, we can approximate such site specific values by dividing the Lee County trip values by the probability of making a Lee County trip to a specific ramp. If we make these adjustments for the trips to a particular ramp, we get values in the range of $30-40 per trip to a specific ramp. Such values are consistent with the range of user day values found in the recreation literature.

Table 3.52: Random Utility Model estimates for choice of ramp groups.

Variable (Water Site Characteristic)	Estimated Parameter	S.E.	p-value
Travel cost	-0.0299	0.003	<0.0000
Inclusive value of water sites	0.4586	0.126	0.0003
Number of sites within group	0.8701	0.138	<0.0000
Average parking size (1000's)	0.0328	0.008	0.0001
Parking condition index	0.8340	0.328	0.0111
Ramp development index	4.4716	0.618	<0.0000
Marina	-1.4790	0.237	<0.0000

N=153

LogL = -391.25

McFadden R2 = 0.281

One caveat for the models we present for Lee County relates to the water site choice model. Because many of the water site variables are correlated, the model is not well suited to evaluating the effect of changes in individual water site characteristics. However, the model does perform well in terms of predicting water site choice, and hence, the model does a good job of predicting the utility index (inclusive value) of the available water sites from any ramp. Thus, the combined models are well suited to valuation of ramps, but less-well suited to valuation of changes in specific water site characteristics. This is due to the correlation in the water site characteristics available from ramps in Lee County. However, a model with a broader scope would use data from more areas which likely would reduce the correlation problem for the water site characteristics making valuation of the water site characteristics feasible.

The model we present is based on boaters that have launched from ramps in Lee County. Thus, the scope of the model or what might be referred to as the “market area” covered by the model is boaters utilizing public ramps in Lee County. Lee County is a large area with many possible public ramps available to boaters. It is natural to think that ramps within Lee County are a part of the relevant market area for the segment of boaters that have used a Lee County ramp. These ramps are also natural substitute sites for Lee County boaters. Our model includes these possibilities. However, it may be that the geographic market area includes some ramps and boaters using other ramps outside of Lee County. For example, when the characteristics of a Lee County ramp are improved, it may attract some boaters that were not previously using a Lee County ramp. These boating behaviors occurring outside of Lee County would not be captured by our current Lee County RUMs. In this case our model may underestimate the benefits of a Lee County ramp improvement because it cannot capture the benefits to potential new users of Lee County ramps. That said, when an improvement occurs, we know that the main beneficiaries are those already using Lee County ramps and these benefits are captured by our models. A model with a broader scope using statewide boating data has been developed and allows us

to assess the extent to which the relevant geographic market area for Lee County ramps extends to ramps outside of Lee County.

Table 3.53: Estimated site values and observed and predicted trips to the ramp groups.

Ramp Group Name	Survey Data on Ramps		Predicted Probability a Lee County Trip is to a particular ramp	Access Value of Ramp (per Lee County Trip)
	Visitation Shares	Frequency		
BMX Strausser	0.0%	0	0.032	$1.09
Alva Ramp	0.0%	0	0.006	$0.20
Burnt Store Ramp	5.9%	9	0.059	$1.99
Cape Coral Yacht Basin	5.9%	9	0.048	$1.64
Lover's Key / Carl E. Johnson Recreation Area	9.2%	14	0.070	$2.71
Ft. Myers Yacht Club	6.5%	10	0.033	$1.11
Fort Myers Shores (Davis Boat Ramp)	0.7%	1	0.010	$0.34
Franklin Locks North	0.0%	0	0.008	$0.28
Franklin Locks South	0.7%	1	0.013	$0.40
Bokeelia Boat Ramp & Cottages	0.7%	1	0.018	$0.62
Horton Park	9.2%	14	0.144	$5.27
Imperial River Ramp	3.3%	5	0.012	$0.42
Koreshan State Historic Site	0.7%	1	0.011	$0.36
Punta Rassa Ramp	9.8%	15	0.037	$1.27
Sanibel Island Ramp	2.6%	4	0.022	$0.73
Bonita Beach Resort Motel	0.0%	0	0.003	$0.09
Cape Harbour Marina	1.3%	2	0.023	$0.77
Ohio Avenue Ramp	0.0%	0	0.007	$0.24
Castaways Marina	0.0%	0	0.029	$1.07
Tween Waters Marina	2.6%	4	0.026	$1.04
Mullock Creek Marina	5.2%	8	0.008	$0.28
Fish Trap Marina	0.0%	0	0.006	$0.20
Riverside Park	0.0%	0	0.003	$0.11
Pine Island Commercial Marina	0.0%	0	0.015	$0.51
Leeward Yacht Club 2	0.0%	0	0.006	$0.21
Russell Ramp Park	0.0%	0	0.003	$0.09
Burnt Store Marina and Country Club	1.3%	2	0.005	$0.17
Pineland Marina	2.0%	3	0.015	$0.51
Terra Verde County Club	0.0%	0	0.005	$0.16
Judd Park	0.0%	0	0.007	$0.21
Jug Creek Cottages, Malu Lani Inn, Bocilla Marina*	7.2%	11	0.044	$1.49
Monroe Canal Marina, St. James Marina*	5.9%	9	0.023	$0.78
Viking Marina, Matlacha Park, D&D Tackle*	19.6%	30	0.236	$9.15
Hickory Bait & Tackle, Coconut Point Marina*	0.0%	0	0.011	$0.36
Inlet Motel, Captain Con's Fish House*	0.0%	0	0.000	$0.74
Total	**100%**	**153**	**1**	**$36.61**

Note: * denotes aggregated ramps, comprised of two or more single ramps.

Lee County Environmental, Physical and Regulatory Assessment

The Lee County Manatee Protection Plan (MMP) includes a marine facilities siting element (MFSE) that prescribes a method for determining site suitability for new boating facilities as well as for the expansion, rehabilitation and reconfiguration of existing sites. The focus of the method is on manatee protection as this is an important consideration for boating and facility siting in the county.

This siting element of the plan first identifies the required regulatory reviews for activities associated with boating facilities, standard performance measures imposed, legislatively-established management measures, e.g., motorboat-prohibited zones, no marina zones, and county and municipal comprehensive plan policies and land use zoning restrictions. The core of the method is a scored matrix system that is employed through a multiple-step evaluation process. Potential sites are first evaluated and scored for three base factors, then three mitigating factors. Many of the evaluation factors are available as GIS datasets.

The method begins with an initial screening for sufficient water depth and protection of seagrass or other submerged aquatic vegetation. In general:

- Projects cannot directly or indirectly adversely impact more than 1,000 square feet of submerged aquatic vegetation; and
- Project sites must have at least four feet of depth at MLW throughout, including ingress and egress pathways.

If these requirements are not met development of boating facilities at the site are prohibited (a variance procedure is available).

If the above criteria are met, the project is then scored on three base criteria:

- Manatee mortality: relative risk of watercraft mortality is determined by dividing the number of watercraft deaths within a five-mile radius of a project site by the number of watercraft-related deaths for the entire county.
- Manatee abundance: determined by calculating the average number of manatees observed per aerial survey flight within a five-mile radius.
- Project proximity to important warm-water refuges: refuges are identified in areas of the Orange River, Franklin Lock and Dam, Matlacha Isles, Ten-Mile Canal, and Cape Coral Canals. Projects are scored based on their distance from particular refuges.

Three mitigating criteria (scores deducted from cumulative base score above):

- Project proximity to speed zones: projects are scored more favorably if not within any federal, state, or local speed zones are in place thereby providing manatees with protection from high speed boat collisions.
- Expansion of existing facilities: preference given to projects that are expansions of existing, environmental sound facilities.
- Proximity to passes and open water: preferential score for projects located closer to a Gulf Pass or directly accessing Charlotte Harbor.

Finally, whether or not the project is within one of two Areas of Special Concern based on their use by manatees for traversing, high potential for boat and manatee interaction, and a historically high level of manatee rescues.

- Caloosahatchee River west of the State Road 31 bridge and east of Intracoastal Waterway channel marker 93.
- Matlacha Pass south of channel marker 77, north of the Intracoastal Waterway in San Carlos Bay and west of Intracoastal Waterway channel marker 93.

Based on the above method, sites are scored and designated as preferred, conditional or non-preferred.

The MPP's marine facilities siting element method is used to determine site suitability on a case-by-case basis. The method has been applied to each of the case studies below and the results reported. As an illustration, some of the key siting criteria are also presented in a series of maps (Figures 3.53 to 3.57) following case study 1.

Many of the MFSE criteria are available in GIS format and datalayers could be combined to create maps to depict areas of suitability and areas with limitations on a broad scale as a guide for planning new or expanded boating facilities. However, decision making on suitability ultimately requires a site-level assessment. In the early stages of the project, the project team prepared a report describing the context for the Lee County site suitability assessment, the associated issues, the significance of the various inputs and steps, and outlined the process and method.

Case Studies

When faced with competing alternative uses for public funds, it is helpful to employ an analytical framework that permits an objective comparison of these alternatives. While the choice of measurement can vary by decision, e.g., number of jobs created, net return to the public treasury, number of species saved, etc., the most common approach is to compare alternatives by their economic value net the cost of implementation; benefits verses costs or benefit/cost analysis (BCA). In its simplest form, a BCA measures potential benefits and costs and provides a framework to compare alternatives using the common metric of monetary value. This comparison can be viewed as a ratio of benefits to costs (where values greater than one are considered beneficial) or as the net of benefits less costs (where positive values are considered beneficial).

In the following case studies, the benefits of an action are calculated as the discounted sum of value accruing to boaters for the lifetime of the action. Since public lands/ramps are held in trust indefinitely, the benefits can be viewed as a never ending stream of value that accrues to the boating public. However, benefits accruing in the future are worth less than those accruing today, so this stream of value must be discounted across time. The most commonly used rate for public projects is 3% per annum. The benefits of an action can now be simplified to the discounted value of an infinite stream of benefits; a perpetuity. To determine if the action is net beneficial, the perpetuity benefit can be compared to the implementation cost as either a ratio or the net of discounted benefits less costs.

Case 1: Add public access to a new site (Ostego Drive).

In the first case policy makers wish to evaluate the benefit of adding an additional ramp to the set of ramps already available in the county. A ramp presently exists on Ostego Drive (Figure 3.52), but is not operational due to a regulatory constraint. The question becomes is the expense and time required by the county to successfully challenge the regulatory constraint a good investment of public funds? Using the RUM, it is possible to calculate the per trip value provided by opening this ramp and, by extension, the total value for all boaters dependent on ramp access in Lee County. To calculate the per trip additional value with the opening of this ramp, each surveyed boater's choice set was recomputed by adding the new site, its characteristics, and the individual's specific travel costs to this site. The RUM generated value added to all trailered boating trips for this additional ramp site was estimated to be

$0.86 per trip to Lee County. For the 588,000 countywide boat trips using a trailer and launching from public access points, this action would translate into a total annual value of $505,680 for boaters dependent on Lee County ramp access. Assuming that this action would be indefinite, it could be viewed as a perpetuity[6] with a 3% annual discount rate and equal the sum net present value of $16,856,000. This value would assume constant boater participation rates and ramp choices over time. If policy makers believe this sum is greater than the cost of litigating the regulatory constraint, then the action would make economic sense.

Table 3.54: Results of Lee County's marine facility siting element method for a boat ramp on Ostego Drive.

Results of applying MFSE methodology to the Ostego Drive site:								
First Evaluation		Base Criteria			Mitigating Criteria			Total
Seagrass	Depth	Mortality	Abundance	Warm Water	Speed Zone	Expansion	Open Water	
OK	OK	6	4	0	-2	0	-1	7

The results of the screening method suggest that this site is "preferred" and is appropriate for development.

Figure 3.52: Aerial photo of the Ostego Drive ramp.

[6] "Perpetuity" refers to an asset that perpetually pays an annual dividend of a fixed amount; the present value (PV) of a perpetual stream of periodic payments discounted at rate *i* is given by the formula, PV = annual payment/ *i*.

Figure 3.53: Water depth, existing sites and location of aids to navigation near the Ostego Drive ramp.

Figure 3.54: Mangroves, seagrass, manatee boat-related mortality (in the last 10 years) and manatee abundance near the Ostego Drive ramp.

Figure 3.55: Protected areas near the Ostego Drive ramp.

Figure 3.56: Zoning near the Ostego Drive ramp.

Figure 3.57: Land use near the Ostego Drive ramp.

Case 2: Increase the average parking size at Pine Island Commercial Marina and Bokeelia Boat Ramp and Cottages by 50% (i.e., 50% more parking).

In addition to adding or removing sites, policy makers might wish to enhance a site's features. In the case of ramps at Pine Island Marina and Bokeelia Boat Ramp and Cottages (Figure 3.58), policy makers would like to know if a significant increase in their parking areas is a worthwhile public investment. One of the significant RUM variables is average parking size (Table 3.52) meaning this variable can be evaluated for marginal changes (increases and decreases in size). By increasing the value of this variable by 50% and using the estimated RUM, the value for this policy change was estimated to be $0.26 and $0.99 per trip to boaters dependent on Lee County ramps for Pine Island Marina and Bokeelia Boat Ramp and Cottages respectively. Overall, for the 588,000 countywide boat trips using a trailer and launching from a public access point, this action would translate into a total annual value of $153,000 and $882,000 for boaters using Lee County ramps due to added parking at Pine Island Marina and Bokeelia Boat Ramp and Cottages respectively. Assuming that this action of purchasing the land needed for the parking lot expansion would be indefinite, it could be viewed as a perpetuity with a 3% annual discount rate and would equal the sum net present value of $5,100,000 and $19,404,000 for Pine Island Marina and Bokeelia Boat Ramp and Cottages respectively. If policy makers believe this sum is greater than the cost of purchasing and preparing the parking lot expansions, then the action would make economic sense.

Figure 3.58: Aerial photo of Pine Island Marina Ramp (top) and of Bokeelia Boat Ramp and Cottages (bottom).

Table 3.55: Results of Lee County's marine facility siting element method for boat ramps at Pine Island Commercial Marina and at Bokeelia Boat Ramp and Cottages.

Results of applying MFSE methodology to the Pine Island Commercial Marina site:								
First Evaluation		Base Criteria			Mitigating Criteria			Total
Seagrass	Depth	Mortality	Abundance	Warm Water	Speed Zone	Expansion	Open Water	
Quantitative data required	Quantitative data required	0	0	0	-1	-1	-1	-3

Results of applying MFSE methodology to the Bokeelia Boat Ramp and Cottages site:								
First Evaluation		Base Criteria			Mitigating Criteria			Total
Seagrass	Depth	Mortality	Abundance	Warm Water	Speed Zone	Expansion	Open Water	
Quantitative data required	OK	4	4	0	-1	-1	-2	4

The results of the screening method suggest that both sites are "preferred" and are appropriate for development unless quantitative data reveal depth limitations or issues with seagrass. If either were to occur, proposed alterations to that particular site could be prohibited, although variances could be considered.

Case 3: Close access to Hickory Bait and Tackle at Weeks Landing (a site within group 9350150).

Another possible policy consideration is the removal of ramps. For various reasons, present sites may be lost to public access. It becomes useful to document the economic value lost to public boating resulting from closures. In this case, the privately owned public access ramp located at Hickory Bait and Tackle at Weeks Landing is scheduled be removed from public access (Figure 3.59). Policy makers may wish to document the value lost to boaters resulting from this closure. In the RUM, this is modeled by removing the site from the choice set and letting the model predict the likely distribution of future boating and economic value lost to boaters from the reduced number of boating access sites. In this particular case, the ramp under consideration for closure is in close proximity to Coconut Point Marina, another privately owned public access point. As an indication of the values for this case, we know that the value would be less that the total value of access to this aggregated site which is $0.36 per trip to Lee County (Table 3.53). Working with this "upper limit" for the economic loss, this action would translate into a total annual loss of $212,000 for boaters using Lee County ramps. This is based on the yearly 588,000 trailer based boating trips in Lee County launched from public access points. Treated as a perpetuity with a 3% annual discount rate, the present value, "upper limit" loss of this action would be $7,066,000. While this estimate is likely high, even if one assumes half this value, the loss would still exceed $3.5 million if the ramp were to close. If this loss is larger than the cost of purchasing the ramp and keeping it open, then it would make economic sense to keep the ramp operational. As with the other cases, this view assumes constant boater participation rates and ramp choices across time.

Figure 3.59: Aerial photo of Hickory Bait and Tackle at Weeks Landing.

Table 3.56: Results of Lee County's marine facility siting element method for a boat ramp at Hickory Bait and Tackle.

Results of applying MFSE methodology to the Hickory Bait and Tackle site:								
First Evaluation		Base Criteria			Mitigating Criteria			Total
Seagrass	Depth	Mortality	Abundance	Warm Water	Speed Zone	Expansion	Open Water	
Quantitative data required	Vessel draft restriction	6	6	0	-1	0	0	11

The results of the screening method suggest that this site is "conditional" and presents a medium risk to manatees and would require additional mitigation measures. There are also potential issues with both water depth and potential impacts on seagrass. If quantitative data determine that either or both of these first evaluation criteria were an issue, any potential site alteration could be prohibited, although variances could be considered.

A report entitled "Site Suitability Analysis Using Lee County as the Case Study" was developed in 2007 as part of this project and is included in Appendix M. The aim of this appendix is to provide the context for and present a universal methodology for site suitability, which could potentially complement the existing county and municipal boating facility siting plan processes.

3.6 ESTIMATE OF FUTURE DEMAND

3.6.1 Projecting boating demand to the year 2025

This section describes the methods used to forecast the number of public launches per county that are projected to occur in future years. By "public launches" we mean launches from publicly owned ramps and other facilities that allow public access (for a fee or otherwise). Both types of facilities are relevant here because privately-owned, but publically-accessible, facilities are relevant substitutes for publically-owned ramps, and hence these constitute a key part of ramp capacity.

The forecasts combine parameters, derived from regression relationships between current launches by county of origin and key demographic and geographic variables, with forecasted changes in the demographic variables to get the desired forecasts on the future number of public launches by county of origin. The county of origin data are then programmed through the RUM models to derive forecasted changes in public launches per county of destination. The forecasted demographic trends we use are in turn based on forecasted economic trends that affect these demographic variables. The dependent variable in the regression was the number of public launches per county. The number of public launches per county was derived by adjusting the estimated launches per county by the survey data on the percentage of the launches that occurred at ramps that were not open to public use. Since there are 67 counties, there were 67 observations.

The independent variables were selected to meet several criteria. First, the variables needed to be known demographic correlates with boating demand. Second, the variables needed to have credible forecasts available for each county for the years 2010 – 2025 and perhaps beyond. Finally, the variables needed to be powerfully related to the dependent variable yet parsimonious in number given the limited number of observations for the dependent variable (launches per county). A review of demographic forecasts led to the selection of the well-respected forecasts of county level populations by age, sex, race and Hispanic origin produced by the Bureau of Economic and Business Research (BEBR) at the University of Florida. The demographic forecasts of BEBR are based on past trends and on projections of economic growth by region. The latest projections (2008) were used, and these projections imply smaller growth in many areas compared to past forecasts as a result of updated economic assumptions modeled by BEBR. These data were used to create variables for the number of males of age 35-65 by county for the following three groups: white non-Hispanics, black non-Hispanics, and Hispanics. The age range 35-65 was chosen since these are the prime ages for boat ownership and usage and the boat owners are overwhelmingly male. A county geographic indicator variable was also used to distinguish coastal counties from non-coastal counties.

The resulting regression results are presented in Table 3.57. The overall regression is highly significant for the explanatory variables taken as a whole ($p<0.000$). The overall regression explained 92% of the variation in the dependent variable (adjusted R^2 =0.9196). The model variables for the three groups of males were each significantly different than zero. The number of white, non-Hispanic males age 35-64 and the number of Hispanic males age 35-64 in a county were both positively associated with public launches originating in the county. The former variable had about twice the impact on launches than the latter. The number of black, non-Hispanic males falling in the age range 35-64 in a county was negatively associated with the number of public launches originating in a county. Being a coastal county had a positive, but not significant ($p=0.277$), effect on the number of public launches per county. Although not significant at the typical 5 or 10% levels, the coastal county indicator variable was maintained in the regression because of its fit with the nesting structures of the RUM recreation site choice demand models.

Table 3.57: Regression of public launches per county on county-level demographic interactions for white, black, and Hispanic males aged 35-64.

Variable	Parameter	t-stat	p-value
Constant	39,039	4.016	0.0002
Coastal County (yes=1, no=0)	15,463	1.097	0.2767
Number of White, Non-Hispanic Males, Age 35-64	4.718	16.97	<0.000
Number of Black, Non-Hispanic Males, Age 35-64	-6.516	-5.72	<0.000
Number of Hispanic Males, Age 35-64	2.326	7.567	<0.000

Dependent variable = Public Launches per County

N = 67

Adjusted R-squared = 0.9196

F (4,62) = 189.7 (p<0.000)

To project future changes in launches per county of origin, the regression parameters were combined with the BEBR forecasted changes in the demographic variables to forecast percentage changes in public launches per county of origin as the demographic variables changed over time with the BEBR forecasts. The forecasted demographic variables were available for the years 2010, 2015, 2020 and 2025; hence, these years form the basis of the projections.

The predicted public launches per county of origin were then programmed through the RUM demand models to distribute the predicted launches per county of origin to counties of launch destination. The RUM site choice probabilities given in equations 3 to 11, combined with the RUM parameter estimates in Tables 3.46 to 3.48, are used to make these predictions. As such, for each possible origin county, the full set of ramp-specific site choice probabilities, along with their resulting inclusive value indices, were computed to generate the probabilities that a marine and a freshwater trip that originated in county j would go to destination county *k*. Thus, each origin county yields a unique set of destination probabilities, the P_{ik}s, for both marine and freshwater launch destinations.

Launches per county of origin are found in Table 3.58. Several trends emerge from the projected launches. First, most counties, over most of the years examined, are forecast to experience growth in launches. However, some counties are forecasted to experience declines. The declines are most pronounced by 2025 where about half the counties are projected to experience a decline in launches while half are projected to experience an increase. The forecasted declines are basically due to shifts in the demographic composition of counties – typically declines in white, non-Hispanic males age 35-64 and increases in both black, non-Hispanic males age 35-64 and Hispanic males age 35-64. Even though Hispanic males age 35-64 are positively associated with launches, the regression parameters suggest that an increase in the number of a Hispanic males age 35-64 that is equally offset by a decline in white, non-Hispanic males age 35-64 will result in a net loss of launches originating in a county. As these potential changes in launch origins are then programmed through the RUM to their likely destinations, the launches at destination sites will change accordingly (see Table 3.59).

