

National Wetland Condition Assessment 2021 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.

Sample Frame: The sample frame source is the U.S. Fish & Wildlife Service’s National Wetland Inventory (NWI). The NWI wetland polygon data was updated on October 8, 2019 and is the latest available. Rusty Griffin, USFWS National Wetlands Inventory, National Standards and Support Team, Madison, WI provided access for NWCA to download the 22 GB file. This data is the basis for the NWI “Wetlands Mapper” to view America’s wetland resources. “The Wetland Mapper fulfills the U.S. Fish and Wildlife Service’s strategic plan for the development, revision and dissemination of wetlands data and information to resource managers and the public. This information is intended to promote the understanding and conservation of wetland resources through discovery and education as well as to aid in resource management, research and decision making.”

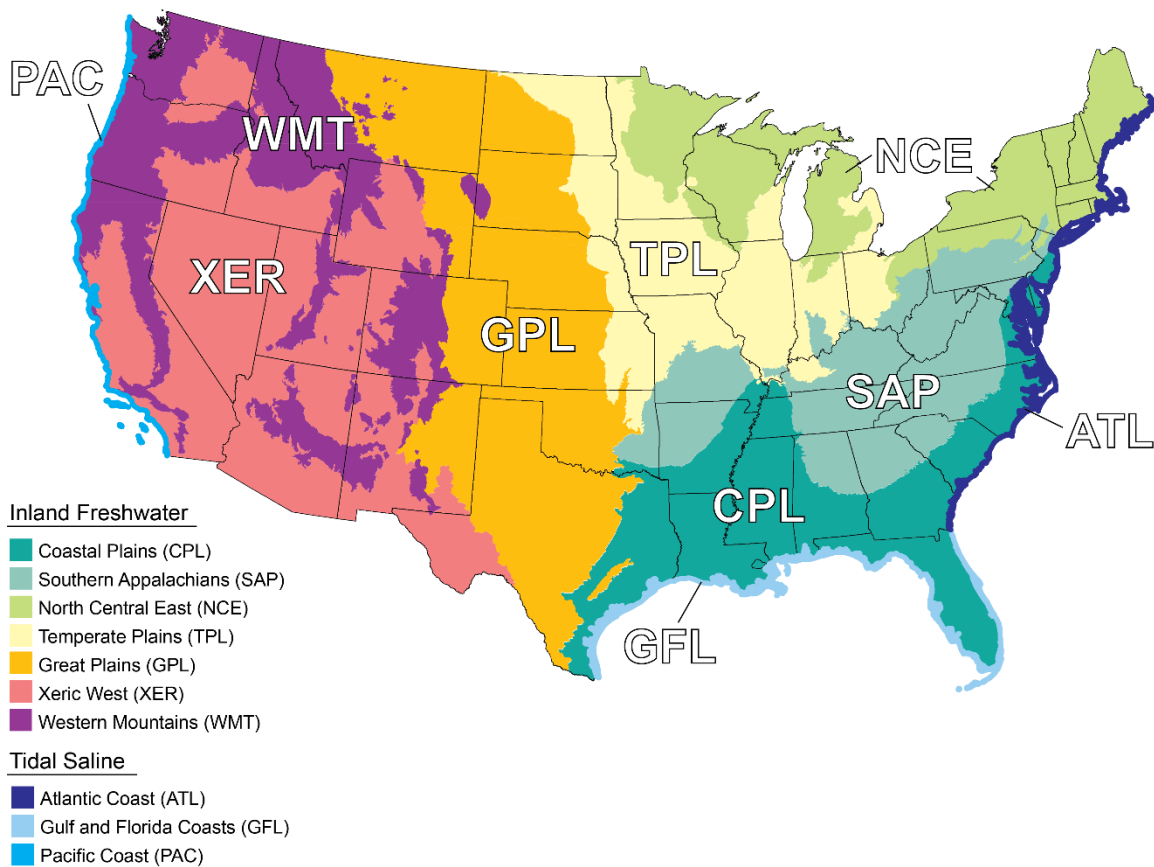
NWCA processed the data by assigning wetland polygons to states and within each state assigning them to the NARS nine aggregated ecoregions. In addition, the detailed wetland types were categorized into seven wetland types of interest to NWCA (E2EM, E2SS, PEM, PSS, PFO, Pf and PUBPAB) and five wetlands types not included (EOTH – estuarine other wetlands, M1M2 – marine wetlands, LOTH – lacustrine other wetlands, POTH – palustrine other wetlands, and ROTH – riverine other wetlands). The former are included as they are likely to result in sites that would meet the NWCA definition of a wetland and the latter are excluded as they are unlikely to result in sites that would meet the NWCA definition of a wetland. Cowardian wetland classes were assigned to each NWCA wetland class by two wetland ecologists.

Montana provided a GIS layer similar to NWI that had not yet been incorporated.

