

National Wetland Condition Assessment 2011 Survey Design

Description of Sample Design

Target population: The target population for the NWCA is all wetlands of the conterminous U.S. not currently in crop production, including tidal and nontidal wetted areas with rooted vegetation and/or shallow open water less than 1 meter in depth. A wetland's jurisdictional status under state or federal regulatory programs will not factor into this definition of target¹.

Sample Frame: The sample frame is the FWS National Wetland Status and Trend 2005 survey and was obtained through collaboration with FWS. The sample frame consists of all polygons mapped based on 2005 remote sensing information for over 5,048 2 mi by 2 mi plots across the 48 states. Additional attributes added to the sample frame are state, EPA Region, Omernik ecoregion level III, Wadeable Stream Assessment 3 and 9 aggregated ecoregions. The wetland types included are E2EM, E2SS, PEM, PSS, PFO, Pf and PUBPAB which includes PAB, PUBa, PUBf, PUBi, PUBn, and PUBu. The following land cover types were excluded: E1UB, E2AB, E2US, LAC, M1, M2, OUT, PUS, RIV, UA, UB, UFP, UO, and URD.

Survey Design: The survey design is a two-stage design with the first stage design from the FWS National Wetland Status and Trend survey design. The first stage is an area frame design stratified by state and physiographic region where the area frame consists of 2 mi by 2 mi plots that cover the 48 contiguous states. The first stage results in the identification of land cover types focused on wetland types within each 2 mi by 2 mi plot selected (sample size is 5,048 plots). The second stage is a Generalized Random Tessellation Stratified (GRTS) survey design for an area resource applied to the stage one sample plots. The second stage survey design is a stratified design with unequal probability of selection based on area within each stratum. The details are given below.

Stratification and unequal probability categories: Stratification is by state and unequal probability of selection is by seven (7) wetland type categories. Allocation of sites by state and wetland type categories was completed by solving a quadratic programming problem that minimized the sum of the squared deviations of the expected sample size minus proportional allocation of sites by wetland type based on state area within each wetland type subject to constraints that (1) the sum of the expected sample sizes for a state within a wetland type was the following E2EM=128, E2SS=127, PEM=129, PSS=129, PFO=129, Pf=129, and PUBPAB=129, (2) the minimum number

¹ Impacts to wetlands and other aquatic resources are regulated under the Clean Water Act when an aquatic resource is determined to be a "Water of the United States." Jurisdictional Determinations are made on a case-by-case basis according to the definition found in *40 CFR 230.3(s)*. For more information please visit the following website: <http://www.epa.gov/owow/wetlands/guidance/CWAwaters.html>.

of sites for a state was 8, (3) the maximum number of sites within a state for E2EM or E2SS was 13 (coastal states), (4) the maximum number of sites within a state for PEM, PSS, PFO, Pf, or PUBPAB was 10 and (5) the minimum number of sites was greater than or equal to zero for each wetland type and state combination. This approach ensured that the sample size for the seven wetland types was sufficient for national reporting, each state received a minimum number of sites (which also improved the national spatial balance of the sites) and otherwise proportionally allocated the sites by area within a wetland type.

Panels: Design includes three panels. Revisit: identifies sites that are to be visited twice. Base: identifies remaining sites to be visited. Over: identifies sites available to be used as replacement sites.

Expected sample size: Expected sample size 900 sites for conterminous 48 states. The maximum number of sites for a state was 69 (Louisiana) and the minimum number of sites for a state was 8 (Vermont). Total number of site visits is 996 allocated to 900 unique sites with 96 sites to be revisited.

Over sample: A 100% over sample size was selected to provide replacement sites that either are not part of the target population or are could not be sampled.