There are two main factors that explain how launches per destination county can change (either decline or increase). First, the largest source of launches is typically from those launches that originate within the county. As such, projected declines (or increases) in launches originating in a county are typically a major reason for declines (or increases) in destination launches in that same county. Second, for counties which attract many launches from other counties, changes in the launches originating in the source counties will manifest themselves as changes in launches at the destination counties.

These factors can sometimes work to offset one another. For example, launches originating in Broward and Duval are forecasted to decline by some 30% due to forecasted demographic changes suggesting the numbers of white non-Hispanic males will decline and black non-Hispanic and Hispanic males will increase. But launches for trip destinations for these counties only decline by about half the amount of the declines in launches originating in those two counties. The reason is that the launches in the other source counties do not decline as much as the forecasted losses in launches from their own respective counties. For example, launches originating in St. Johns, which is next to Duval, increase substantially due to a large forecasted population growth for St. Johns, and some of these launches are forecasted to go to Duval as a destination county. Similarly for St. Johns, even though launches originating there are forecasted to increase substantially (by about 31% due in part to a forecasted increase in the age 35-64 white male population of about 40%), St. Johns is only forecasted to see a 5% growth in launches where St. Johns is the destination site. The reason is that almost half of the launches where St. Johns is the destination county originate from outside of St. Johns, and trips originating in the source counties, such as the ones adjacent to St. Johns, are forecasted to decline by over 100,000 launches by 2025.

Table 3.58: Estimated launches by origin county, 2006 – 2025.

County		Launches by origin county y2006	Launches by origin county y2010	Launches by origin county y2015	Launches by origin county y2020	Launches by origin county y2025
1	Alachua	179000	181900	182800	183400	183000
2	Baker	33000	33000	33400	33800	34000
3	Bay	203700	205600	207400	209300	206500
4	Bradford	22100	22000	21700	21700	21400
5	Brevard	517900	517200	517600	514300	499400
6	Broward	553300	546100	499600	443200	385100
7	Calhoun	20900	20800	20600	20600	20800
8	Charlotte	246600	250300	256100	258800	255700
9	Citrus	262600	266900	273800	279600	279100
10	Clay	192000	191700	195700	203500	209300
11	Collier	279300	280000	292400	302200	303100
12	Columbia	61800	61400	61400	61800	61800
13	Desoto	35000	35200	35400	35300	34900
14	Dixie	37200	37100	36900	36900	36800
15	Duval	427700	428300	381100	333000	276700
16	Escambia	194800	194100	187400	182200	175300
17	Flagler	74100	74200	79400	84100	87200
18	Franklin	41700	41600	41100	40900	40700
19	Gadsden	46100	45100	42100	38700	36700
20	Gilchrist	27000	27100	27400	27800	27900
21	Glades	13500	13500	13600	13600	13600
22	Gulf	44000	43700	43500	43200	42900
23	Hamilton	3000	3000	3000	2900	2900
24	Hardee	26000	26000	25900	26000	26000
25	Hendry	35000	35200	35400	35900	36300
26	Hernando	155000	160000	167600	174100	176100
27	Highlands	135800	137600	140300	141000	139100
28	Hillsborough	601900	600700	582900	568700	551000
29	Holmes	31000	31000	30600	30800	31000
30	Indian River	150900	152600	156900	158200	156200
31	Jackson	71000	70500	68900	68100	67100
32	Jefferson	19000	19000	18900	18900	18800
33	Lafayette	13000	12600	12500	12700	12700
34	Lake	337000	342700	362600	379700	387200

Table 3.58: Estimated launches by origin county, 2006 – 2025 (continued).

County		Launches by origin county y2006	Launches by origin county y2010	Launches by origin county y2015	Launches by origin county y2020	Launches by origin county y2025
35	Lee	587800	587900	620900	649600	657700
36	Leon	218000	214700	203500	194100	185600
37	Levy	74000	74700	76000	77000	77900
38	Liberty	16000	15900	15800	15800	15700
39	Madison	19000	18900	18600	18500	18300
40	Manatee	249300	253000	259200	263200	261900
41	Marion	274600	276800	286500	297000	299400
42	Martin	176500	176700	176200	174500	169700
43	Miami-Dade	684500	692500	705100	705600	694500
44	Monroe	202800	197600	181900	167900	157100
45	Nassau	95000	97600	100800	104800	107800
46	Okaloosa	184100	183000	181600	182200	179800
47	Okechobee	49800	49500	49200	49200	48800
48	Orange	419600	420700	412500	401600	386900
49	Osceola	120100	122700	132300	142500	150500
50	Palm Beach	560600	555300	540100	519900	489900
51	Pasco	351100	351800	364900	377800	382900
52	Pinellas	652700	644400	613100	581700	544900
53	Polk	512000	513600	519400	522800	516400
54	Putnam	138000	137500	135300	134400	132000
55	Santa Rosa	213800	215700	220200	228300	234500
56	Sarasota	283900	287200	294400	297000	291700
57	Seminole	240200	239100	239000	241400	241700
58	St Johns	178400	185900	201400	219100	232900
59	St Lucie	191900	193000	204400	211800	212900
60	Sumter	63000	64400	71600	79600	85200
61	Suwannee	53000	51900	53000	54300	54800
62	Taylor	54300	54600	54400	54600	54300
63	Union	13000	12900	12800	12700	12600
64	Volusia	463700	464000	463400	459800	448400
65	Wakulla	73000	73800	75400	77500	78800
66	Walton	80100	80400	84300	88700	91200
67	Washington	43000	43300	43700	44500	45100
Total		**12628400**	**12658700**	**12666600**	**12634200**	**12397900**

Table 3.59: Estimated total launches by destination county, 2006 – 2025.

County		Launches by destination county y2006	Launches by destination county y2006	Launches by destination county y2006	Launches by destination county y2006	Launches by destination county y2006
1	Alachua	52500	53100	53500	54000	54000
2	Baker	14900	14900	14600	14300	13900
3	Bay	257700	258700	259100	260400	258100
4	Bradford	10600	10600	10500	10600	10500
5	Brevard	584300	584800	587400	586500	574200
6	Broward	587900	584200	556300	519200	477000
7	Calhoun	9000	9000	8900	8900	8800
8	Charlotte	307300	310000	319500	325900	324600
9	Citrus	499100	504800	518500	531600	534000
10	Clay	36200	36300	36100	36300	36100
11	Collier	326600	327300	341700	353200	354400
12	Columbia	12000	11900	11900	12000	11900
13	Desoto	24500	24700	25500	26200	26300
14	Dixie	125500	125600	126200	127300	127300
15	Duval	411000	413300	390000	368000	339400
16	Escambia	164200	164200	162000	161600	159700
17	Flagler	141700	142600	144700	147100	147000
18	Franklin	117000	116400	113800	111900	110000
19	Gadsden	24800	24500	23400	22400	21700
20	Gilchrist	7700	7800	7800	7900	7900
21	Glades	29300	29400	30300	31000	30900
22	Gulf	70500	70200	69600	69100	68400
23	Hamilton	4400	4400	4400	4400	4400
24	Hardee	14700	14800	15100	15300	15200
25	Hendry	42200	42300	43700	44900	45100
26	Hernando	208300	210600	216100	221000	221600
27	Highlands	33700	34000	34700	35000	34600
28	Hillsborough	755900	757200	754200	751000	737200
29	Holmes	7900	8000	8000	8100	8100
30	Indian River	227200	228100	232000	233100	229200
31	Jackson	17000	16900	16600	16500	16300
32	Jefferson	7200	7100	7000	6800	6700
33	Lafayette	4900	4800	4800	4900	4900
34	Lake	117800	119300	124100	128200	129400

Table 3.59: Estimated total launches by destination county, 2006 – 2025 (continued).

County		Launches by destination county y2006	Launches by destination county y2006	Launches by destination county y2006	Launches by destination county y2006	Launches by destination county y2006
35	Lee	490600	492100	513800	531700	534600
36	Leon	38300	37900	36300	35000	33900
37	Levy	330400	333400	340200	347100	348500
38	Liberty	7600	7600	7500	7400	7300
39	Madison	6200	6200	6100	6100	6000
40	Manatee	256800	258700	261200	262300	258600
41	Marion	51300	51800	53400	55100	55500
42	Martin	211000	211000	211500	209800	203800
43	Miami-Dade	645300	647600	641300	624700	600100
44	Monroe	227900	224400	212400	200300	189500
45	Nassau	143800	145300	141300	138000	132700
46	Okaloosa	195000	194600	194400	196300	195400
47	Okechobee	24900	24900	25100	25200	24700
48	Orange	72700	73100	73500	73300	72000
49	Osceola	40700	41100	42300	43400	43800
50	Palm Beach	485100	481400	468400	450300	424500
51	Pasco	415900	417500	421900	425800	422300
52	Pinellas	1067000	1066400	1055700	1043400	1016300
53	Polk	201800	202300	203200	203400	200400
54	Putnam	58100	58100	58000	58300	57900
55	Santa Rosa	208600	209200	208900	211100	211300
56	Sarasota	315200	317700	323000	325100	320200
57	Seminole	76200	75900	75100	75000	74200
58	St Johns	367600	372500	377100	383900	384400
59	St Lucie	255300	256200	261400	263600	260000
60	Sumter	54800	55500	57800	60000	60800
61	Suwannee	11000	10800	10900	11100	11100
62	Taylor	136500	136100	135200	135000	134000
63	Union	6200	6300	6200	6200	6200
64	Volusia	659100	660600	663900	665100	655400
65	Wakulla	179000	177600	172400	168400	164600
66	Walton	116800	116900	118800	121500	122300
67	Washington	16300	16400	16400	16600	16700
Total		**12628400**	**12658700**	**12666600**	**12634200**	**12397900**

3.6.2 Discussion on capacity and demand

When management agencies are faced with competing uses for scarce public funding, such as two counties competing for new ramp development, it becomes even more important to use an analytical and transparent framework to guide the decision making process. Within the economic paradigm, the most common approach to evaluating the worthiness of projects is to compare their potential economic benefits to their costs. This often takes the form of a benefit/cost analysis (see example case studies in the Lee County Site Suitability section). The estimation of consumer surplus at the level of individual boat ramps, and aggregated to counties, provides the basis for this analytical framework.

Also important to the process is a good understanding of the present and projected level of public launch facility capacity. It is often the goal of management agencies to minimize congestion in areas where use has exceeded capacity. As a proxy for boat ramp capacity, the ratios of boat ramp launches to parking lot size, number of boating lanes and number of restrooms were estimated at the county level. While not a direct measure of capacity, these ratio variables provide a means to compare use and capital base across counties.

Management agencies could rank order these capacity ratios by water access (salt or freshwater) allowing a comparison of relative boating facility capacity across counties. This process could be repeated for projected boating demand to the year 2025 to evaluate projected changes in relative capacity. Likewise, counties could also be rank ordered by consumer surplus and compared to the county capacity rankings. Results for the lane capacity ratios for both marine and freshwater ramps for the current year and the year 2025 use estimates are presented in Table 3.60. The ratio results for parking lot size and restroom capacity are found in Tables 3.61 and 3.62 respectively.

Freshwater Capacity and Demand

Beginning with freshwater access ramps, presently the counties with the lowest capacity in parking include Bay, Manatee, Collier' Miami-Dade and Taylor. When boating demand is projected to the year 2025, Miami-Dade County is replaced in this list by St. Johns County. Similarly, Bay, Collier, Manatee, Charlotte and St. Johns counties have the lowest ramp lane capacity, and this is not expected to change by the year 2025. Finally, looking at restroom usage, Walton, Union and Levy counties presently have no restrooms available at public access ramps. Focusing on counties with restrooms located at their freshwater ramps, Volusia, Bay, Charlotte, Collier and Hernando have the most heavily used facilities in the state. In summary, Bay, Charlotte and Collier rank near the bottom of capacity for lane accessibility, parking and restroom availability.

Considering the county rank ordering of consumer surplus, Polk, Broward, Collier, Miami-Dade and Palm Beach contribute the largest share of value to those who trailer their boats to public access freshwater ramps. Of this group of high valued counties, Collier County is the most constrained on ramp lanes, parking and restrooms. Accordingly, this would make Collier County a reasonable choice for future ramp development (Table 3.49 and Tables 3.60 to 3.62).

Table 3.60: Launch capacity by county - freshwater and salt water access, 2006 - 2025 (per lane).

County		Fresh + Salt Water		Freshwater Only		Salt Water Only	
		Present	Year 2025	Present	Year 2025	Present	Year 2025
1	Alachua	1694	1740	1694	1740	NA	NA
2	Baker	2981	2776	2981	2776	NA	NA
3	Bay	4685	4693	33757	34210	4147	4146
4	Bradford	1177	1162	1177	1162	NA	NA
5	Brevard	6351	6241	5426	5250	6591	6500
6	Broward	5820	4723	3429	2738	8680	7097
7	Calhoun	531	519	531	519	NA	NA
8	Charlotte	14631	15457	10669	11479	16216	17048
9	Citrus	10620	11361	1737	1853	17795	19041
10	Clay	2014	2008	2014	2008	NA	NA
11	Collier	9332	10127	25406	27896	6652	7165
12	Columbia	855	853	855	853	NA	NA
13	Desoto	2719	2919	2719	2919	NA	NA
14	Dixie	3303	3350	703	708	4656	4724
15	Duval	7339	6060	3198	2483	12474	10496
16	Escambia	3648	3550	3064	2841	3815	3752
17	Flagler	9444	9801	5224	5661	10500	10836
18	Franklin	2208	2075	689	673	2653	2486
19	Gadsden	1376	1205	1376	1205	NA	NA
20	Gilchrist	407	417	407	417	NA	NA
21	Glades	946	998	946	998	NA	NA
22	Gulf	1807	1754	575	566	3401	3291
23	Hamilton	210	208	210	208	NA	NA
24	Hardee	1633	1693	1633	1693	NA	NA
25	Hendry	3246	3467	3246	3467	NA	NA
26	Hernando	9058	9634	3703	4011	10947	11619
27	Highlands	449	462	449	462	NA	NA
28	Hillsborough	12599	12286	4963	4629	17019	16719
29	Holmes	722	735	722	735	NA	NA
30	Indian River	6884	6945	4880	4949	7525	7583
31	Jackson	771	743	771	743	NA	NA
32	Jefferson	796	743	796	743	NA	NA
33	Lafayette	443	443	443	443	NA	NA
34	Lake	1178	1294	1178	1294	NA	NA

Table 3.60: Launch capacity by county - freshwater and salt water access, 2006 - 2025 (per lane) (continued).

County		Fresh + Salt Water		Freshwater Only		Salt Water Only	
		Present	Year 2025	Present	Year 2025	Present	Year 2025
35	Lee	8177	8910	NA	NA	8177	8910
36	Leon	1127	996	1127	996	NA	NA
37	Levy	9718	10251	1172	1228	12795	13499
38	Liberty	363	350	363	350	NA	NA
39	Madison	1248	1208	1248	1208	NA	NA
40	Manatee	7782	7837	10942	11396	7346	7346
41	Marion	2231	2414	2231	2414	NA	NA
42	Martin	5553	5364	2788	2693	7166	6923
43	Miami-Dade	5563	5173	5607	5306	5549	5133
44	Monroe	2398	1995	NA	NA	2398	1995
45	Nassau	8987	8296	2312	2255	17568	16064
46	Okaloosa	3750	3757	2289	2244	4524	4558
47	Okechobee	1464	1455	1464	1455	NA	NA
48	Orange	1548	1533	1548	1533	NA	NA
49	Osceola	1017	1094	1017	1094	NA	NA
50	Palm Beach	4851	4245	2231	1933	8184	7187
51	Pasco	11884	12066	7078	7392	14087	14208
52	Pinellas	8402	8002	7211	6380	8611	8288
53	Polk	1208	1200	1208	1200	NA	NA
54	Putnam	1382	1378	1382	1378	NA	NA
55	Santa Rosa	3023	3062	2002	2052	3306	3342
56	Sarasota	7881	8005	7119	7153	8102	8252
57	Seminole	8466	8243	3628	3533	NA	NA
58	St Johns	11141	11648	8799	10290	11661	11950
59	St Lucie	6382	6501	4132	4262	7466	7578
60	Sumter	2609	2895	2609	2895	NA	NA
61	Suwannee	1096	1110	1096	1110	NA	NA
62	Taylor	5055	4963	4161	4138	5126	5029
63	Union	1248	1233	1248	1233	NA	NA
64	Volusia	5447	5416	2249	2213	7408	7381
65	Wakulla	3654	3359	739	738	6056	5521
66	Walton	2849	2984	1334	1468	3723	3859
67	Washington	354	363	354	363	NA	NA

Table 3.61: Parking capacity by county - freshwater and salt water access, 2006 - 2025 (launches per parking sq. ft.).

County		Fresh + Salt Water		Freshwater Only		Salt Water Only	
		Present	Year 2025	Present	Year 2025	Present	Year 2025
1	Alachua	0.1421	0.1460	0.1421	0.1460	NA	NA
2	Baker	0.7747	0.7213	0.7747	0.7213	NA	NA
3	Bay	0.8306	0.8320	3.7508	3.8011	0.7434	0.7433
4	Bradford	0.2209	0.2181	0.2209	0.2181	NA	NA
5	Brevard	0.5590	0.5494	0.3195	0.3091	0.6660	0.6568
6	Broward	0.5983	0.4854	0.3333	0.2661	0.9577	0.7830
7	Calhoun	0.1120	0.1095	0.1120	0.1095	NA	NA
8	Charlotte	0.8729	0.9222	0.6132	0.6597	0.9825	1.0329
9	Citrus	1.8430	1.9717	0.4739	0.5055	2.3866	2.5537
10	Clay	0.3090	0.3081	0.3090	0.3081	NA	NA
11	Collier	0.7584	0.8231	1.0863	1.1928	0.6362	0.6853
12	Columbia	0.2161	0.2157	0.2161	0.2157	NA	NA
13	Desoto	0.2074	0.2228	0.2074	0.2228	NA	NA
14	Dixie	1.3633	1.3827	0.1987	0.2003	2.5240	2.5611
15	Duval	0.9106	0.7519	0.4449	0.3454	1.3647	1.1484
16	Escambia	0.5089	0.4952	0.5964	0.5530	0.4924	0.4843
17	Flagler	1.3832	1.4355	0.6320	0.6848	1.6232	1.6753
18	Franklin	0.5209	0.4895	0.5121	0.5006	0.5216	0.4887
19	Gadsden	0.2560	0.2243	0.2560	0.2243	NA	NA
20	Gilchrist	0.1088	0.1115	0.1088	0.1115	NA	NA
21	Glades	0.0688	0.0725	0.0688	0.0725	NA	NA
22	Gulf	0.1658	0.1609	0.1499	0.1475	0.1697	0.1643
23	Hamilton	0.0264	0.0262	0.0264	0.0262	NA	NA
24	Hardee	0.0661	0.0685	0.0661	0.0685	NA	NA
25	Hendry	0.3250	0.3471	0.3250	0.3471	NA	NA
26	Hernando	0.9059	0.9635	0.9247	1.0016	0.9037	0.9591
27	Highlands	0.0465	0.0478	0.0465	0.0478	NA	NA
28	Hillsborough	1.1075	1.0801	0.4575	0.4267	1.4570	1.4314
29	Holmes	0.1067	0.1087	0.1067	0.1087	NA	NA
30	Indian River	0.6818	0.6878	0.4202	0.4261	0.7829	0.7890
31	Jackson	0.1145	0.1103	0.1145	0.1103	NA	NA
32	Jefferson	0.0881	0.0823	0.0881	0.0823	NA	NA
33	Lafayette	0.0678	0.0677	0.0678	0.0677	NA	NA
34	Lake	0.1283	0.1409	0.1283	0.1409	NA	NA

Table 3.61: Parking capacity by county - freshwater and salt water access, 2006 - 2025 (launches per parking sq. ft.) (continued).

County		Fresh + Salt Water		Freshwater Only		Salt Water Only	
		Present	Year 2025	Present	Year 2025	Present	Year 2025
35	Lee	0.7747	0.8442	NA	NA	0.7747	0.8442
36	Leon	0.1718	0.1518	0.1718	0.1518	NA	NA
37	Levy	2.5356	2.6747	0.8806	0.9226	2.7031	2.8520
38	Liberty	0.1304	0.1257	0.1304	0.1257	NA	NA
39	Madison	0.1357	0.1314	0.1357	0.1314	NA	NA
40	Manatee	0.8225	0.8283	2.0095	2.0929	0.7334	0.7335
41	Marion	0.1029	0.1113	0.1029	0.1113	NA	NA
42	Martin	0.4074	0.3935	0.1833	0.1770	0.5638	0.5446
43	Miami-Dade	0.9473	0.8809	1.0222	0.9672	0.9265	0.8570
44	Monroe	0.2827	0.2351	NA	NA	0.2827	0.2351
45	Nassau	0.9545	0.8812	0.2954	0.2880	1.5337	1.4025
46	Okaloosa	0.6803	0.6815	0.6077	0.5959	0.7028	0.7081
47	Okechobee	0.0776	0.0772	0.0776	0.0772	NA	NA
48	Orange	0.1072	0.1062	0.1072	0.1062	NA	NA
49	Osceola	0.2746	0.2953	0.2746	0.2953	NA	NA
50	Palm Beach	0.4889	0.4279	0.3244	0.2810	0.5933	0.5210
51	Pasco	1.4971	1.5201	0.9011	0.9411	1.7662	1.7814
52	Pinellas	0.8189	0.7799	0.7473	0.6611	0.8306	0.7994
53	Polk	0.0934	0.0928	0.0934	0.0928	NA	NA
54	Putnam	0.2283	0.2276	0.2283	0.2276	NA	NA
55	Santa Rosa	0.4018	0.4070	0.3585	0.3674	0.4101	0.4146
56	Sarasota	0.8624	0.8759	0.4248	0.4268	1.1697	1.1914
57	Seminole	0.4968	0.4838	0.4968	0.4838	NA	NA
58	St Johns	1.4394	1.5050	0.8954	1.0471	1.6027	1.6424
59	St Lucie	0.9779	0.9961	0.6162	0.6357	1.1593	1.1767
60	Sumter	0.4940	0.5481	0.4940	0.5481	NA	NA
61	Suwannee	0.1459	0.1478	0.1459	0.1478	NA	NA
62	Taylor	1.2115	1.1895	1.0124	1.0069	1.2272	1.2039
63	Union	0.4099	0.4052	0.4099	0.4052	NA	NA
64	Volusia	0.5887	0.5854	0.2265	0.2228	0.8383	0.8353
65	Wakulla	0.8975	0.8250	0.2345	0.2342	1.2269	1.1186
66	Walton	0.8771	0.9188	0.5170	0.5690	1.0246	1.0621
67	Washington	0.1363	0.1396	0.1363	0.1396	NA	NA

Table 3.62: Restroom capacity by county - freshwater and salt water access, 2006 - 2025 (launches per restroom).

