National Wetland Condition Assessment 2016 Survey Design

Description of Sample Design

Target population: NWCA includes tidal and nontidal wetlands within the conterminous U.S. with rooted vegetation and, when present, shallow open water less than one meter deep, that are not currently being used in the production of crops. Wetland types included are

- E2EM – estuarine intertidal emergent (estuarine herbaceous)
- E2SS – estuarine intertidal scrub shrub/forested (estuarine woody)
- PEM – palustrine emergent (inland herbaceous)
- PSS – palustrine scrub shrub (inland woody)
- PFO – palustrine forested (inland woody)
- Pf - Palustrine farmed (inland herbaceous)
- PUBPAB – palustrine unconsolidated bottom/aquatic bed (inland herbaceous).

While these categories are used by the U.S. Fish & Wildlife Services Status and Trends programs, they are used here to identify the types of wetlands included in NWCA and are based on the National Wetland Inventory categories.

Sample Frame: The survey design is a two-stage design. The first and second stages both require a sample frame. The first stage sample frame is an area sample frame for the 48 contiguous states covered by 2 mi by 2 mi square area plots that was created by the FWS for their National Wetland Status and Trend program. This sample frame has each plot associated with a state and physiographic region and may result in a plot being subdivided on state and physiographic region boundaries. This sample frame was obtained from the FWS. The first stage survey design selects a sample of these plots to serve as the sample frame for the second stage survey design.

The second stage sample frame is a combination of (a) the wetland polygons from the FWS National Wetland Status and Trend 2005 survey that was obtained from Tom Dahl and (b) the wetland polygons from the U.S. Fish & Wildlife Service's National Wetland Inventory (NWI). In each case it is only the selected plots from the first stage that are in the second stage sample frame. Additional attributes added to the sample frame are state, EPA Region, Omernik ecoregion level III, and NARS 3 and 9 aggregated ecoregions. The wetland types included are E2EM, E2SS, PEM, PSS, PFO, Pf and PUBPAB (which includes PAB, PUB, PUBf, PUBi, PUBn, and PUBu). In addition, NWCA wetland scientists identified NWI wetland classes that include wetland types within the NWCA target population definition.

Survey Design: The survey design is a two-stage design and includes sites from prior NWCA 2011 survey design to be resampled as well as new sites from the 2016 second stage sample frame.

New Site Design: First, the survey design for new sites is described. Note that the design is not really a two-stage design but a two-step design to select sites in wetland polygons in the 48 contiguous states.

Step 1: The 2x2 sq mi plots for the first stage consisted of all the FWS Status and Trends plots (~5,000) and a sample of 50 to 400 plots for each state from the FWS national grid of 2x2 sq mi plots for an initial set of 9,100 plots. The number of plots for each state depended on the state area. The design is stratified by state. Within each stratum, the plots are a spatially balanced sample of the plots with equal probability.

Step 2: The second stage is a Generalized Random Tessellation Stratified (GRTS) survey design for an area resource applied to the stage one sample plot wetland polygons. What makes this a two-step design is that the sites are selected from all polygons within the stratum and not within each first stage plot. The second step survey design is stratified by state with unequal probability of selection based on wetland class and reporting regions within each state. Unequal selection categories are combination of NWCA reporting regions (ALL (estuarine wetlands for all coasts), CPL, EMU (combination of NAP, SAP, UMW), IPL (combination of NPL, TPL, SPL), WMT, XER) based on aggregations of nine aggregated ecoregions and two wetland classes (herbaceous (E2EM, PEM, PF, PUBPAB) and woody (PFO, PSS, E2SS).

Resample Design: The resample design includes 239 sites sampled in NWCA 2011. While the preference is to have approximately 50% of the sites be re-sample sites, the NWCA 2011 design limitations led to a decision to reduce the number of re-sample sites. Limitations were related to lack of sites in the west and multiple sites within the same 2x2 sq mi plot. The design intent is to have 96 of the sites visited twice in 2016. The survey design selected sites that were spatially balanced across the 48 states with unequal inclusion probabilities defined so that the number of sites in the NWCA categories based on five geographic regions and two wetland categories: ALL_EH=20, ALL_EW=20, CPL_FH=20, CPL_FW=20, EMU_FH=20, EMU_FW=20, IPL_FH=20, IPL_FW=20, WMT_FH=20, WMT_FW=12, XER_FH=11, and XER_FW=5. An additional 96 sites were selected using the same categories to be sites that would be visited twice. While the sample size exceeded the number desired, sites were eliminated due to being duplicates.

Panels: Design includes four panels. Base11_RVT2: identifies sites that are to be visited twice. Base11: identifies sites from NWCA 2011 to be visited once. Base16: identifies new sites to be visited once and Base16_OverSamp: identifies sites available to be used as replacement sites. Note that no over sample sites from 2011 are included. If any site from 2011 cannot be sampled and all sites from 2011 available have been evaluated and sampled if possible, then the over sample site will be the next available new site in Base16_OverSamp.

Expected sample size:

Total of 239 resampled sites from NWCA 2011 and 665 new sites for a total of 904 sites. Each state will revisit 2 sites for an additional 96 visits resulting in 1,000 site-visits for

NWCA 2016. The minimum number of sites in a state is 7 (with two revisits total of 9 site-visits) and the maximum is 61.