

**Florida Boating Access Facilities Inventory  
And Economic Study with a Pilot  
Study for Lee County**

**Residential Sampling  
Of Private Waterfront Residences  
2009**

**Paul Kubilis  
(Statistician)**

**David Harding, Ph.D.  
(Economist, Project Manager)**

Fish and Wildlife Research Institute  
Information Science and Management  
Florida Fish and Wildlife Conservation Commission

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 slips at private waterfront residences in order to develop 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.

**Method:** Stratified Simple Random Sampling (1<sup>st</sup> Phase)  
Stratified Simple Random Sub-Sampling (2<sup>nd</sup> Phase)

**Statistical Analysis:** The county- level waterfront residential property (WFP) boating access facility (BAF) survey sampling design consisted of a stratified random sampling design. For each county, simple random sampling was carried out within each of 4 residential property parcel stratum sampling frames: 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 grids that could be used to define WFP sampling

frames for each of these strata were available as GIS coverage's for 63 of the 67 Florida counties.

Stratum sample sizes were determined based on 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 WFP's. Preliminary data consisted of the number of dock feet and the number of boat slips estimated from aerial photographs for each up to 200 verified WFP's per stratum. Strata with less than 200 WFP's were censused completely. A sample of 200 WFP's was drawn from strata containing more than 200 WFP's. 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 total. It was determined that a sample size of 300 WFP's 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 the initial stratum sample sizes to 300 WFP's for all counties. This means that a stratum sampling frame would be sampled until 300 verified WFP's had been encountered in the overall sample, or until all WFP's had been censused when the sampling frame contained less than 300 true WFP's.

**Infrastructure:** Bulkhead, Single Dock, Finger or T dock without slips, and Finger or T Dock with slips.

**Sampling Strata:**

1. Single family residential and individual mobile homes.
2. Multi family - < 10 units
3. Multi family - > 10 units
4. Condos

Counties Not Sampled: Citrus, Highlands, Sumter and Martin Counties of Florida due to a lack of parcel data.

Estimates Statewide: County-level estimated totals and variances for each stratum and for all strata combined were used to estimate "Statewide" (i.e. 63 county) population totals for dock footage, boat slips, and number of WFP 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.

## **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 WFP’s 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 stratified random sampling design in which counties were viewed as strata (Thompson, 2002).*

### **Statewide:**

- Approximately 28,794 waterfront residential properties with boat slips for an estimated 49,831 private residential boat slips. These number may be broken down into the following:
  - 27,676 waterfront single family properties with boat slips (= 33,809 slips total).
  - 398 waterfront multi-family < properties with boat slips (=1,414 slips total).
  - 230 waterfront multi-family > 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 wet slips. As with wetslips, this number can also be broken down by property type as previously defined in this report. Again these estimates do not include Citrus, Highlands, Martin, or Sumter Counties because of a lack of complete parcel data.

- 155,191 single family properties had boat docks.
- 2,105 multi-family <10 properties had boat docks.
- 549 multi-family >10 properties had boat docks.
- 711 condominiums had boat docks

Thompson S.K. 2002. “Sampling”. John Wiley and Sons, Inc. New York, 367 pp.