County		Fresh + Salt Water		Freshwater Only		Salt Water Only	
		Present	Year 2025	Present	Year 2025	Present	Year 2025
1	Alachua	6851	7037	6851	7037	NA	NA
2	Baker	7453	6939	7453	6939	NA	NA
3	Bay	14184	14207	33757	34210	13041	13040
4	Bradford	5779	5705	5779	5705	NA	NA
5	Brevard	18258	17944	9372	9067	22913	22594
6	Broward	21377	17346	11093	8857	38026	31090
7	Calhoun	1389	1358	1389	1358	NA	NA
8	Charlotte	27932	29509	32008	34438	27026	28414
9	Citrus	37909	40555	10421	11116	47845	51196
10	Clay	3295	3285	3295	3285	NA	NA
11	Collier	19212	20849	31757	34870	15352	16535
12	Columbia	3989	3983	3989	3983	NA	NA
13	Desoto	12234	13137	12234	13137	NA	NA
14	Dixie	14935	15148	1827	1842	34233	34737
15	Duval	22215	18345	8621	6693	44549	37487
16	Escambia	10945	10649	5107	4735	14836	14592
17	Flagler	18889	19603	5224	5661	27999	28897
18	Franklin	13506	12691	8265	8078	14183	13287
19	Gadsden	3538	3099	3538	3099	NA	NA
20	Gilchrist	2579	2642	2579	2642	NA	NA
21	Glades	4776	5035	4776	5035	NA	NA
22	Gulf	4859	4717	1488	1464	9635	9326
23	Hamilton	734	728	734	728	NA	NA
24	Hardee	3674	3809	3674	3809	NA	NA
25	Hendry	16880	18028	16880	18028	NA	NA
26	Hernando	28408	30216	22221	24069	29400	31203
27	Highlands	1417	1458	1417	1458	NA	NA
28	Hillsborough	31497	30716	12132	11315	43116	42356
29	Holmes	1985	2022	1985	2022	NA	NA
30	Indian River	20651	20834	7808	7918	31353	31597
31	Jackson	2313	2228	2313	2228	NA	NA
32	Jefferson	1791	1673	1791	1673	NA	NA
33	Lafayette	4875	4873	4875	4873	NA	NA
34	Lake	3366	3696	3366	3696	NA	NA

Table 3.62: Restroom capacity by county - freshwater and salt water access, 2006 - 2025 (launches per restroom) (continued).

County		Fresh + Salt Water		Freshwater Only		Salt Water Only	
		Present	Year 2025	Present	Year 2025	Present	Year 2025
35	Lee	18632	20302	NA	NA	18634	20304
36	Leon	3285	2902	3285	2902	NA	NA
37	Levy	70804	74686	NA	NA	68495	72267
38	Liberty	2541	2448	2541	2448	NA	NA
39	Madison	6241	6042	6241	6042	NA	NA
40	Manatee	20545	20691	14589	15195	22426	22426
41	Marion	3947	4271	3947	4271	NA	NA
42	Martin	12789	12354	6506	6284	16380	15823
43	Miami-Dade	33962	31583	21628	20464	41157	38069
44	Monroe	6718	5588	NA	NA	6717	5587
45	Nassau	23964	22124	20812	20292	24595	22490
46	Okaloosa	11251	11272	6508	6382	13983	14089
47	Okechobee	5971	5938	5971	5938	NA	NA
48	Orange	2346	2324	2346	2324	NA	NA
49	Osceola	3129	3366	3129	3366	NA	NA
50	Palm Beach	14266	12485	5950	5155	27701	24326
51	Pasco	18907	19196	12977	13553	21130	21313
52	Pinellas	44771	42642	19574	17316	55259	53184
53	Polk	3062	3040	3062	3040	NA	NA
54	Putnam	4098	4086	4098	4086	NA	NA
55	Santa Rosa	10011	10141	3754	3847	13914	14068
56	Sarasota	26270	26683	16018	16095	31396	31977
57	Seminole	11722	11414	11722	11414	NA	NA
58	St Johns	29608	30958	17598	20580	33423	34252
59	St Lucie	18235	18573	6714	6927	33596	34102
60	Sumter	5479	6079	5479	6079	NA	NA
61	Suwannee	3653	3699	3653	3699	NA	NA
62	Taylor	10775	10579	4161	4138	12011	11783
63	Union	NA	NA	NA	NA	NA	NA
64	Volusia	15064	14980	4703	4626	25544	25452
65	Wakulla	11189	10286	1725	1723	23357	21295
66	Walton	7535	7894	2858	3146	11387	11803
67	Washington	930	953	930	953	NA	NA

Salt Water Capacity and Demand

Within the salt water access sites, the counties with the least capacity for parking include Levy, Dixie, Citrus, Pasco and Flagler. When boating demand is projected to the year 2025, the rankings remain unchanged. Launch lane capacity in Citrus, Nassau, Hillsborough, Charlotte and Pasco counties is lowest among the salt water access sites. This too is not expected to change by the year 2025. Finally, looking at restroom usage, Levy, Pinellas, Citrus, Duval and Hillsborough counties have the most heavily used restroom facilities of salt water sites. By the year 2025 Duval is expected to be replaced by Miami-Dade. In summary, only Citrus County ranks consistently at or near the bottom of capacity for lane accessibility, parking and restrooms. This is not expected to change by the year 2025 based on projected boater demand (Tables 3.60 to 3.62).

The rank ordering of consumer surplus for salt water access sites finds that Pinellas, Hillsborough, Volusia, Miami-Dade and Lee counties contribute the most to statewide value. Of this group, only Miami-Dade County ranks among the most capacity constrained counties. However, Citrus County is ranked ninth in consumer surplus, making it and Miami-Dade good prospects for infrastructure improvement (Table 3.49 and Tables 3.60 to 3.62.

3.6.3 Supply of Launch Access and Facilities

In the above sections, demand for boating sites has been related to the characteristics of the sites and to projected demographic changes. The demand forecasts assume that there are no changes in the supply of access and facilities of launches; however, for capital budgeting of public resources and other planning purposes, it would be useful to have forecasts of the future supply of ramp access, capacities, and facilities. This need was considered by the project team and efforts were made to address it.

One of the key challenges faced in this effort regards the nature of supply of the ramps and their facilities. In typical market supply and demand studies, supply is driven by private decision-makers in light of market conditions, costs, and technology, among other factors. However, the supply of launch sites and facilities in Florida are not entirely market driven. Although there are private marinas that allow fee-based launch access to the general public, the large majority of launches are made from publicly owned and operated ramps. While the public ramps face market pressures, their supply is driven by many factors external to the market such as public budgets and politics. Moreover, in both the private and public sectors, the provision of ramps and facilities are also influenced by governmental rules and regulations (e.g., permitting needs), as well as external market trends that influence costs (e.g., increases in the demand for coastal properties will increase the costs of acquiring and paying property taxes on coastal land). Finally, plans for expansion are not always certain and the information can be exploited by potential competitors or political opponents. The potential uncertainty and sensitivity of this information was expected to make it all the more difficult to acquire. Despite these potential difficulties, efforts were made to collect information on expansion plans from both public and private sectors. However, the results were inconclusive and deemed unreliable, partly because many marinas were not interested in providing such data, and item and overall response problems yielded data that were too spotty to be conclusive. Consequently, we take an alternative approach to considering future supply issues. In what follows, we consider the need to supply future public launch ramps so as to at least maintain the present capacity levels in counties where demand is forecasted to grow.

3.7 A PROCESS TO IDENTIFY WHAT CAPITAL COSTS WILL BE NECESSARY TO MEET CURRENT AND FUTURE ACCESS DEMAND

3.7.1 Introduction

This section of the report focuses on spending on capital improvements related to boating access in the state of Florida. It includes: (1) the findings and conclusions from a survey of cities and counties to identify capital improvement plans, needs and spending; (2) recommendations for how the results from this study can be utilized to improve on the future allocation of monies available for boating access; and, (3) suggestions for the development of a system which will provide better information on capital needs and spending.

The combined results of the study clearly show that: (1) that participation in recreational boating is projected to change over the next 16 years and this will require a change in the allocation of boating access investments; (2) in many counties and cities, financing the upkeep and renovation of existing boating access sites will become a greater challenge than the development of new sites; (3) there is significant variation in the type, reliability and validity of information and studies which have been utilized to verify the need and to argue both in support of and in opposition to boating access including marinas; (4) the public [consumer surplus] value of access sites in different counties and even across launch sites in the same county differs significantly indicating the importance of assessing consumer surplus when evaluating proposed launch sites; (5) the public value and economic significance of recreational boating is substantial and wide-spread which makes it even more important that decisions related to future investments in public boat access are analytical and based on economic information; (6) currently, the public [consumer surplus] value and economic development benefits of public access sites are not adequately incorporated into decisions on the development or financing of boating access; (7) most counties and cities do not have, and are not required to have, comprehensive public access plans or multi-year capital budgets related to boating access; (8) there is no consistent current information available about boating access-related capital expenditures, needs or spending projects for counties, cities and certainly not for private companies; and (9) while this study has produced valuable information and tools (e.g., Random Utility Models [RUM Models], economic impact assessment, site suitability) with the potential for enhancing the efficiency and effectiveness of future boating access investments, its actual impact depends on regularly updating the information, requiring that the information and tools are part of boating access grant applications, and educating agencies and organizations on how to use the tools and information.

3.7.2 Capital Budgeting Needs, Projects and Expenditures

As part of this overall study the Recreational Marine Research Center (RMRC) conducted a web-based survey to assess boating access capital budgeting priorities and the plans of counties and cities. An invitation email was sent along with three separate reminder emails. Respondents were provided with two weeks to respond to the survey. A total of 33 officials responded; 16 representing city governments or agencies, and 16 representing counties (Appendix O and P).

The survey collected information about: (1) the number of public access sites and launch ramps the county/city maintains; (2) whether they have estimates of the numbers of launches annually at their launch sites; (3) how they arrive at these estimates; (4) spending (in dollars) on the maintenance and operations of public access sites in 2009; (5) the source(s) of funding used to maintain/operate public access sites in their city/county; (6) spending on capital improvements for public access sites in 2009; (7) types of capital improvements in 2009; (8) whether they have a prioritized list that identifies future needed capital improvements for public access sites; (9) estimates of what will be necessary in terms of

capital improvements (in dollars) to make improvements to public access sites in 2010; (10) some of the major problems and concerns related to the adequacy and operation of public access sites in their city/county; (11) considered actions in response to expected future access site issues in response to the current economic and budgetary problems confronted by Florida cities and counties.

RMRC received more than fifteen emails indicating that the city/county did not collect or maintain the information requested in the survey. A number of others wrote that it would take more than two weeks to respond implying that the information was not readily available. RMRC had additional follow-up discussions with a number of the agencies and organizations which revealed that the capital budgeting information is either not available, or that it is collected irregularly using different measures and methods.

The results of the survey are presented in Tables 3.63 to 3.71 and in Appendix P. Only about 21% of the agencies that responded have estimates of the use (number of launches) for the launch sites that they operate. They estimate utilization through traffic counters and fees/donations. The reliability of these methods should be evaluated, and the Florida Fish and Wildlife Conservation Commission (FWC) should test and recommend enhancements. These enhancement methods should be incorporated into an educational program aimed at improving boating access information and capital allocation decisions.

The results indicate the impacts of a worsening budget situation in Florida. About 16% of respondents indicate that they will spend less in 2009 than they did in 2008 on maintenance and operations of the boating access facilities. Interestingly though, about 12% will actually spend more in 2009. Most of the funding for maintenance and operations still comes primarily from the general fund revenues of the cities and towns. Only about 22% of the agencies now generate funding through fees and charges. In large part, the reluctance to charge fees is due to the inefficiency of collecting fees and also because some boaters feel that they are already paying for the cost of providing launch opportunities through their vessel registration fees. However, this is not the case, and boaters need to be better educated about the increasing cost of maintaining and updating launch facilities. About 71% of the respondents have prioritized lists for capital improvements of boating access in their cities and counties. However, the criteria for establishing these priorities are not consistent and there is no current requirement, as will be discussed later, for reporting these priorities to FWC or to any other central database.

As would be expected, a small percentage (12%) developed new launch sites and the same percentage of respondents added ramps/lanes to existing sites. Forty-six percent of the respondents renovated or expanded existing launch lanes or docks, and the same percentage renovated or expanded parking areas and added amenities to existing sites. These results are understandable given the incredibly high cost of purchasing waterfront property in Florida. Table 3.72 shows that the cost of one acre of coastal waterfront property acquired for public access averages $15 million and an acre of inland lake/river property averages $7.5 million. The cost is much less in the northwest part of the state but it is still substantial, $1.1 million per acre for coastal property and $400,000 per acre on inland lakes/rivers. The survey results suggest that tools for assessing investments in public access and findings need to be as relevant and applicable to the assessment of proposed launch site renovations and expansions as they are for new-site development decisions.

Respondents were asked to identify needed capital improvements in the launch sites that they manage. Two-thirds identified renovation or expansion of ramps or docks at existing launch sites as needing improvements, while 58% indicated the need to renovate or expand parking areas. Half of the respondents stated that additional amenities were needed and 46% identified a need for dredging. A relatively high percentage (39%) indicated a need for new launch sites; however, the cost of acquiring land and permitting are major limitations to developing new sites.

Table 3.63: Percent with and without estimates of number of launches per year at public access sites operated by city/county.

Have estimates of number of launches per year at public access sites operated by the city/county?	
Yes	20.7%
No	79.3%

Table 3.64: Methods for arriving at annual launch estimates.

Methods for arriving at annual launch estimates	
Traffic centers	33.3%
Parking lot payment/donation boxes	50.0%
Fees	66.7%
Other	50.0%

Table 3.65: Comparison of 2009 spending on maintenance/operations to spending in 2008.

Comparison of 2009 spending on maintenance/ operations to spending in 2008	
More than in 2008	12.0%
About the same as in 2008	72.0%
Less than in 2008	16.0%

Table 3.66: Funding Sources used to maintain/operate public access sites.

Funding source used to maintain/ operate public access sites	
City general fund revenues	50.0%
County general fund revenues	38.5%
Fees and charges	23.1%
Special assessments	3.8%
Other	46.2%

Table 3.67: Types of capital improvements to be accomplished in 2009.

Types of capital improvements to be accomplished in 2009	
Entirely new launch sites	11.5%
Add additional ramps to existing launch sites	11.5%
Renovation or expansion of ramps or docks at existing launch sites	46.2%
Dredging of launch sites	23.1%
Renovation or expansion of parking areas	46.2%
Amenities	46.2%
Other	19.2%

Table 3.68: Percent with prioritized list that identifies future needed capital improvements.

Have prioritized list that identifies future needed capital improvements?	
Yes	70.8%
No	29.2%

Table 3.69: Identified needed improvements in public access sites.

Identified needed improvements in public access sites	
Entirely new launch sites	38.5%
Add additional ramps to existing launch sites	26.9%
Renovation or expansion of ramps or docks at existing launch sites	65.4%
Dredging of launch sites	46.2%
Renovation or expansion of parking areas	57.7%
Amenities	50.0%
Other	7.7%

Respondents were also asked to identify major problems and concerns related to the adequacy and operations of boat launch sites. The greatest percentage (85%) identified insufficient parking. Almost two-thirds (65%) cited overcrowding, followed by insufficient dock space (46%), and the need to accommodate larger boats (39%). About half (45%) are considering potential actions in response to these problems. Twenty-seven percent of those considering actions are contemplating deferring capital improvements and 27% are considering imposition of new or increased fees and charges.

Table 3.70: Major problems/concerns related to adequacy/operation of public access sites.

Major problems/concerns related to adequacy/operation of public access sites	
Overcrowding	65.4%
Need to accommodate larger boats	38.5%
Increased time to launch boats	23.1%
Water level/dried up	30.8%
Insufficient parking	84.6%
Insufficient dock space	46.2%
Other	26.9%

Table 3.71: Percent considering actions in response to expected future access site issues.

Considering actions in response to expected future access site issues	
No	46.2%
Yes, closing launch sites	3.8%
Yes, deferring capital improvements	26.9%
Yes, imposing new or increased fees	26.9%
Other	11.5%

Table 3.72: Cost of waterfront property in Florida regions.

Region	Coastal/Intra-coastal ($ per acre)	Inland lake/river ($ per acre)
Northeast	$3,000,000	$1,500,000
East Central	$2,000,000	$500,000
Southeast	$15,000,000	$7,500,000
Southwest	$1,500,000	$250,000
West Central	$1,500,000	$300,000
Northwest	$1,100,000	$400,000

Source: Florida DEP Appraisal Data

It should be noted that thirteen counties have Boating Facility Siting Plans that are a part of the Manatee Protection Plan. These plans can be accessed through the Internet: www.myfwc.com/WILDLIFEHABITATS/Manatee_MPP.htm. While some are very detailed, they do not usually include projections of capital improvement needs or multi-year capital budgets, nor do they include a prioritization of capital improvement projects based on demand analysis or estimates of consumer surplus. The primary purpose of the plans is to minimize the impacts of marinas and boat launch sites on marine resources. While it is also true that cities and counties employ various means for identifying boating access needs for the purpose of applying for grants to build, expand and enhance launch sites, few have comprehensive boating access plans including multi-year capital budgets.

There is no requirement that counties or cities have boating access plans or capital improvements budgets, or that they regularly report to any one organization or agency (e.g., FWC) on their capital development efforts and spending. This is even more true for the private businesses that provide access. Private boating access businesses are generally unwilling to share information (e.g., composition, cost) about future expansion and improvement projects. In many instances, uncertainties related to permitting and financing make it difficult to provide expected start and completion dates for the project. The marina surveys conducted as part of this study failed to provide adequate information to reliably assess marina capital investment needs or plans. Marina operators/managers were unwilling and/or unable to provide this information.

The capital improvements study determined that information is not available to reliably identify: (1) capital improvement plans by scope, by facility owners or by operators; (2) types of improvements envisioned (upgrades, expansion, new sites, general improvements); (3) the percent of facilities by type that have capital improvement plans; (4) expansions funded by capital improvements (marina berths, dry storage, boat ramps); (5) capital improvement plans by specific stage of development; and (6) the percent of facilities by specific stage of capital improvement (facilities listing planning stage, conceptual phase, awaiting approval.)

While the information to forecast the need for specific capital improvements is not presently available, it is still a useful exercise to project the capital needed to maintain public infrastructure at status quo levels, given the projected changes in boating demand. This can be accomplished by using cost estimates for land acquisition (Table 3.72) and ramp construction and tying these estimates to projected demand and present ramp infrastructure. Assuming the desire is to maintain access capacity at 2006 levels, capital investments for fresh and marine access statewide would fall in the range of $68 million and $111 million over the next 16 years. This estimate is based on FWC and Florida DEP sources and assumes the average boat lane costs approximately $100,000 to design, permit and construct and require between 1.5 and 2.5 acres of property. Property cost is by far the most expensive component of

ramp development and these costs vary greatly by access water type (marine or fresh) and region. Because waterfront property in Southeast Florida is significantly more expensive than the remainder of the state, this estimate could be notably higher if boating demand increases in this expensive region rather than decline as projected. Table 3.73 lists the projected required capital investments needed to maintain the 2006 status quo by county and access type.

3.7.3 Utilizing Study-Produced Information and Tools to Improve the Efficiency and Effectiveness of Evaluating Boating Access Investments

The capital improvements study has resulted in information and tools which can, if utilized effectively, improve the process for evaluating and deciding future allocations of monies available for investment in boating access. This includes development of entirely new launch sites, as well as the renovation of existing sites to increase capacity and enhance amenities. While the focus in the past has always been on development and expansion, it may be just as, if not more, important in the future to evaluate existing boating facilities that were developed many years ago and may no longer be economically viable (e.g., cost to maintain, required improvements). The tools can also be used to assess the different economic effects of closing existing launch sites (e.g., consumer surplus, economic impact, return-on-investment).

Future Demand and Launch Site Capacity to Launch Ratios

As mentioned previously, this study created a forecast model that can be used to project the number of launches per county that can be expected, given population and socio-economic makeup (e.g., age, race) for the years 2010, 2015, 2020 and 2025. The forecast model can be used to simulate changes in boating access demand that would be expected given alternative future scenarios. The projected number of future launches is then used with current launch site features/attributes including launch lanes, space for parking and restroom facilities as different launch-to-capacity ratios. The numbers of estimated present and future launches-to-capacity ratios (Tables 3.60, 3.61, and 3.62) are graphically presented in Figures 3.60 to 3.74.

This launch-to-capacity information can be used to identify launch sites that can be expected to have capacity limitations in the future, and also to identify the extent and nature of these limitations (e.g., parking, launch capacity). This, along with estimates of consumer surplus (RUM Models) associated with expanding capacity and associated economic impacts (Economic Impact Models), can be used to prioritize for future investment in launch sites (e.g., additional ramps, more parking space) that are expected to reach or exceed capacity. The information can also be used, along with consumer surplus estimates, to evaluate the potential fees and charges as a means of maintaining use levels within capacity limits. In addition, the ratio of expected future launches to capacity measures might suggest marketing strategies to redirect boaters to less-congested sites with similar features.

Table 3.73: Capital budget projections to 2025 by county and access type (marine and fresh). Capital increases needed to maintain ramp capacity at 2006 levels (Upper bound assumes 2.5 acre project, lower bound assumes 1.5 acre project. Estimates in 2009 dollars.

County		Projected Marine Access Capitial Budget Increase		Projected Fresh Water Access Capitial Budget Increase	
		Lower Bound	Upper Bound	Lower Bound	Upper Bound
1	Alachua	$0	$0	$1,978,410	$3,241,224
2	Baker	$0	$0	$0	$0
3	Bay	$0	$0	$9,382	$14,744
4	Bradford	$0	$0	$0	$0
5	Brevard	$0	$0	$0	$0
6	Broward	$0	$0	$0	$0
7	Calhoun	$0	$0	$0	$0
8	Charlotte	$1,810,221	$2,965,682	$250,616	$387,315
9	Citrus	$4,279,795	$7,011,578	$770,358	$1,190,553
10	Clay	$0	$0	$0	$0
11	Collier	$5,431,879	$8,899,035	$232,827	$355,368
12	Columbia	$0	$0	$0	$0
13	Desoto	$0	$0	$365,475	$564,825
14	Dixie	$644,653	$1,049,864	$73,645	$115,729
15	Duval	$0	$0	$0	$0
16	Escambia	$0	$0	$0	$0
17	Flagler	$1,770,961	$2,925,936	$588,972	$964,912
18	Franklin	$0	$0	$0	$0
19	Gadsden	$0	$0	$0	$0
20	Gilchrist	$0	$0	$323,708	$508,684
21	Glades	$0	$0	$797,483	$1,217,212
22	Gulf	$0	$0	$0	$0
23	Hamilton	$0	$0	$0	$0
24	Hardee	$0	$0	$181,114	$279,903
25	Hendry	$0	$0	$420,038	$641,111
26	Hernando	$2,450,094	$4,013,985	$274,452	$424,154
27	Highlands	$0	$0	$1,177,285	$1,819,440
28	Hillsborough	$0	$0	$0	$0
29	Holmes	$0	$0	$141,212	$221,904
30	Indian River	$603,710	$993,201	$96,020	$152,503
31	Jackson	$0	$0	$0	$0
32	Jefferson	$0	$0	$0	$0
33	Lafayette	$0	$0	$0	$0
34	Lake	$0	$0	$8,333,494	$13,235,550

Table 3.73: Capital budget projections to 2025 by county and access type (marine and fresh) (continued).