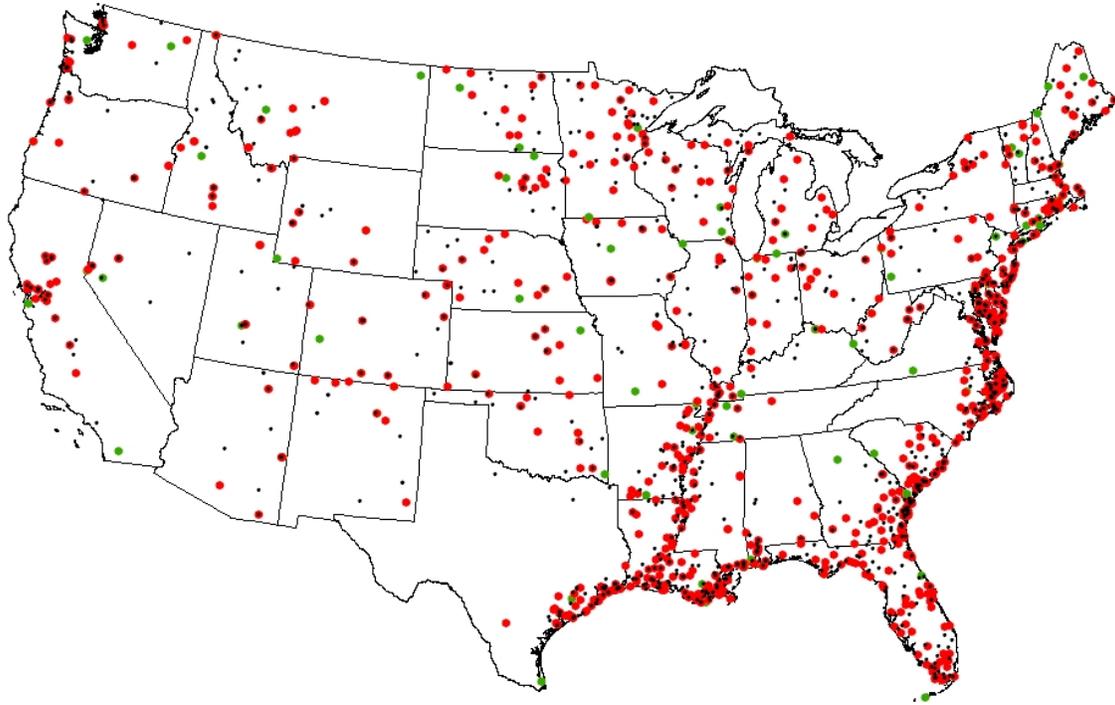
Site Use: Sites should be used in SiteID order within each state. If a revisit site can not be sampled the next site in the Base panel within the state should be used as revisit site.

Sample Frame Summary

See accompanying excel worksheet.

Site Selection Summary

See accompanying excel worksheet for details. Map identifies revisit sites in green, base sites in red and over sample sites in black.



Description of Sample Design Output:

See accompanying excel worksheet

Projection Information

```
ROJCS["NAD_1983_Albers",  
GEOGCS["GCS_North_American_1983",  
DATUM["D_North_American_1983",  
SPHEROID["GRS_1980",6378137.0,298.257222101]],  
PRIMEM["Greenwich",0.0],  
UNIT["Degree",0.0174532925199433]],  
PROJECTION["Albers"],  
PARAMETER["False_Easting",0.0],  
PARAMETER["False_Northing",0.0],  
PARAMETER["Central_Meridian",-96.0],  
PARAMETER["Standard_Parallel_1",29.5],  
PARAMETER["Standard_Parallel_2",45.5],  
PARAMETER["Latitude_Of_Origin",23.0],  
UNIT["Meter",1.0]]
```

Evaluation Process

The survey design weights that are given in the design file assume that the survey design is implemented as designed. Typically, users prefer to replace sites that can not be sampled with other sites to achieve the sample size planned. The site replacement process is described above. When sites are replaced, the survey design weights are no

longer correct and must be adjusted. The weight adjustment requires knowing what happened to each site in the base design and the over sample sites. EvalStatus is initially set to "NotEval" to indicate that the site has yet to be evaluated for sampling. When a site is evaluated for sampling, then the EvalStatus for the site must be changed.

Recommended codes are:

EvalStatus Code	Name	Meaning
TS	Target Sampled	site is a member of the target population and was sampled
LD	Landowner Denial	landowner denied access to the site
PB	Physical Barrier	physical barrier prevented access to the site
NT	Non-Target	site is not a member of the target population
NN	Not Needed	site is a member of the over sample and was not evaluated for sampling
Other codes		Many times useful to have other codes. For example, rather than use NT, may use specific codes indicating why the site was non-target.

Statistical Analysis

Any statistical analysis of data must incorporate information about the monitoring survey design. In particular, when estimates of characteristics for the entire target population are computed, the statistical analysis must account for any stratification or unequal probability selection in the design. Procedures for doing this are available from the Aquatic Resource Monitoring web page given in the bibliography. A statistical analysis library of functions is available from the web page to do common population estimates in the statistical software environment R.

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Aquatic Resource Monitoring On-line Resource - Web Page:
<http://www.epa.gov/nheerl/arm>

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