County		Projected Marine Access Capitial Budget Increase		Projected Fresh Water Access Capitial Budget Increase	
		Lower Bound	Upper Bound	Lower Bound	Upper Bound
35	Lee	$12,636,630	$20,702,565	$0	$0
36	Leon	$0	$0	$0	$0
37	Levy	$3,234,928	$5,299,776	$236,356	$365,278
38	Liberty	$0	$0	$0	$0
39	Madison	$0	$0	$0	$0
40	Manatee	$1,613	$2,643	$91,316	$141,125
41	Marion	$0	$0	$1,038,888	$1,605,554
42	Martin	$0	$0	$0	$0
43	Miami-Dade	$0	$0	$0	$0
44	Monroe	$0	$0	$0	$0
45	Nassau	$0	$0	$0	$0
46	Okaloosa	$447,120	$728,167	$0	$0
47	Okechobee	$0	$0	$0	$0
48	Orange	$0	$0	$0	$0
49	Osceola	$0	$0	$2,568,948	$4,080,093
50	Palm Beach	$0	$0	$0	$0
51	Pasco	$486,741	$797,426	$268,622	$415,143
52	Pinellas	$0	$0	$0	$0
53	Polk	$0	$0	$0	$0
54	Putnam	$0	$0	$0	$0
55	Santa Rosa	$1,041,821	$1,696,681	$260,332	$409,094
56	Sarasota	$1,347,004	$2,206,794	$23,715	$36,651
57	Seminole	$0	$0	$0	$0
58	St Johns	$3,079,508	$5,087,883	$2,389,141	$3,914,124
59	St Lucie	$1,260,219	$2,073,263	$349,794	$555,556
60	Sumter	$0	$0	$1,265,307	$1,955,474
61	Suwannee	$0	$0	$297,806	$487,895
62	Taylor	$0	$0	$0	$0
63	Union	$0	$0	$0	$0
64	Volusia	$0	$0	$0	$0
65	Wakulla	$0	$0	$0	$0
66	Walton	$1,663,536	$2,709,187	$1,057,166	$1,661,260
67	Washington	$0	$0	$790,887	$1,242,823
TOTAL		**$42,190,435**	**$69,163,665**	**$26,652,771**	**$42,205,200**

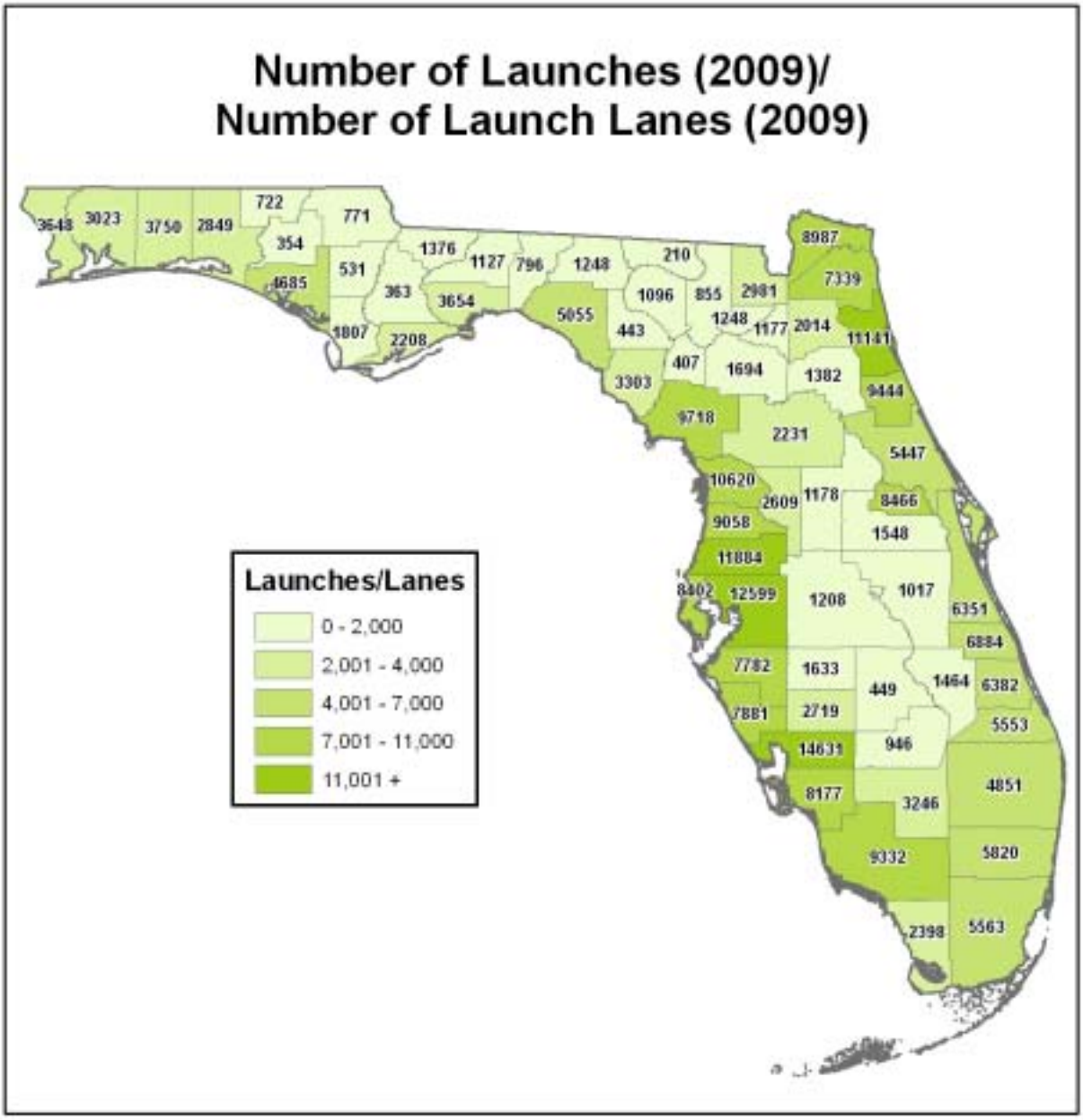


Figure 3.60: Number of launches (2009)/number of launch lanes (2009).

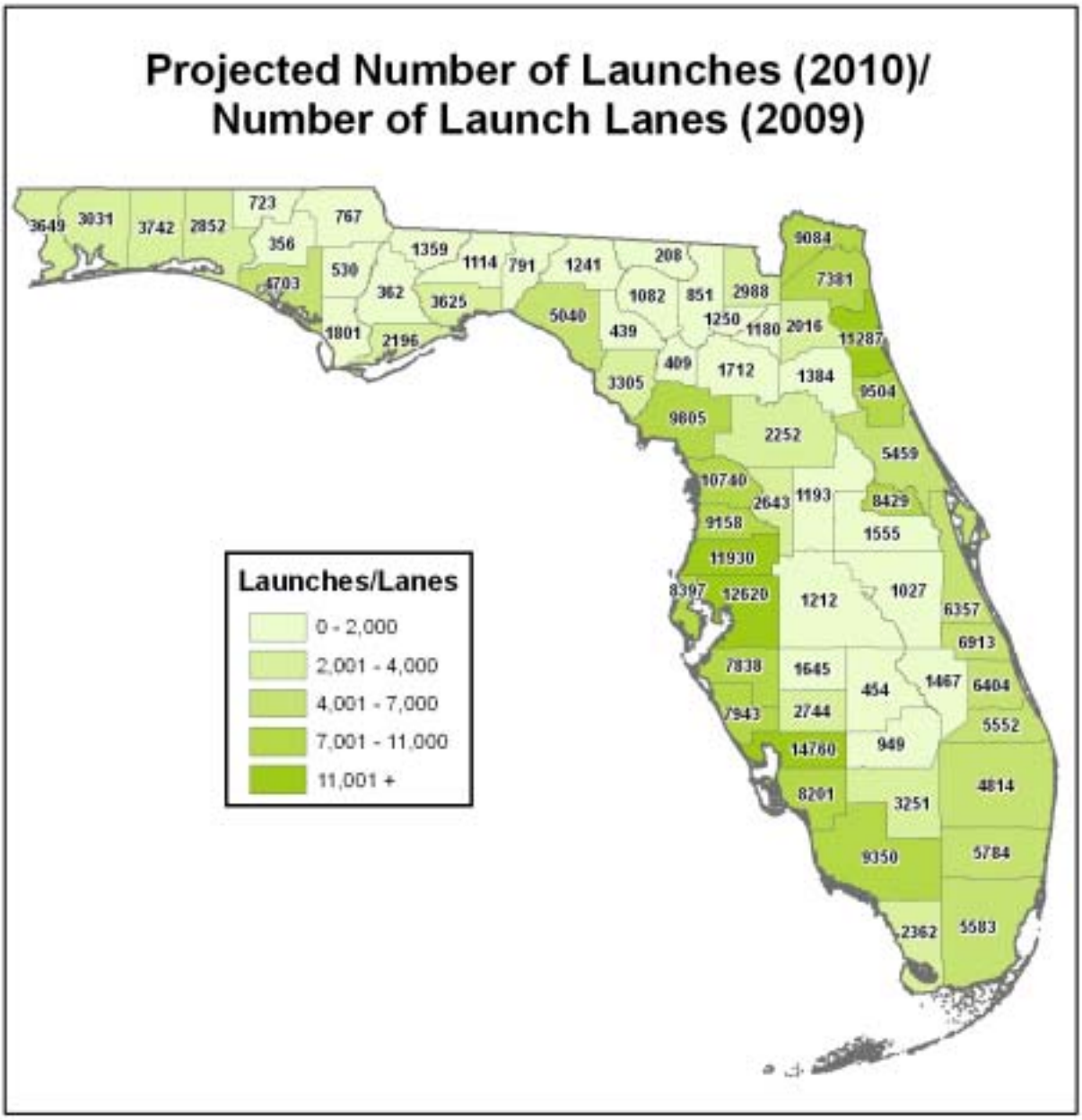


Figure 3.61: Projected number of launches (2010)/number of launch lanes (2009).

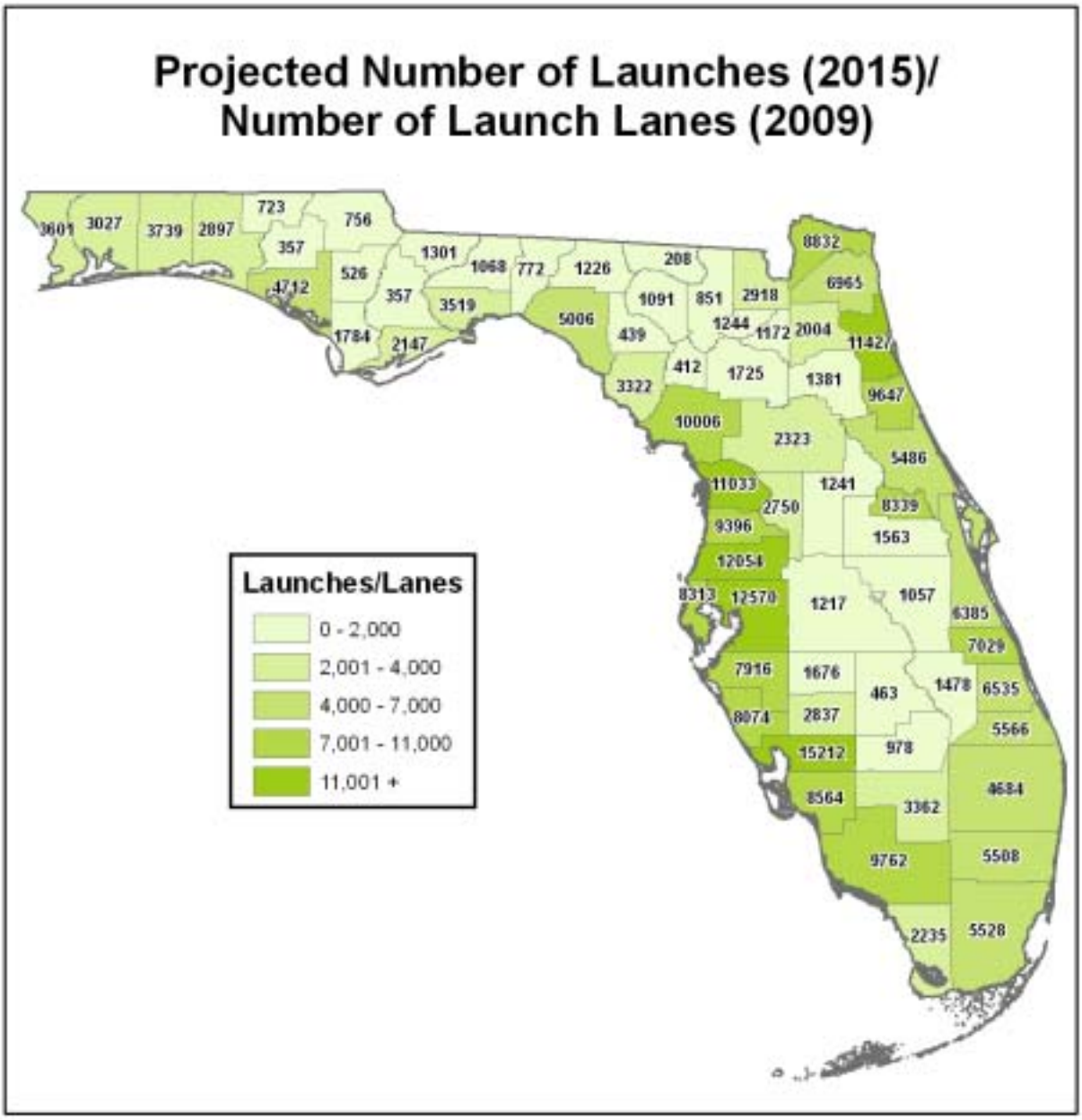


Figure 3.62: Projected number of launches (2015),number of launch lanes (2009).

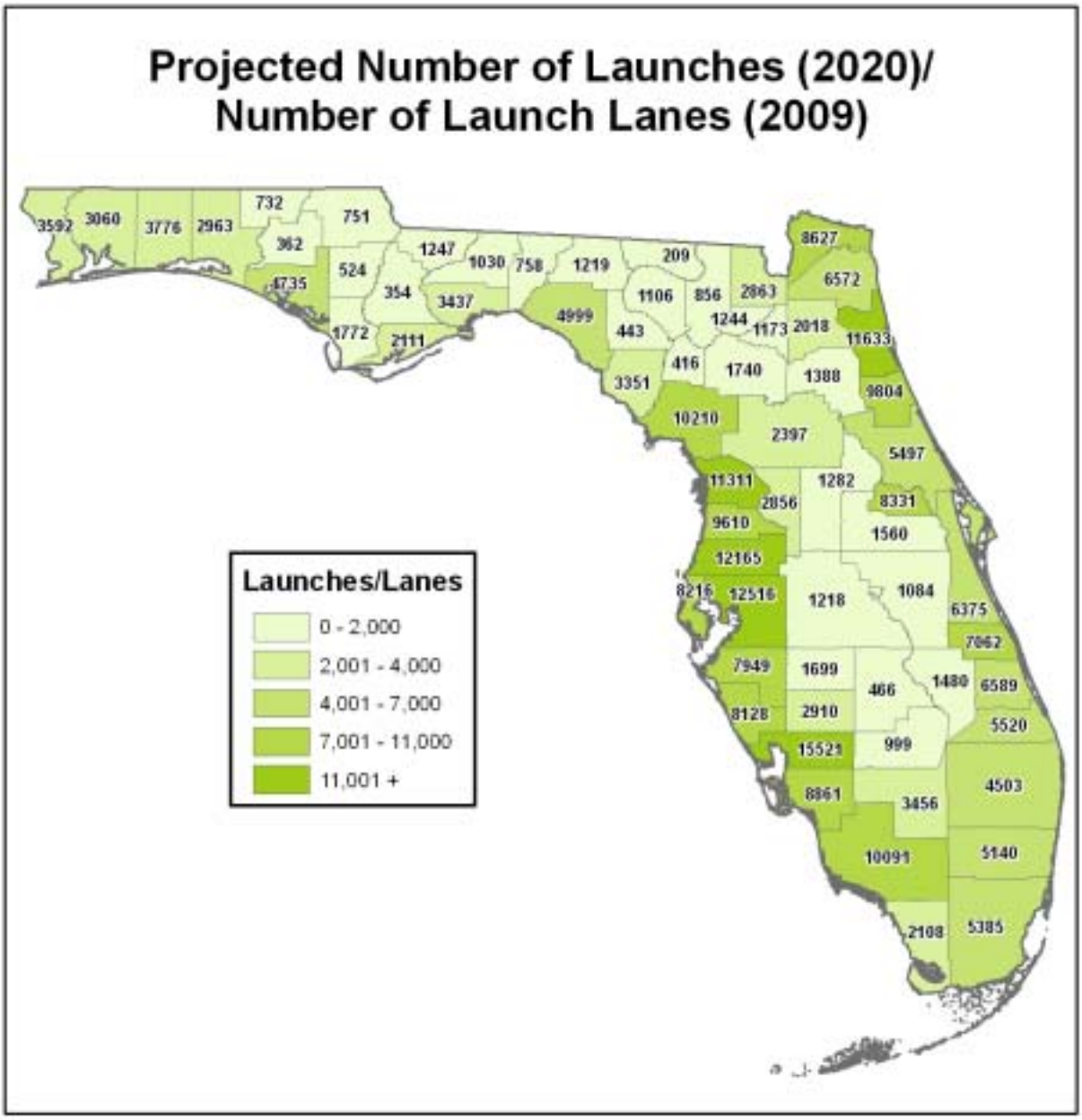


Figure 3.63: Projected number of launches (2020)/number of launch lanes (2009).

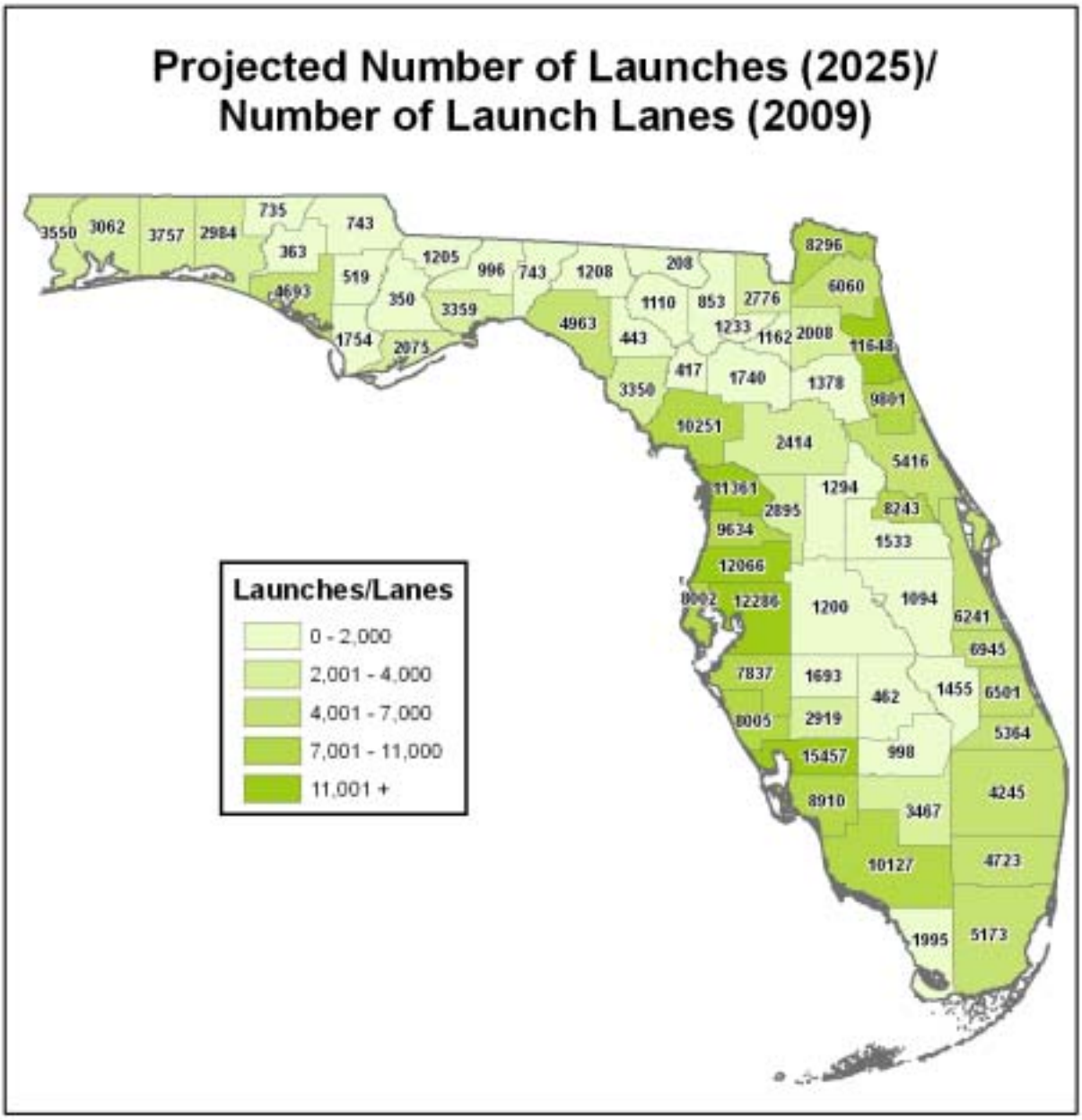


Figure 3.64: Projected number of launches (2025)/number of launch lanes (2009).

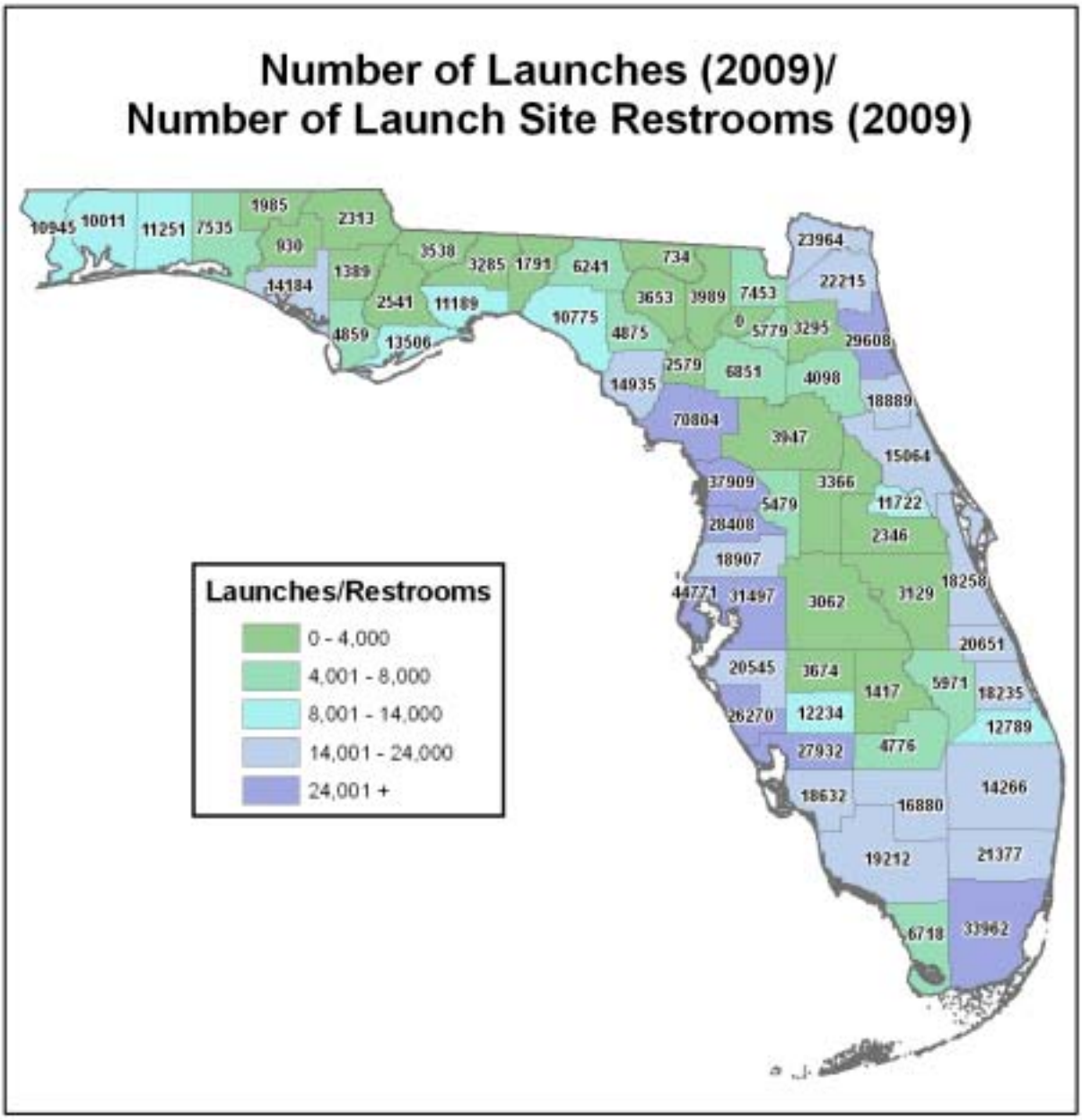


Figure 3.65: Number of launches (2009)/number of launch site restrooms (2009).

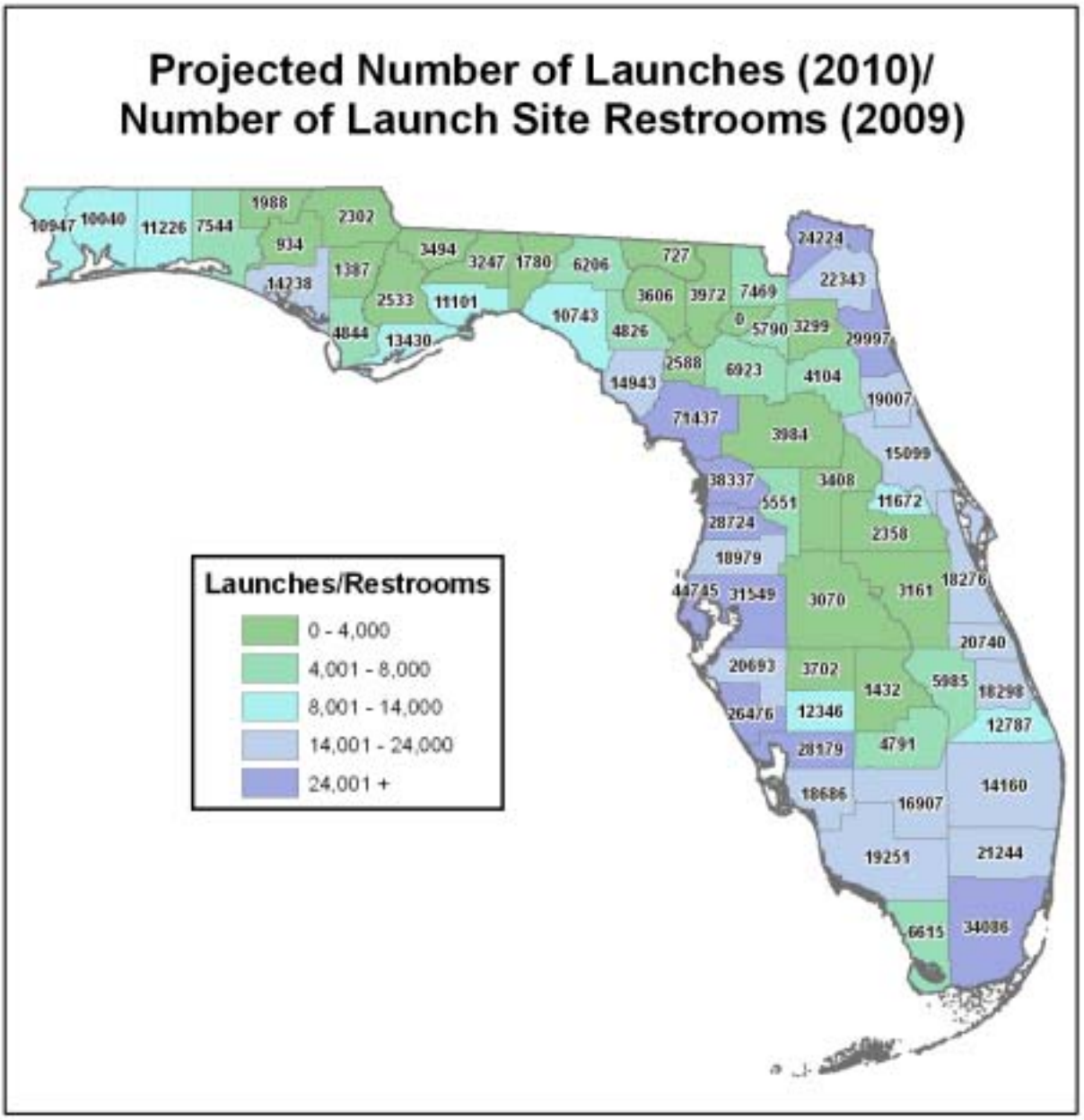


Figure 3.66: Projected number of launches (2010)/Number of launch site restrooms (2009).

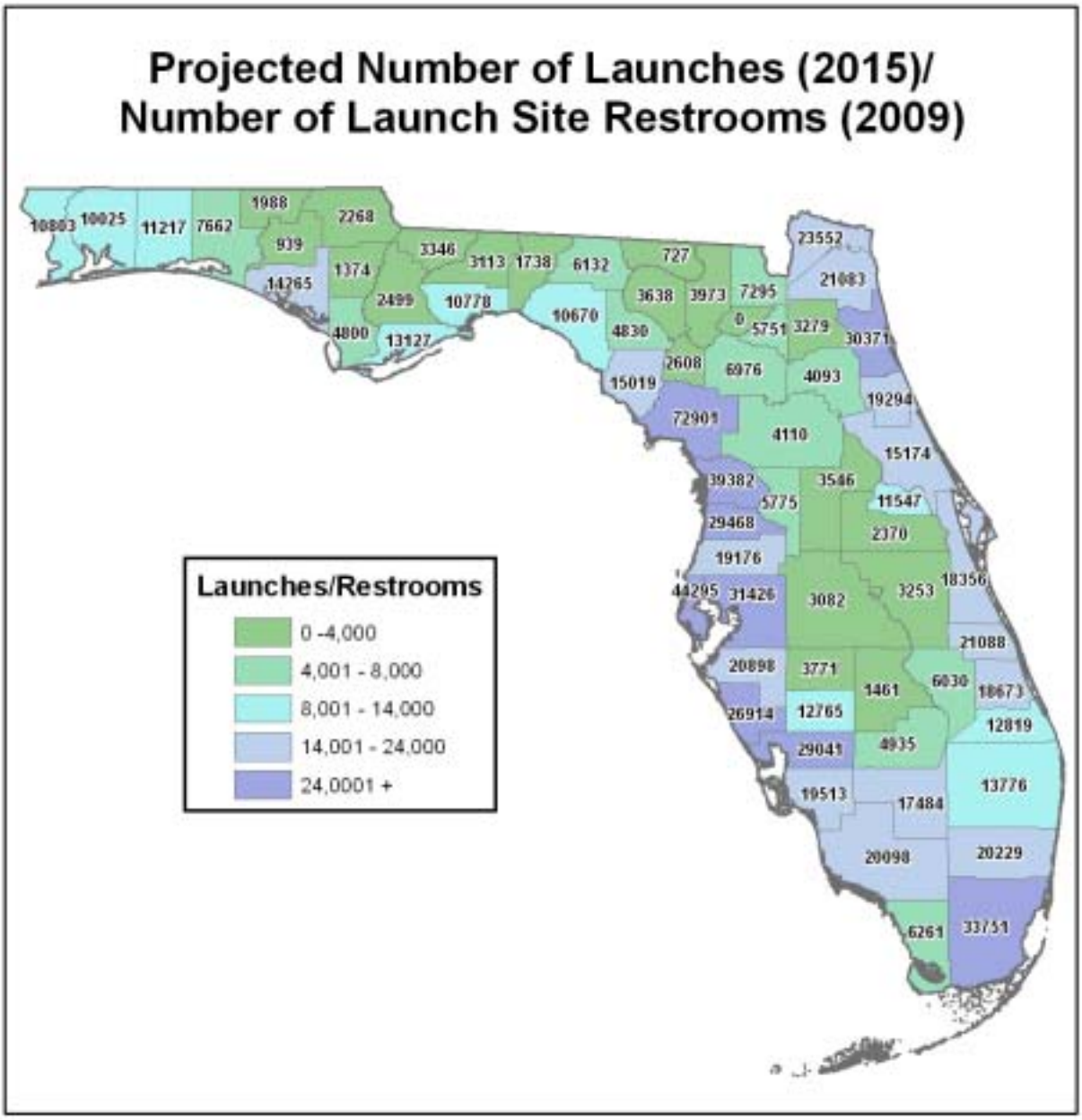


Figure 3.67: Projected number of launches (2015)/number of launch site restrooms (2009).

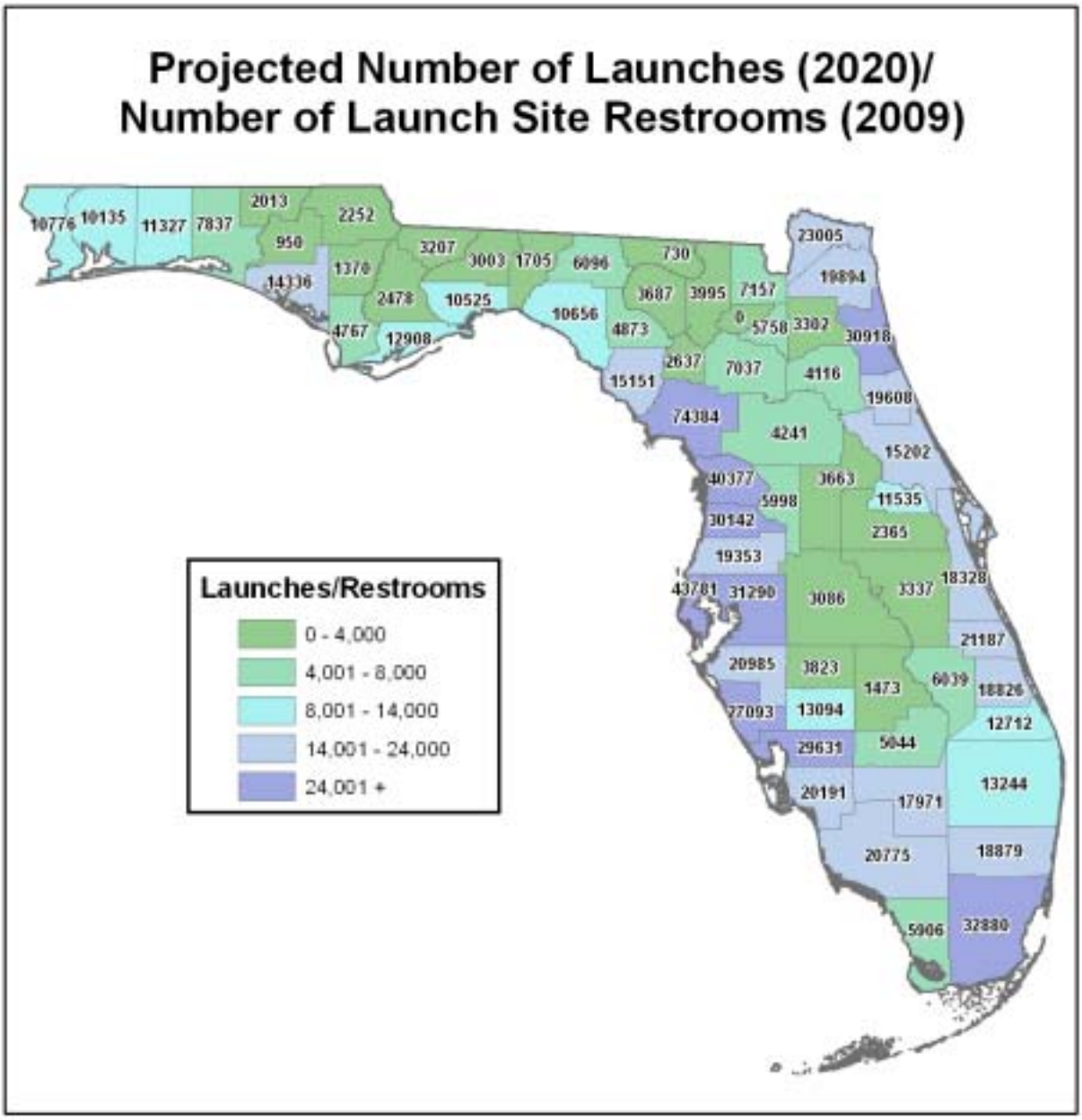


Figure 3.68: Projected number of launches (2020)/number of launch sites per restrooms (2009).

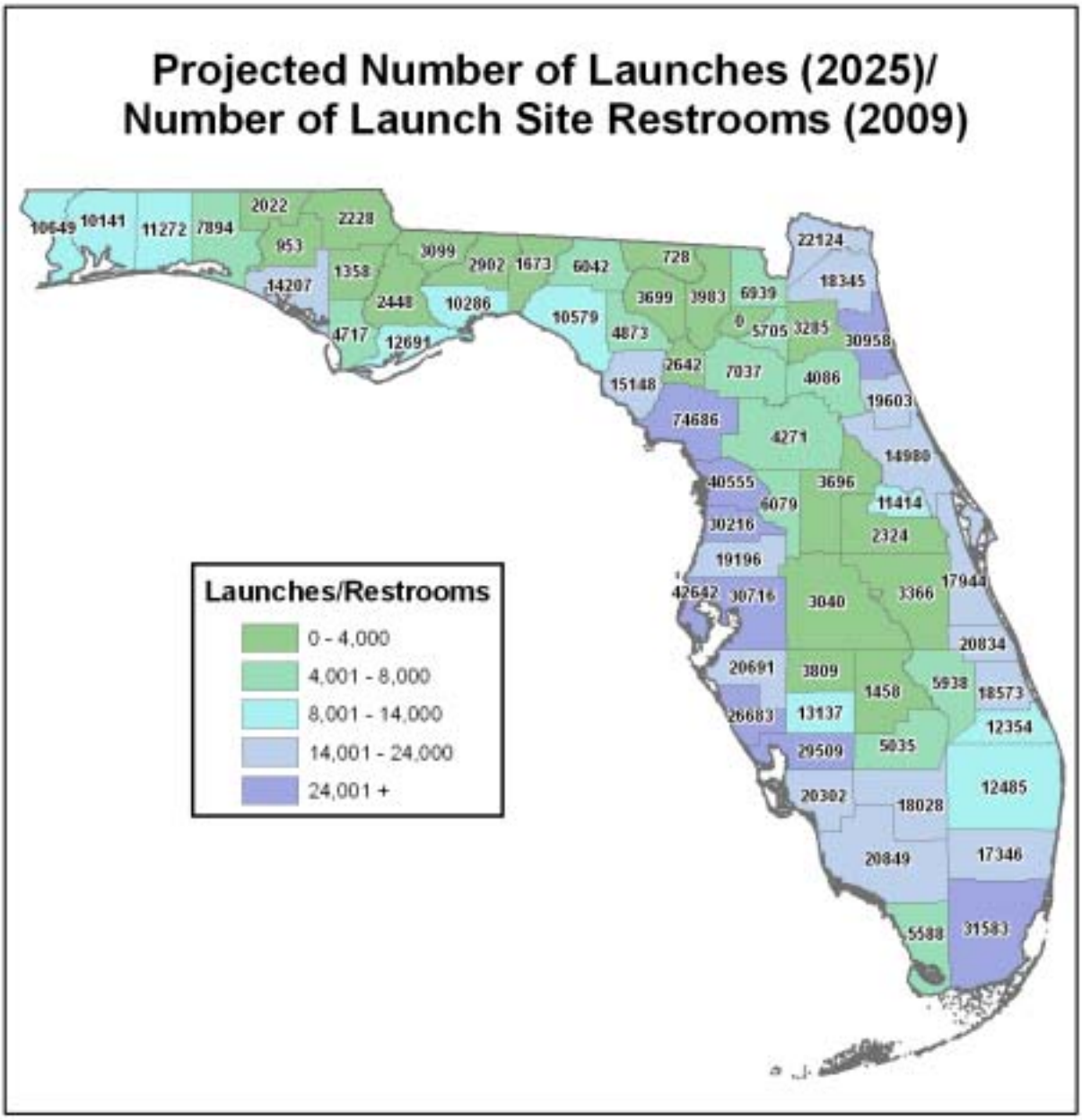


Figure 3.69: Projected number of launches (2025)/number of launch site restrooms (2009).

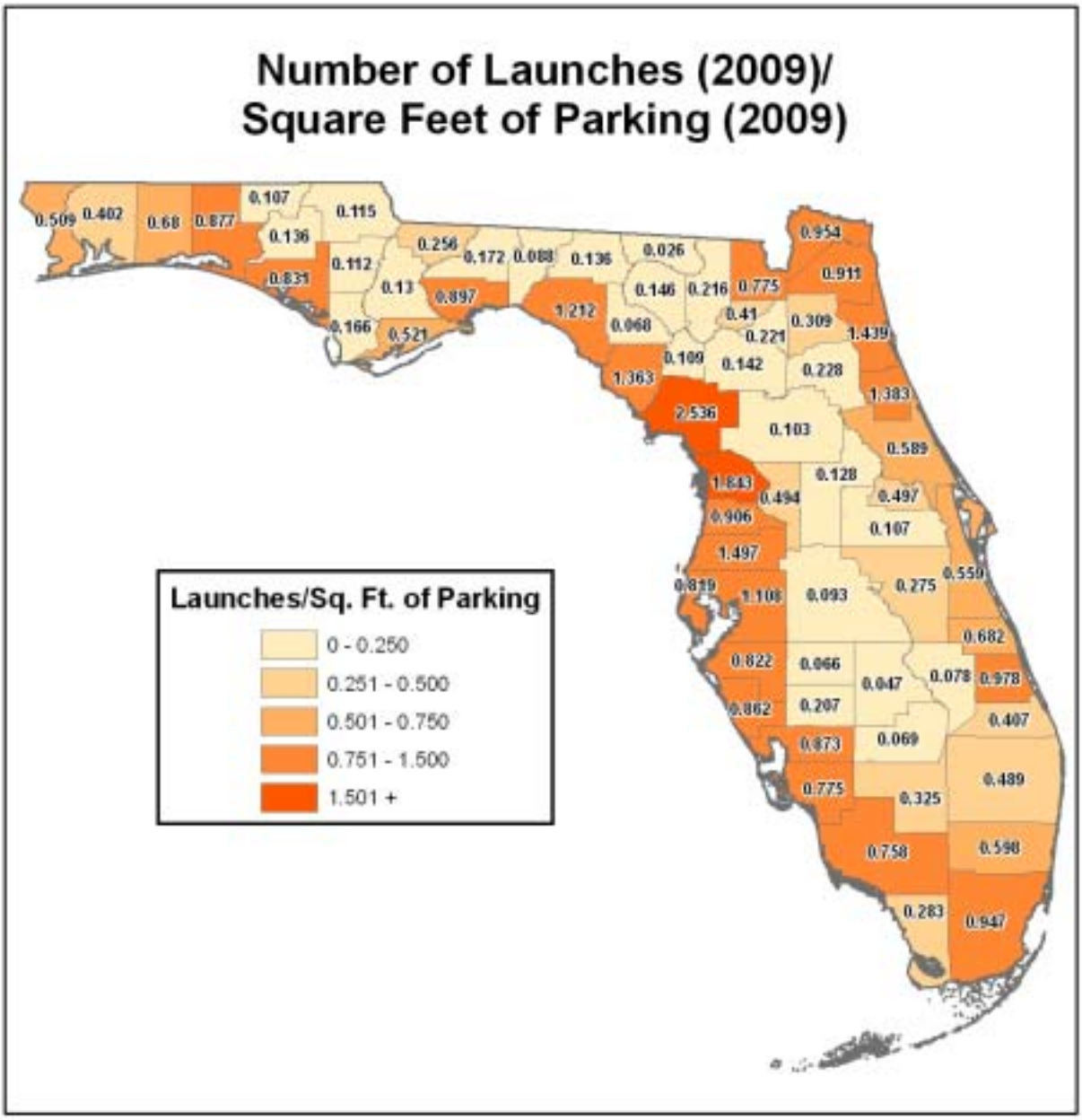


Figure 3.70: Number of launches (2009)/square feet of parking (2009).

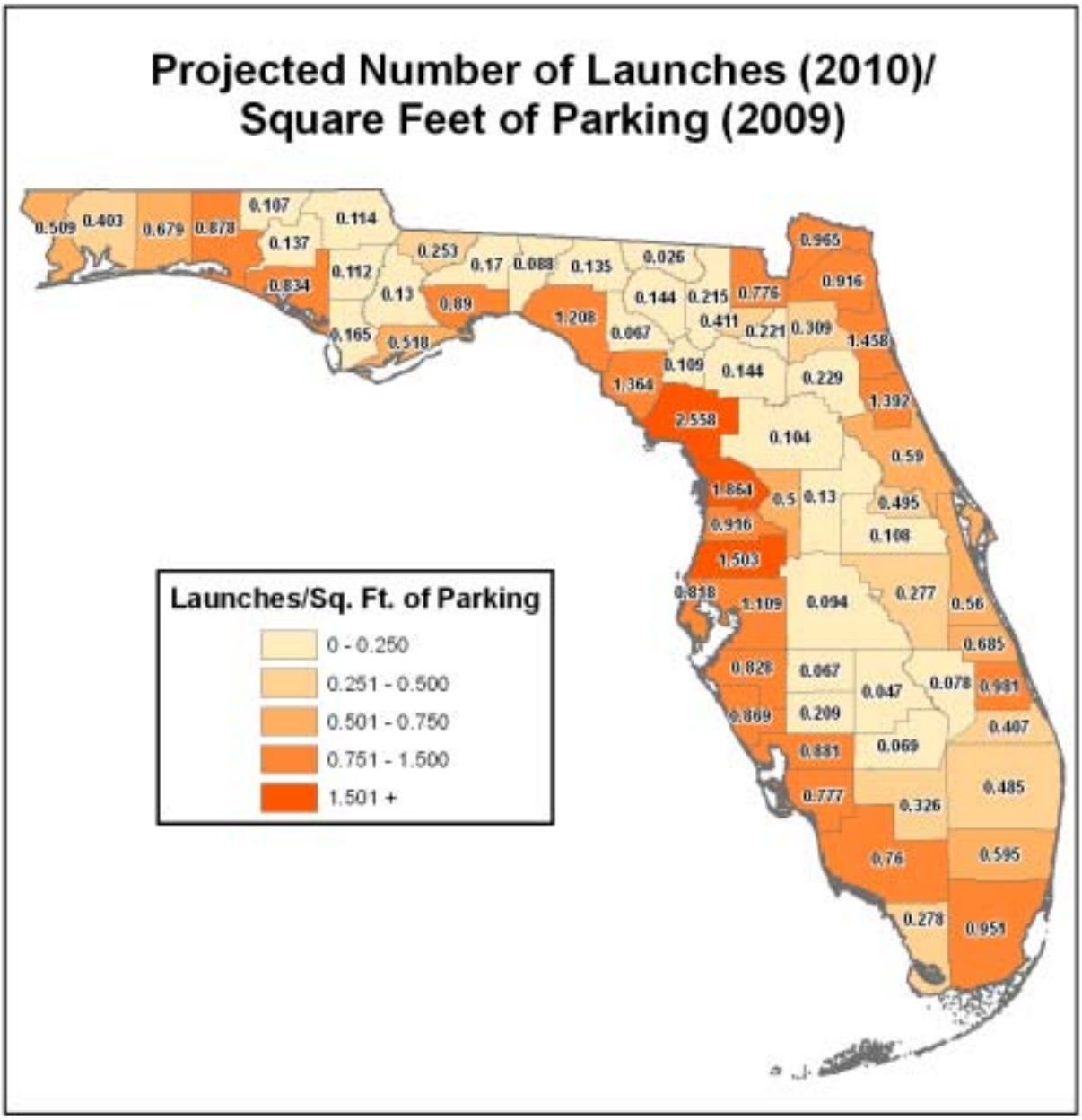


Figure 3.71: Projected number of launches (2010)/square feet of parking (2009).

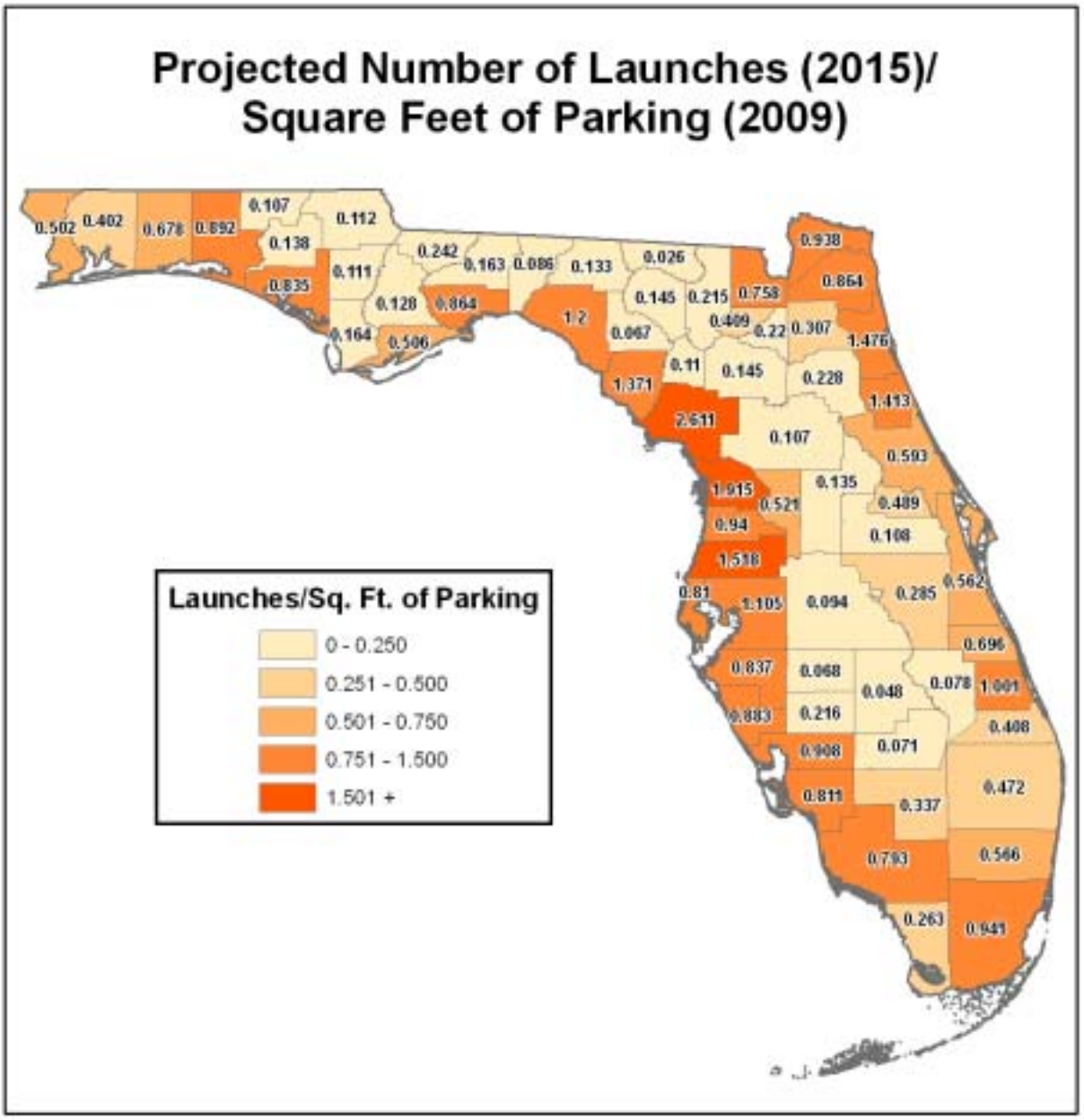


Figure 3.72: Projected number of launches (2015)/square feet of parking (2009).

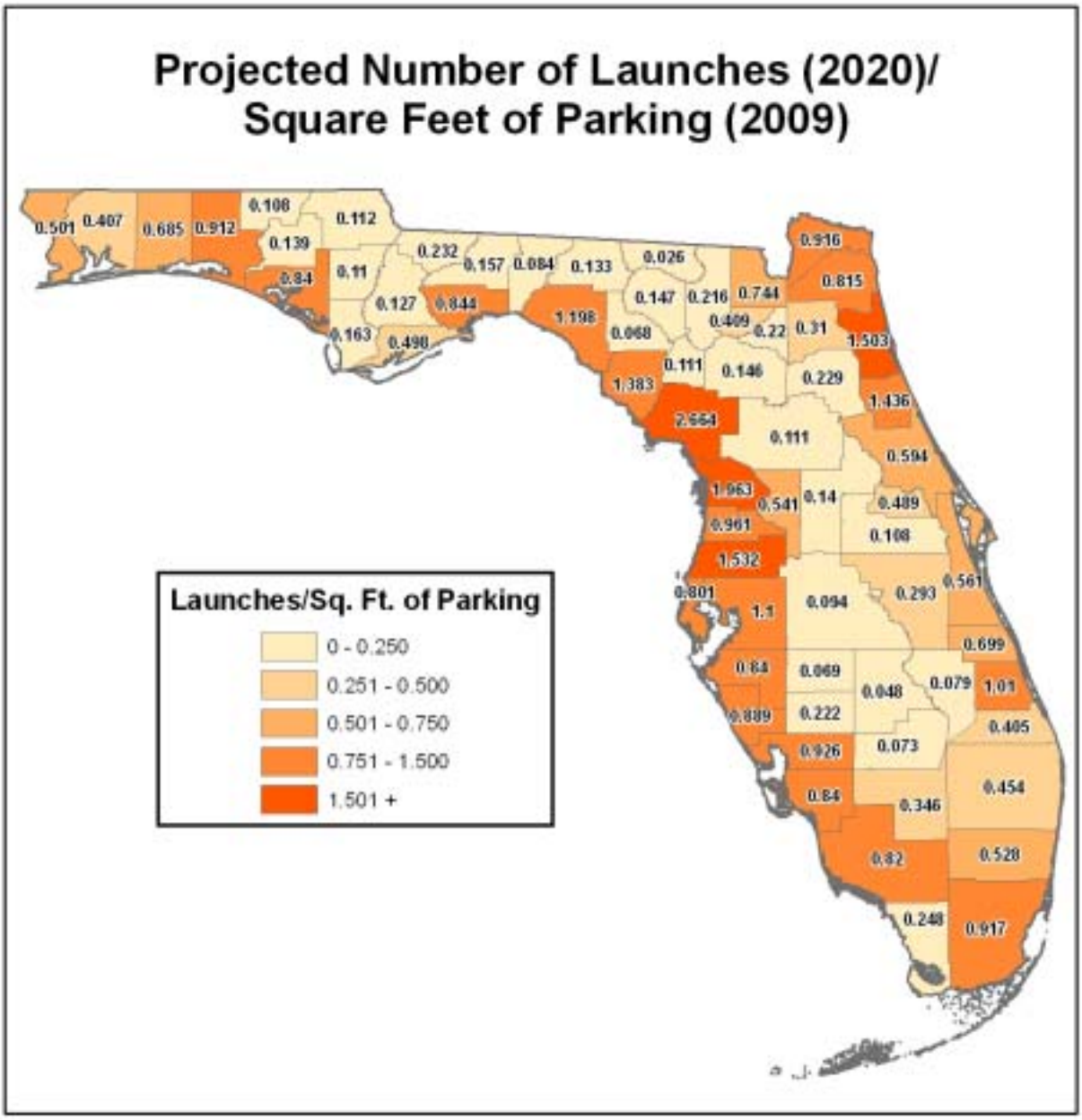


Figure 3.73: Projected number of launches (2020)/square feet of parking (2009).

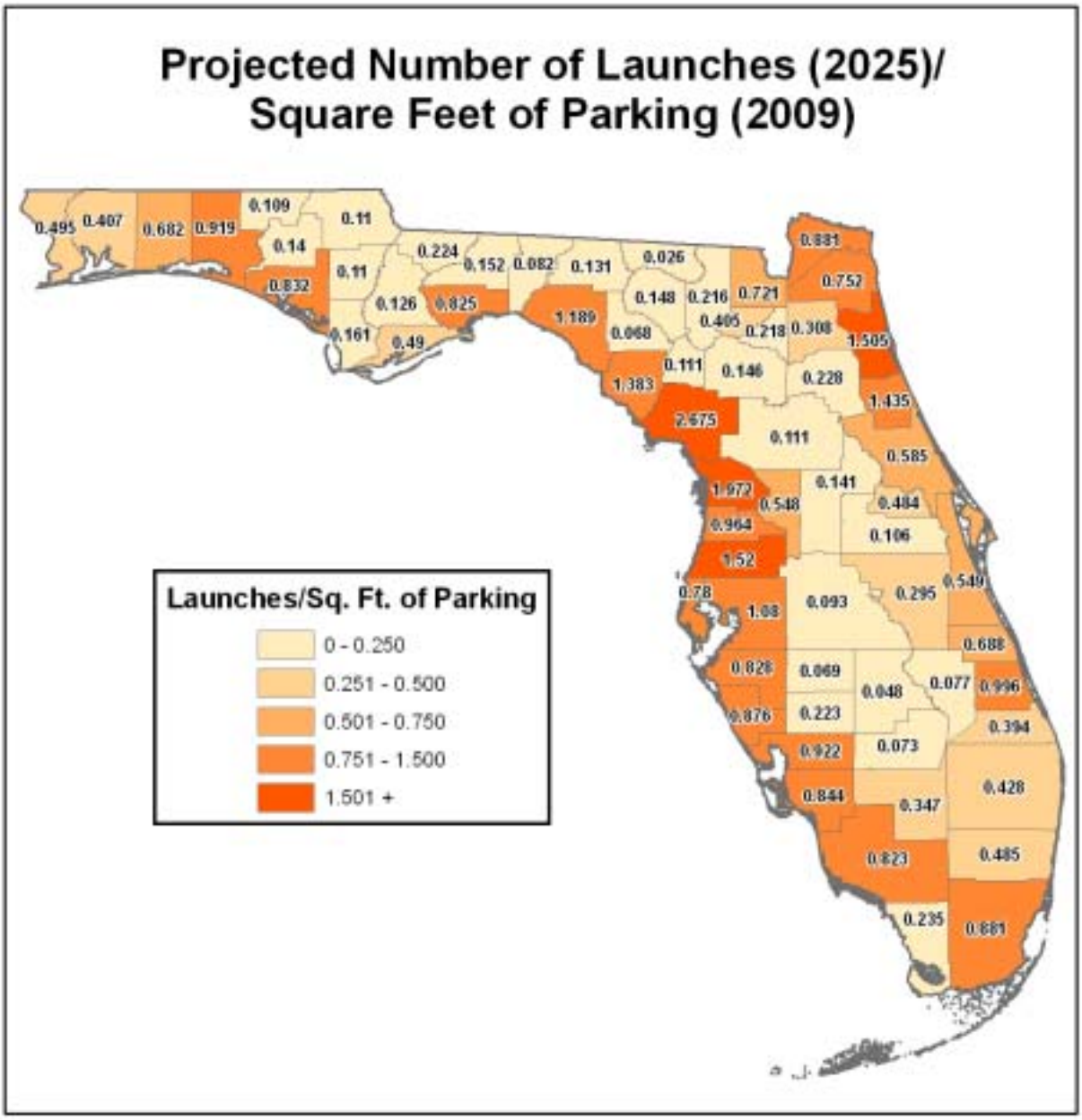


Figure 3.74: Projected number of launches (2025)/square feet of parking (2009).

RUM Models and Estimates of Consumer Surplus Associated with Public Boat Launch Sites

The project produced RUM models which were used to generate estimates of the consumer surplus of boat launch sites located in Florida counties. The total consumer surplus produced by marine access and freshwater ramps is reported by county in Table 3.49 and displayed in Figures 3.75 and 3.77. The number of launch sites for which consumer surplus was estimated in these counties is shown in Figure 3.76. These figures show significant differences in launch site consumer surplus which should be taken into account in future public access investment decisions.

The RUM models, described in much more detail in an earlier section of this report, can be used to estimate the public benefit and, subsequently, the return on investment of proposed new launch sites. The models have the added capability to estimate the value of proposed ramps in alternative locations with different combinations of capacity and amenities. This means that the RUM models can be employed to compare the discounted value of launch sites with proposed launch sites at different locations and also to evaluate alternative types and scales of sites at the same location.

The RUM models can also be used to estimate the public welfare (consumer surplus) and return on investment that would be associated with expansions and amenity improvements to existing launch sites such as adding capacity. This is important given the fact that in many areas of Florida the cost of land for launch sites now exceeds $15 million per acre and increasing utilization of existing ramps may be the only feasible alternative. For example, the RUM models can be used to assess the return on investment from expanding parking or adding launch lanes/ramps at existing launch sites. As was discussed earlier in the report, parking capacity is a significant RUM variable meaning the RUM models can be used to estimate the marginal value of adding additional parking to existing launch sites. In this case, the RUM Model would estimate if the discounted marginal value/benefit of adding parking is greater than the cost (e.g., land acquisition, construction) and/or is greater than the discounted value of alternative investments in other launch sites.

Unfortunately, because of increasing costs of maintenance, operations, improvements, etc., cities, counties and even state and federal agencies may be confronted with the need to identify launch sites for possible closure. It is also a fact that some launch sites developed many years ago may be in locations that can no longer be supported given changing demand and environmental concerns. It may make more economic sense to close older facilities (i.e., sites in need of major repair, located in environmentally sensitive areas, or with high continuing dredging costs) and invest the cost savings to enhance other ramps (e.g., by adding capacity, services). The RUM models can also be employed to estimate the reductions in public welfare associated with either closing or downsizing of existing launch ramps. They can be used to evaluate the public (consumer surplus) benefit impacts of closing alternative ramps compared with the estimated cost savings and the marginal benefits of investing those savings in other ramps.

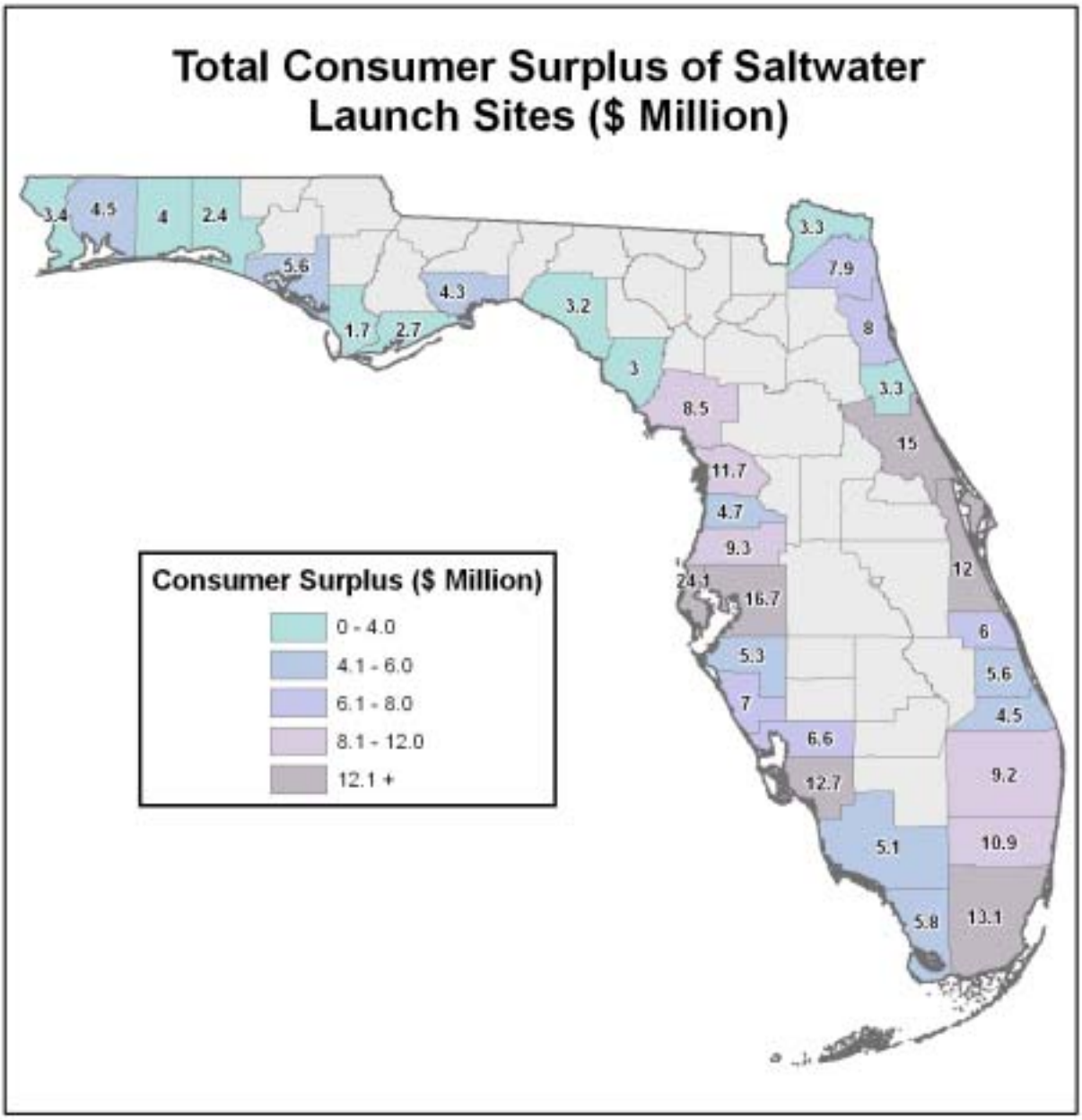


Figure 3.75: Total consumer surplus of saltwater launch sites ($ million).

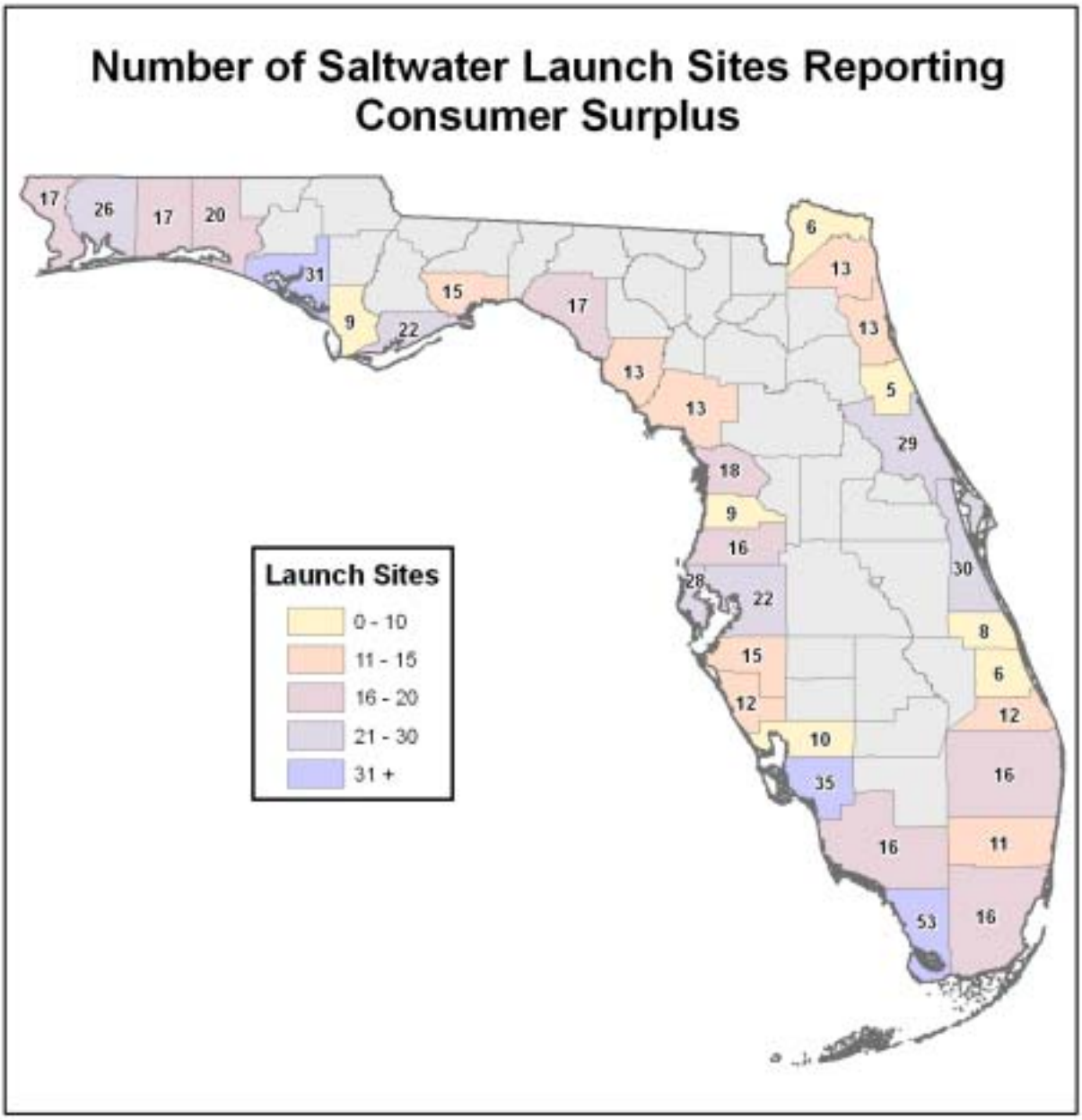


Figure 3.76: Number of saltwater launch sites reporting consumer surplus.

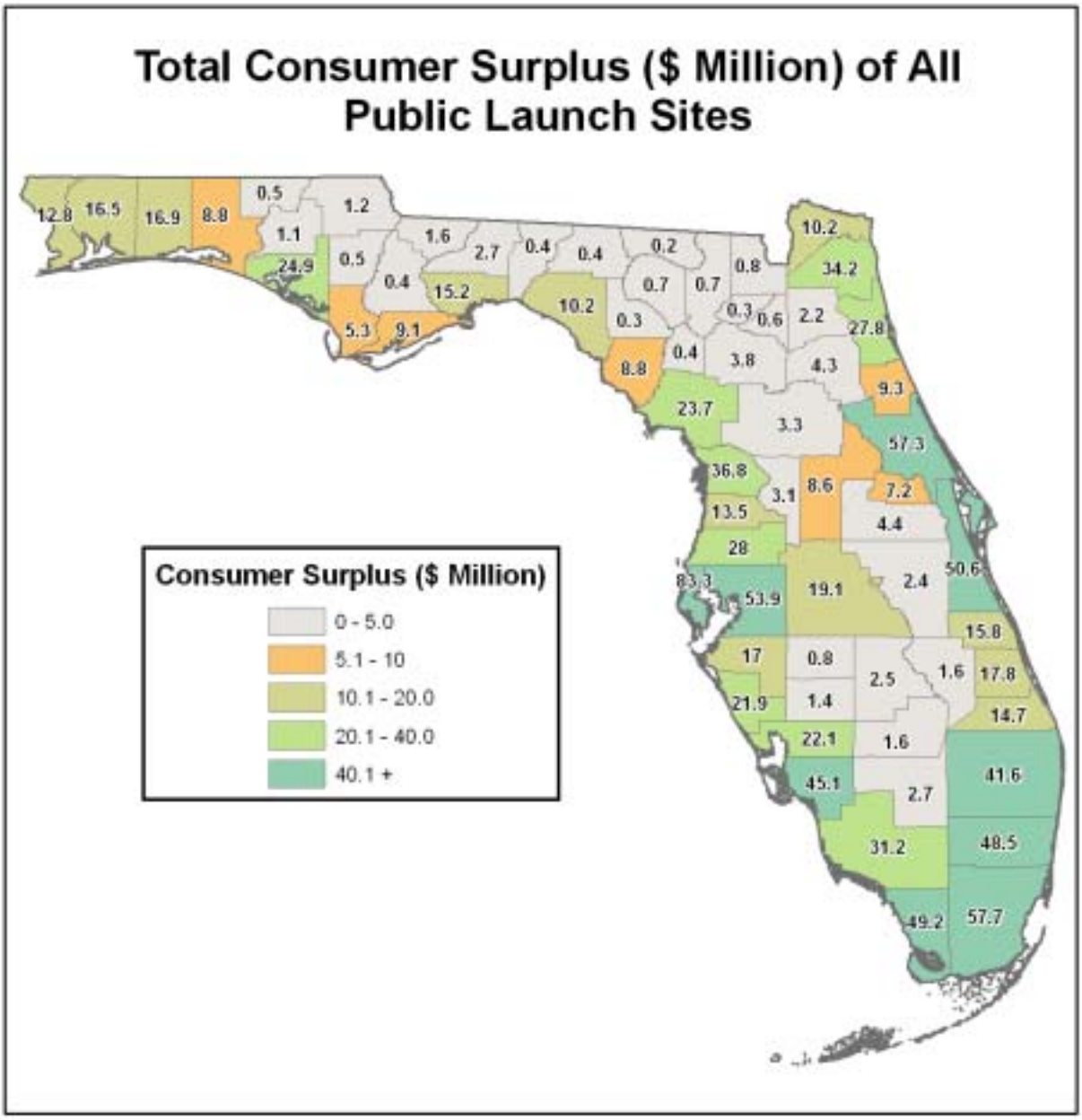


Figure 3.77: Total consumer surplus ($ million) of all public launch sites.

Economic Significance Models

As already detailed in this report, this study produced online models for estimating the economic significance of marinas and launch ramps in Florida. They provide a different (than consumer surplus) economic measure of the benefits associated with launch ramps. This measure should not be added to the consumer surplus, but instead it provides a different perspective of the impact of launch sites and marinas.

The Economic Significance Models use distinct spending profiles for different types and sizes of boats that are kept at marinas, and trailered to launch sites. Economic impacts are estimated by applying estimates of annual craft and trip spending to county or regional multipliers representing the structure of the county or region where registered boat owners reside and where marinas or boat launch sites are located. Multipliers convert boater trip and craft spending in different sectors of the economy into the associated jobs, income, and value added in boat-related and tourism-related businesses.

The models have been designed to be run "forward or in reverse" meaning that they can be used to estimate income, employment and value added impacts of: (1) proposed new launch sites; (2) additional capacity or features that change the number of launches; (3) changes that reduce the number of launches (e.g., dredging issues, water level changes, site deterioration); and (4) the closure or elimination of a launch site (or marina). The models provide direct, indirect and total (income, employment and value-added) effects associated with different numbers of launches from launch sites.

It is important to stress that the RUM and Florida Economic Significance Models produce different measures and perspectives of the economic significance of launch ramps, and the estimates that these models produce (e.g., consumer surplus, spending, income) are not additive. Table 3.74 shows the different economic measures that can be produced for different launch ramp investment scenarios.

Table 3.74: Economic perspectives of different models.

Action/Model	New Proposed Launch Ramp	Renovation of an Existing Launch Site	Closing of an Existing Launch Site
RUM Models	Estimated launches ($) Consumer surplus (value)	Change in the number of launches ($) Marginal value of additional launches ($) Discounted net value of the investment	($) Loss in consumer surplus (public benefit)
Economic Significance Models	Spending and the direct and indirect employment (jobs), income ($) and value added ($) effects of this spending	Added spending associated with the increased number of launches, and the direct and indirect employment (jobs), income ($) and value added ($) effects of this additional spending	Reduced spending associated with the closure, and the direct and indirect employment (jobs), income ($) and value added ($) effects of lost spending

3.7.4 Boating Access Information Needs

The results of survey of county and city boating access sites and many conversations with boating agencies and industry officials clearly indicate that the State of Florida needs to implement a more comprehensive system for collecting, integrating and analyzing data on boating access that should be linked (required) to the grant process and to the access of monies from boating registration fees. Requiring that counties and cities report various information on an annual basis would be the most cost–effective way to gather information related to boating access capital needs. This study was unable to scientifically determine capital needs because the necessary data are either not available, not reported and/or not compiled.

Performance Utilization of Launch Sites

The surveys conducted for this study along with many informal discussions with county and local boating agencies reveal that only a few, if any, maintain information concerning the performance of the launch sites they manage. This includes the number of launches, days when the ramp exceeds capacity (e.g., parking, staging), and waiting time to launch boats. There are a number of reasons why collecting and analyzing this information is important:

- This information is key in assessing and documenting a need for additional launch capacity (e.g., additional ramps, new sites). Most of the agencies do not collect this information on a scientific or regular basis. They argue that it costs too much to collect the information, yet many of the grant applications for new or expanded facilities cite capacity limits.
- The information would be useful in validating the forecasts that are part of funded access grant proposals.
- Information on numbers of launches is a key component in estimating the economic significance of launch sites. This project produced an online tool for estimating economic significance of launch sites. This tool requires estimates of a number of launches annually.
- The information would also be useful in verifying the accuracy of RUM Model estimates and determining the need to re-calibrate the models over time.
- The demand projections indicate that in some counties, the numbers of expected launches will decline and this may imply a need to shut down (mothball) some sites and reallocate maintenance and operations monies to the launch sites that are used most often and regularly exceed capacity. Information on utilization rates along with consumer surplus estimates derived from the RUM Models could help in bringing about the “best allocation” of access monies.
- Information on the utilization performance of launch sites, including waiting times and days that capacity is exceeded, could be used to develop a synchro-marketing strategy designed to steer boaters to underutilized sites and reduce peaking-related issues (e.g., long waits, increased incidents). This strategy might include differential pricing (days of the week, different launch sites).

We strongly recommend that FWC develop and demonstrate cost-effective methods, which government agencies can utilize, to produce reliable and valid estimates of launch site utilization. Until this is accomplished, grant applications and assessment of launch performance and benefits will be based on estimates that will remain difficult to verify. These methods might include: (1) sampling schemes, measures and counting methods (e.g., aerial photos, car counts, observing time to launch); (2) approaches for expanding the results for sampling periods; and (3) demonstrations and associated training materials for county and local units of government.

We further recommend that FWC require better estimates of the utilization of existing launch sites as part of grant applications for new or expanded launch sites. Clearly, this requires that counties and local units of government are knowledgeable about alternative methods of measuring utilization performance. As part of its overall educational/outreach effort to enhance access planning and decision-making, FWC should include training on coming up with valid and reliable utilization estimates.

Integrated Boating Access Information System

We recommend developing a web-based boating access information system where counties, local units of government, FWC units and other state agencies can: (1) update information on the public access sites that they manage (e.g., operating status, expansion, improvements); (2) report annual spending on boating access capital improvements; (3) provide information about maintenance and operations budgets for public access sites; and (4) identify and verify capital improvement/maintenance priorities using tools and information produced by this study.

Current and emerging database and web technologies along with new GIS capabilities permit the development of *Integrated Boating Access Information System* which will provide FWC with a more efficient and effective means for: (1) maintaining accurate information about the amount, distribution and quality of boating access; (2) allocating available boating-access monies to areas of greatest need and benefit (i.e., consumer surplus and economic development); (3) insuring greater accountability with respect to how vessel registration fees are utilized (see Appendix Q); and (4) identifying areas of greatest potential and benefit for potential boating access partnerships with other agencies and private industry.

This project developed a comprehensive database about the location and characteristics of boating access sites throughout Florida. However, because the coastal landscape of Florida is changing rapidly, as is the fiscal climate of cities and counties, it is very likely that this inventory will be out of date even quicker than it was developed. So, it is important that FWC implement a method for updating the information on a continuing basis since it would not be cost effective to conduct another statewide inventory again from scratch. The inventory will become obsolete and essentially useless unless it is maintained.

There are two proposed alternative approaches for updating information on boating access and to understand access trends. RMRC at MSU has developed and tested a relatively simple way of accomplishing this by linking the public access/launch site inventory database created as a result of this study to a web-based form that will allow counties, cities and FWC to update the information on a regular basis. An HTML form showing all the information collected on the inventory would be created and connected to an Access database using ASP (Active Server Page). Using a password, users (e.g., county and local boating agencies) could access the web-based (HTML) form and update the information. The updated data would be incorporated into the database with an ASP connection (Figure 3.78). The system could be further enhanced by incorporating another web-based form which will collect similar information that was collected on the survey of capital needs and expenditures conducted as part of this study. Again, an HTML form would be connected to a database using ASP (Figure 3.79). The system could be enhanced further by incorporating a grant application form and even possibly a boating access and facilities plan (Figure 3.80). The system that RMRC has developed will allow users to update and provide data using PDAs.

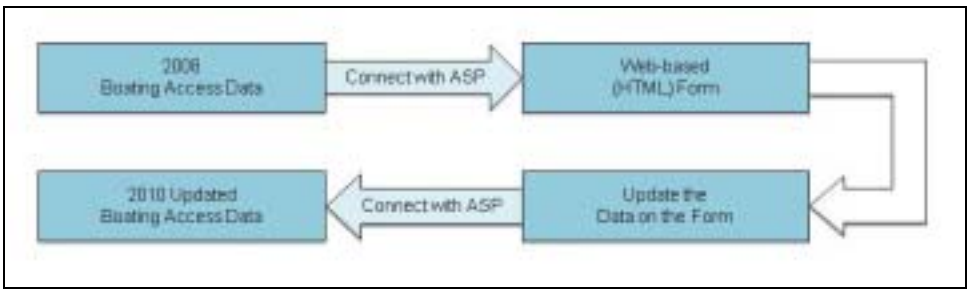


Figure 3.78: System to update boating access inventory.

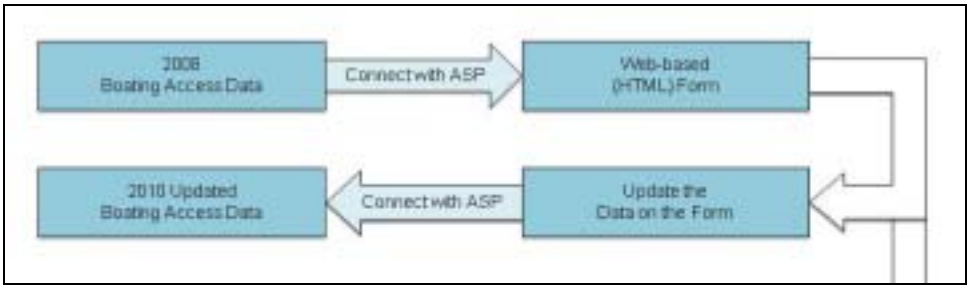


Figure 3.79: Boating access inventory, capital needs and expenditures reporting system.

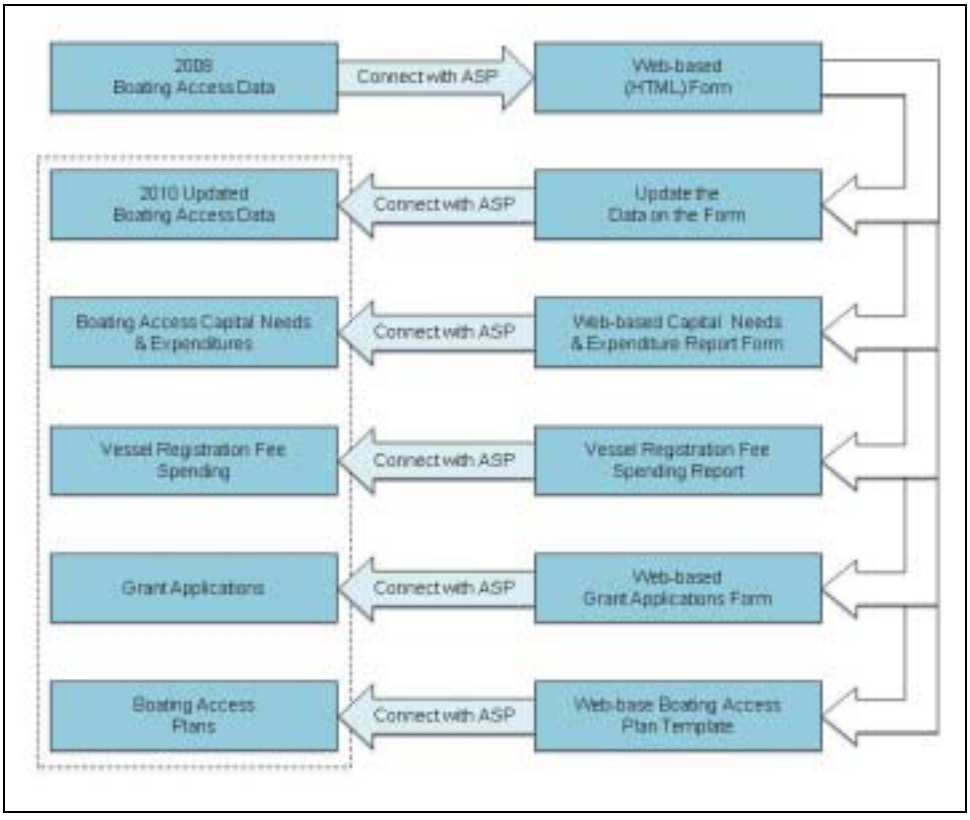


Figure 3.80: Boating access inventory, capital needs and expenditures and access plan reporting system.

Boating Access Surveillance and Indexing System (BASIS)

The other approach would be to monitor boating access on an annual basis, but only in a representative set of sampling areas instead of in a state as a whole. Using data obtained in this project, RMRC at MSU has developed a prototype for such a system. Unlike traditional count-them-all boating access inventories, similar to the one conducted as part of this study, BASIS utilizes scientifically selected sampling areas (e.g., eight locations in Florida) that are representative of changing coastline and boating access situations. The state of Florida was selected to pilot BASIS and eight sampling areas in Florida are serving as a demonstration for the development of BASIS databases and analyses because (1) this study clearly indicated that traditional boating access inventories are no longer feasible, and (2) the different data produced by this study allowed the development of the system.

A demonstration of BASIS can be viewed at www.boatingaccess.org. To view the system, click on BASIS sampling areas (box on left side of page), then on the state of Florida and then on Apalachicola (see also Figures 3.81 to 3.85).

Aerial and satellite photos will be obtained for all sampling areas. Digitized parcel maps will also be acquired to identify different coastal/riparian land uses, including marinas and marine service facilities in the sampled areas. Current land uses and land use trends are important in understanding the potential to develop more boating access and to identify possible reasons for the loss of that access (e.g., due to urban development).

Boating access provided by all marinas, yacht clubs (e.g., numbers of slips, services) and boat launches (e.g., number of ramps, dock space, parking, amenities) in the sampling areas will be identified and measured using a combination of aerial/satellite photos and on-going web-based inventory surveys (e.g., updating numbers of slips). The web-based inventory surveys will collect information not obtainable from the aerial photo interpretation. This additional information will include: occupancy rates, sizes of boats stored, prices and number of transient rental nights at marinas, and estimated numbers of launches for launch ramps. Riparian parcels will also be examined to determine if they provide boating access (e.g., docks and moorings). This information will serve as benchmarks to evaluate changes in the type and amount of boating access.

BASIS will also develop and monitor information on the number and type of boats registered to owners residing in and near the sampling area, as well as on the number and type of boating- and fishing-related businesses. This information will be used to identify and assess impacts of increasing or decreasing amount and types of boating access. In addition, demographic characteristics and projections for the sampling areas will also be developed.

Information on the supply of boating access in the different sampling areas (e.g., aerial/satellite photos, marina permits, survey data) will be compared every two years to formulate an index of changes in the types and amount of boating access, storage and service (e.g., boat yards). Data from the different sampling areas will be combined to form Boating Access Indexes for states, regions and the country as a whole that will provide valid, consistent and representative measures of the change in boating access. Other information about the sampling areas (e.g., land use, demographics) will be used to understand associations with and possible reasons for changing boating access.

Figure 3.81: Demonstration of GIS system for angling and boating.

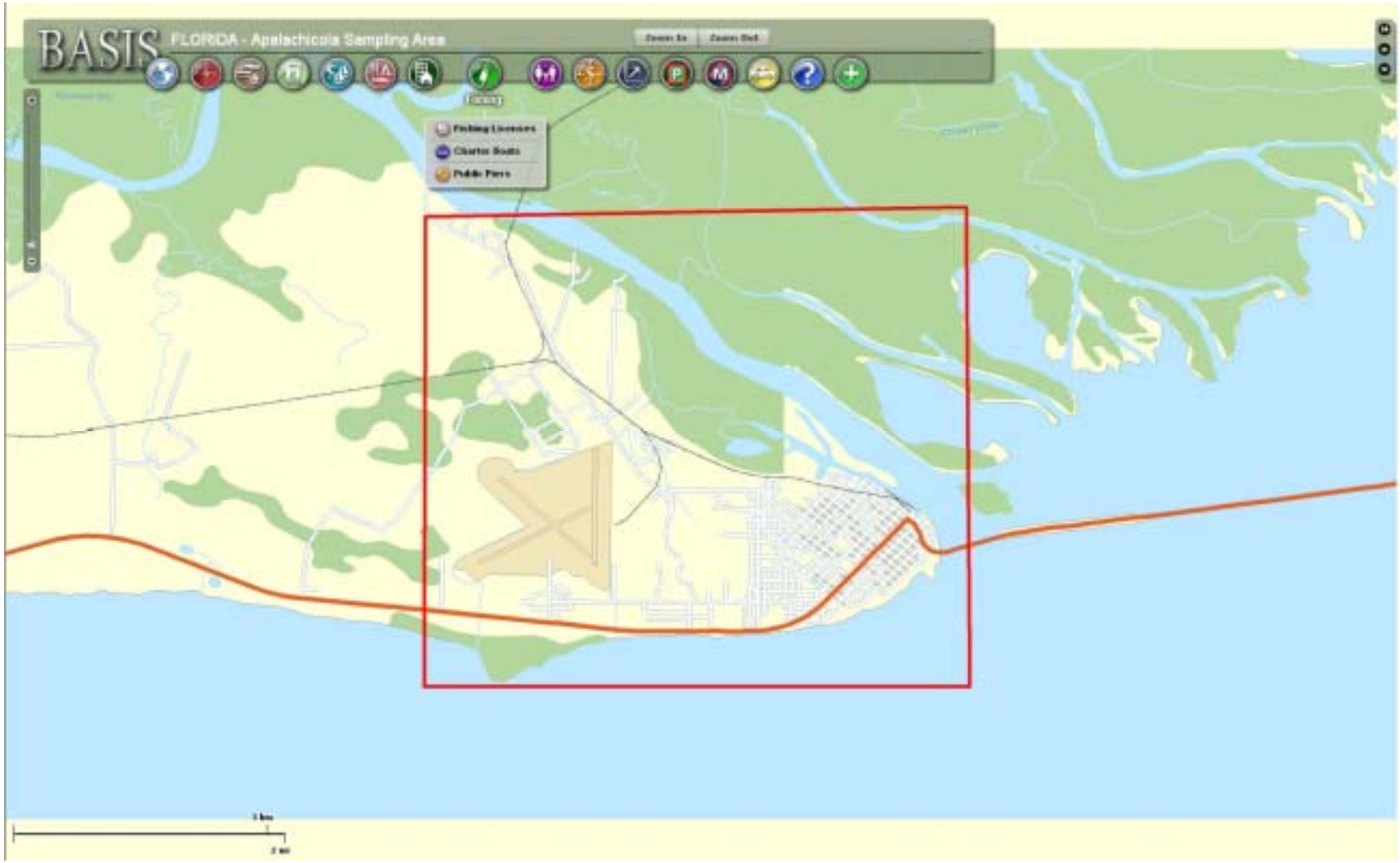


Figure 3.82: Demonstration of GIS system for angling and boating.

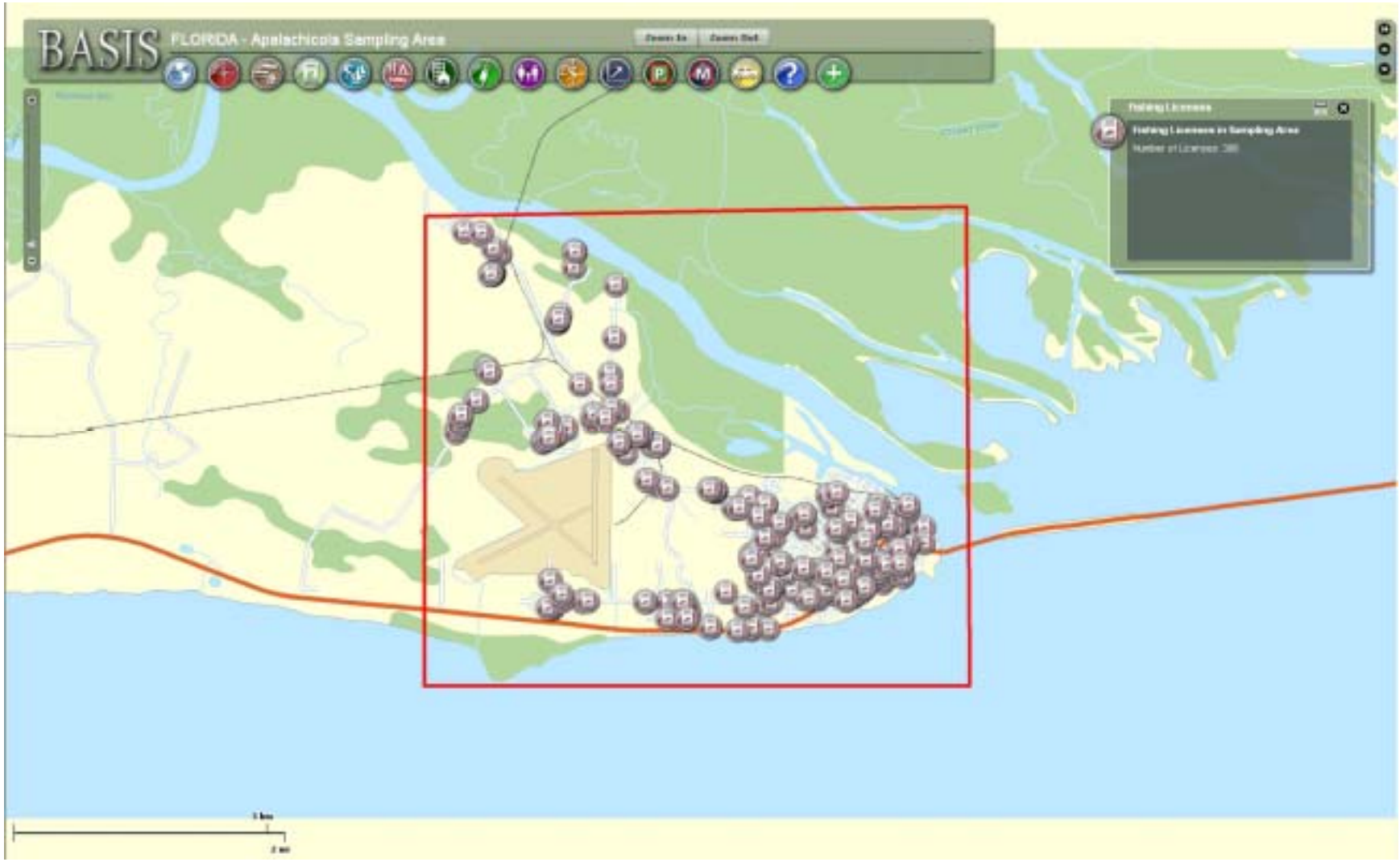


Figure 3.83: Demonstration of GIS system for angling and boating.

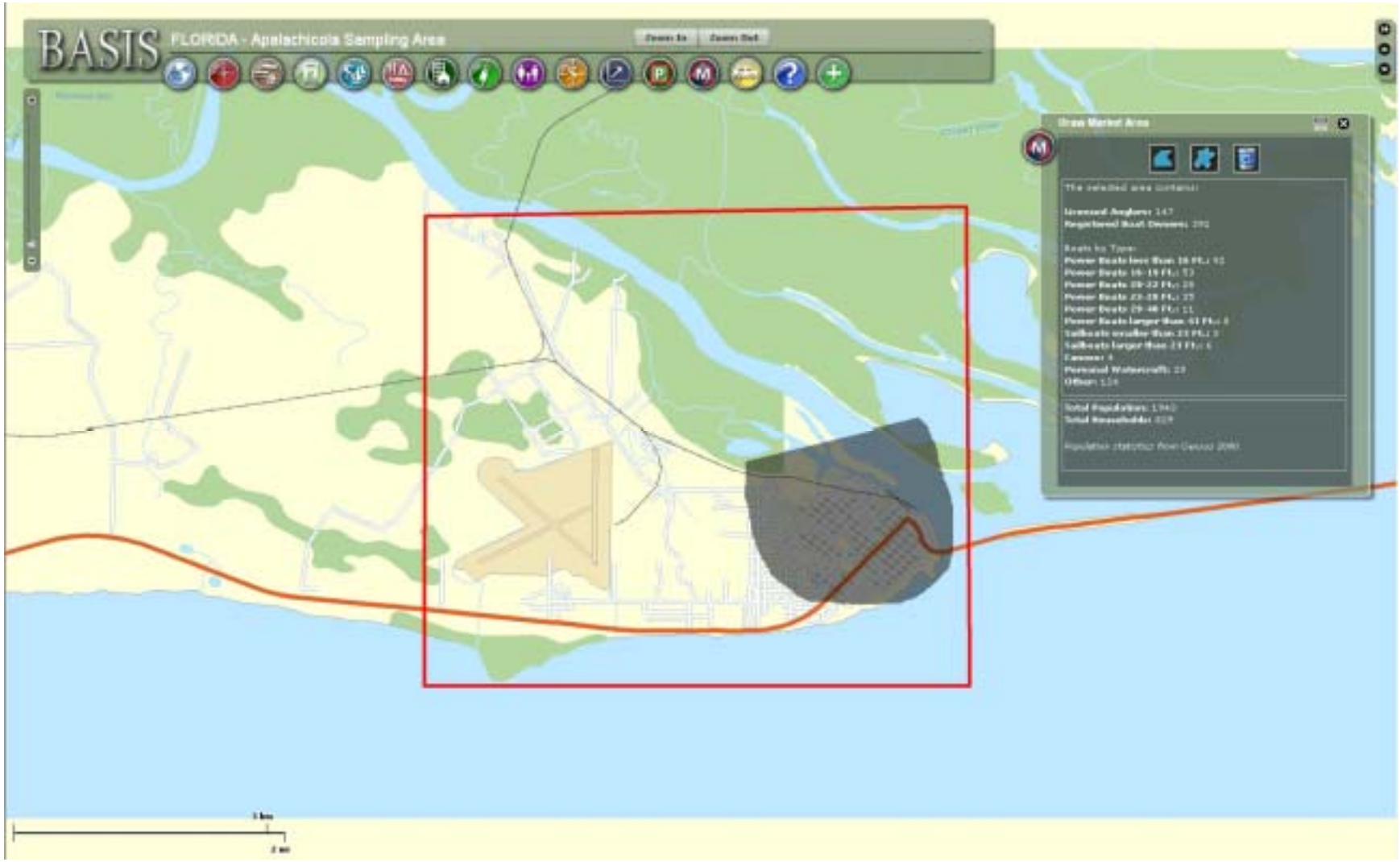


Figure 3.84: Demonstration of GIS system for angling and boating.

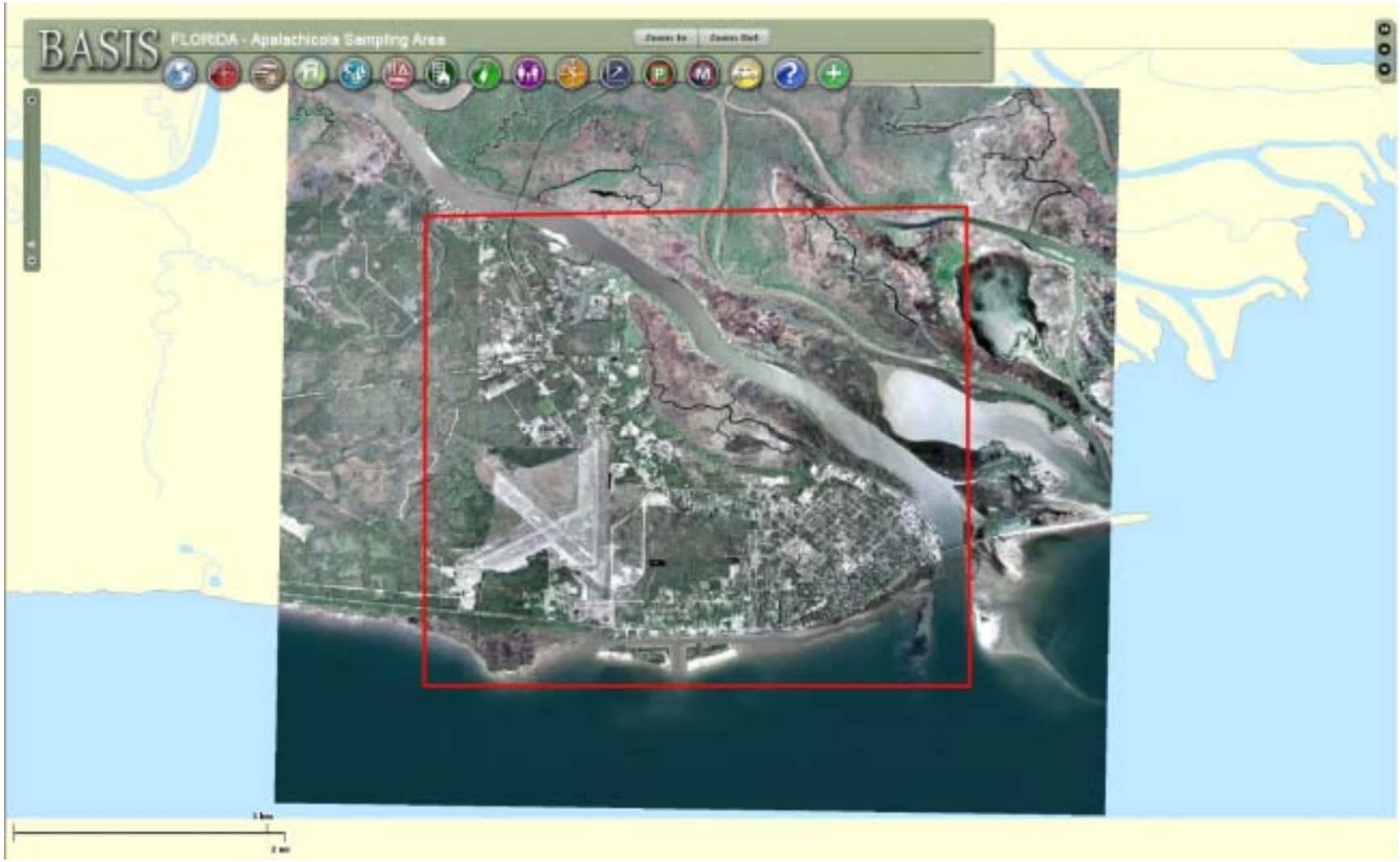


Figure 3.85: Demonstration of GIS system for angling and boating.

BASIS will also be linked to models for estimating the economic impacts (e.g., jobs, income, value added) of changes in boating access. These models produced as part of this project will deliver estimates of boater spending and economic impacts associated with the current supply of boating access and with increases or decreases in types of boating access, such as the loss or expansion of a marina or the development of a new boat launch site. A demonstration can be viewed at www.floridaboatingeconomics.com.

BASIS also provides a capability to assess the feasibility and benefits of proposed access sites. The system allows users to determine numbers and sizes of registered boats, demographics, supporting businesses for market areas located at different distances from proposed access site, or for designated market areas. A BASIS-like system could be developed to cover the entire state.

3.7.5 Outreach

The tools and information that the above-mentioned models and systems will produce are unfamiliar to most county and local boating officials. Few have been exposed to RUM models or more advanced economic impact assessment methods. It is recommended that FWC undertake an outreach and educational effort to make them, and also members of the boating industry, aware of these tools and provide training in when and how they should be employed. This outreach should include: (1) attractive and easy to read executive summaries of different sections of this report that can be accessed through the Internet; (2) articles in boating industry trade publications to create awareness of the online economic impact tools in combination with training sessions to encourage their use; (3) presentations to local and county economic development professionals and planners to increase awareness of the tools produced by the study and how they can be validly employed in different planning and decision-making contexts; (4) demonstrations and case studies of the use of the RUM models to assist in various types of boating access decisions (e.g., new access site development, identification of sites to be closed, reallocations of funding to sites with the greatest net public benefits); (5) educational materials and sessions to improve the reliability of estimating the utilization of existing boating access sites; (6) education aimed at assisting county and local boating officials in evaluating alternative ways of generating revenues to support maintenance and development of boating access; (7) a public statement of the actions which FWC plans to undertake in response to the findings of this study; and (8) hard-hitting presentations to elected officials aimed at enhancing their understanding of both the economic significance of recreational boating and the fiscal challenges related to the development and upkeep of recreational boating facilities and services.

SECTION 4

4. LITERATURE CITED..... 236

4. LITERATURE CITED

BEBR 2008. "Population Projections: Age, Sex, Race, and Hispanic Origin for Florida and Its Counties," Florida Population Studies Bulletin 154. Bureau of Economic and Business Research, University of Florida, Gainesville, FL.

Bell, F.W. 1994. "Estimation of the Present and Projected Demand and Supply of Boat Ramps for Florida's Coastal Regions and Counties." Report to Florida Sea Grant College, R/C-P-19.

Bockstael, N, W. M. Hanemann and I. E. Strand. 1987. "Time and the Recreation Demand Model." *American Journal of Agricultural Economic* (69), pp. 293-302.

Bockstael, N. E., W. M. Hanemann and I. E. Strand. Measuring the Benefits of Water Quality Improvements Using Recreation Demand Models. Environmental Protection Agency Cooperative Agreement CR-811043-01-0, 1989.

Bockstael, N., K. E. McConnell and I. E. Strand. 1989. "A Random Utility Model of Sport Fishing: Some Preliminary Results for Florida." *Marine Resource Economics*, (6), pp. 245-260.

Booth, J. G., R. W. Butler and P. Hall. 1994. "Bootstrap methods for finite populations." *Journal of the American Statistical Association* (89), pp. 1282–1289.

Chen, H., F. Lupi and J. Hoehn. 1999. "An Empirical Assessment of Multinomial Probit and Logit Models for Recreation Demand," in: "Valuing Recreation and the Environment: Revealed Preference Methods in Theory and Practice" (C. Kling and J. Herriges, editors) Edward Elgar Publishing: Northampton, MA, pp. 141-162.

FWC. 2002. "Schedule of Estimated Regulatory Cost: Brevard County Manatee Protection Rule." Florida Fish and Wildlife Conservation Commission.

Greene, G., C. B. Moss, and T. H. Spreen. 1997. "Demand for Recreational Fishing in Tampa Bay, Florida: A Random Utility Approach." *Marine Resource Economics* (12), pp. 293-305.

Haab, T. C., and K. McConnell. 2002. "Valuing Environmental and Natural Resources: The Econometrics of Nonmarket Valuation", Northampton, MA: Edward Elgar.

Haab T. C., M. S. Hamilton and K. E. McConnell. 2008. "Small Boat Fishing in Hawaii: A Random Utility Model of Ramp and Ocean Destination," *Marine Resource Economics* (23), pp. 137-151.

Harding, D. and M. H. Thomas. 2003. "The Economics of Selected Florida Wildlife Management Areas." Companion Report to the Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Jones, C. and F. Lupi. 2000."The Effect of Modeling Substitute Activities on Recreational Benefit Estimates." *Marine Resource Economics* 14(4).

Lupi, F., J. Hoehn and G. Christie. 2003. "Using an Economic Model of Recreational Fishing to Evaluate Benefits of Sea Lamprey (*Petromyzon marinus*) Control," *Journal of Great Lakes Research* (29), pp: 742-54.

Lupi, F., J. P. Hoehn, H. Z. Chen and T. D. Tomasi. 2001. "The Michigan Recreational Angling Demand Model." *2000 Proceedings of International Institute of Fisheries Economics and Trade* (A. Shriver, ed.), Corvallis, OR. 125-134.

Lupi, F., J. P. Hoehn and T. P. Moen. 1997. "User's Guide to the Policy Interface for the Michigan Recreational Fishing Demand Model." *Agricultural Economics Staff Paper* 97-56, Michigan State University, (online at www.msu.edu/user/lupi/guide.htm).

Lupi, F. and P. Feather. 1998. "Using Partial Site Aggregation to Reduce Bias in Random Utility Travel Cost Models," *Water Resources Res.*, 34(12):3595-3603

McConnell, K. 1977. "Congestion and Willingness to Pay: A Study of Beach Use." *Land Economics* 53(2), pp. 185–195.

McConnell, K. E. 1988. "Heterogeneous Preferences for Congestion." *Journal of Environmental Economics and Management* (15), pp. 251-258.

McConnell, K. E. 1992. "The Problem of Onsite Time in the Demand for Recreation." *American Journal of Agricultural Economics* (74).

Milon, J. W. 1988. "A Nested Demand Shares Model of Artificial Marine Habitat Choice by Sport Anglers." *Marine Resources Research* (5), pp. 191-213.

Morey, E., R. Rowe and M. Watson. 1993. "A Repeated Nested Logit Model of Atlantic Salmon Fishing." *American Journal of Agricultural Economics* (75), pp. 578-592.

Morey, E. R. 1999. "TWO RUMs unCLOAKED: Nested-Logit Models of Site Choice and Nested-Logit Models of Participation and Site Choice", Chapter 4 in "Valuing the Environment Using Recreation Demand Models," (C.L. Kling and H. Herriges, Eds.), Edward Elgar Publishing Ltd., Northampton, MA.

Pindyck, R.S. and D.L. Rubinfeld. 1998. *Econometrics Models and Economic Forecasts*. Fourth Edition, Irwin McGraw Hill.

Randall, A. 1994. "A Difficulty with the Travel Cost Method.) *Land Economics* (70), pp. 88-96.

Schuhmann P. and Schwabe K., 2004. "An Analysis of Congestion Measures and Heterogeneous Angler Preferences in a Random Utility Model of Recreational Fishing." *Environmental and Resource Economics* 27(4), pp. 429-450.

Small, K. A. and H. S. Rosen. 1982. "Applied Welfare Economics with Discrete Choice Models." *Econometrica* (49), pp. 105-30.

Swanson, C. S., M. Thomas and D.M. Donnelly. 1989. "Economic Value of Game Hunting in Southeast Alaska." Resource Bulletin RM-16, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Ft. Collins, CO.

Thomas, M. H. and N. Stratis. 2001. "Assessing the Economic Impact and Value of Florida's Public Piers and Boat Ramps: A Final Companion Report to the Executive Document of March 2001." Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Thomas, M. H. and N. Stratis. 2002. "A Random Utility Approach to Boating in Florida." *Marine Resource Economics* 17(1), pp. 23-33.

Tomasi, T. and M. H. Thomas. 1998. "Natural Resource Damage Assessment for the Tampa Bay Oil Spill: Recreational Use Losses for Florida Residents." Draft Report, Florida Department of Environmental Protection.

Thompson S. K. 2002. "Sampling". John Wiley & Sons, Inc., New York, 367 pp.

Thompson S. K. and G. A. F. Seber. 1996. "Adaptive Sampling." John Wiley & Sons, Inc., New York, 265 pp.