Minnesota conducts a wetland quantity survey similar to U.S. Fish & Wildlife Service’s Status and Trends program. It is based on 1 sq mi plots. NWCA used the results of this survey for the Minnesota sample frame. The Minnesota survey design also differs from the NWCA survey design completed for other states.

Reporting Units: NWCA 2021 is based on 17 reporting units associated with 10 geographic areas. Inland wetland regions are based on NARS nine aggregated ecoregions where the Upper Midwest and Northern Appalachians are combined to form the North Central East region and the Northern Plains and Southern Plains are combined to form the Great Plains region. Estuarine wetland coastal regions are the Pacific Coast, Gulf and Florida Coast and the Atlantic Coast. The inland reporting regions are then divided by herbaceous and woody wetland types.

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Expected sample size: The expected sample size is 904 sites for conterminous 48 states with 96 of those sites to be revisited twice for a total of 1,000 site-visits. Each state will have two sites that will be visited twice in 2021 for a total of 1,000 site-visits. Sample allocation depends on the 17 reporting units with 53 in each unit except for three (3) additional sites in CPL woody for total of 904 sites.

Table 1 Sample size by Reporting Unit

Report Unit	Total	PRLH	PRLW
NCE	106	53	53
SAP	106	53	53
CPL	112	56	56
TPL	106	53	53
GPL	106	53	53
WMT	106	53	53
XER	106	53	53
ATL	53		
GFL	53		
PAC	53		
Total	904		

The number of sites for each state is proportional to the wetland area within each reporting unit with a restriction that each state must have a minimum of eight (8) unique sites and with the two revisits a minimum of 10 site visits.

Survey Design: The survey design consists of two main components: sites from prior NWCA 2016 survey and new sites for 2021.

Re-sampled Site Design: Approximately 30 percent of the 904 sites, 269 sites, were selected to be re-sampled from NWCA 2016. The actual number of sites was determined for each state after the number of sites in each state was determined based on wetland area. Sites were restricted to NWCA 2016 evaluated sites and then ordered by state and 2016 siteID within state. The first “n” sites within a state were designated Base21_16RVT2 (first 2 sites), Base21_16 and the remaining sites as Over21_16. This means that some of the Base21_16 sites will likely not have been target and sampled in 2016. Hence over sample sites will likely be required. Note that all sites should be evaluated again in 2021 to determine if they are target and if target whether they can be sampled. Conditions could have changed since 2016.

New Site Design: The remaining approximately 70%, 635, are new sites. The new site survey design is initially stratified by state and reporting unit to ensure sample size requirements are met. An over sample 20 times the number of sites required for the reporting unit was included. Sites were selected using a Generalized Random Tessellation Stratified (GRTS) survey design for an area resource. After the sites were selected, a second survey design was completed on the selected sites for the purpose of removing the reporting unit stratification so that sites could be replaced within a state by inland wetland and, if present, estuarine wetland.

Panels: The survey design includes three panels. Base21_16RVT2: identifies sites that are to be visited twice from NWCA 2016, Base21_16 identifies sites that will be visited once from NWCA 2016, Base21_21 identifies new sites selected for 2021, Over21_16

identifies sites to be used if any Base21_16 site cannot be sampled in 2021, and Over21_21 identifies new sites to be used if any Base21_21 sites cannot be sampled.

Site Use: All “base” sites are expected to be evaluated and sampled if possible. If one or more “base” sites cannot be sampled, then the site replacement process is completed within a state. Sites are listed in siteID order within a state. The replacement process is completed by PANEL_USE within each STRATUM. The STRATUM possible values are ReSamp_2016, Estuarine and Inland.

- STRATUM equal to ReSamp_2016. Replace sites as follows:
 - Base21_16RVT2 sites will be sampled twice in 2021. If one of them cannot be sampled, then the first Base21_16 site is evaluated and if it can be sampled it is sampled twice. If no Base21_16 site is available, then the next available Over21_16 site is evaluated and if it can be sampled it is sampled twice.
 - Base21_16 sites will be sampled once in 2021. If one of them cannot be sampled, then the next available Over21_16 site is evaluated and sampled.
 - If no Over21_16 site is available, then no site is used to replace it. In this case, an additional site must be sampled in the Inland stratum.
- STRATUM equal to Estuarine. If a state has estuarine stratum, then replace sites as follows within the Estuarine stratum:
 - Base21_21 sites will be sampled once in 2021. If one of them cannot be sampled, then the next available Over21_21 site in the Estuarine stratum is evaluated and sampled.
- STRATUM equal to Inland. Replace sites as follows within the Inland stratum:
 - Base21_21 sites will be sampled once in 2021. If one of them cannot be sampled, then the next available Over21_21 site in the Inland stratum is evaluated and sampled.

Sample Frame Summary

See accompanying excel worksheet.

Sample frame area in acres by reporting unit and wetland type.

	EOTH	EST	LOTH	M1M2	POTH	PRLH	PRLW	ROTH	Sum
ATL	1084891	1592982	0	68681	0	0	0	0	2746554
CPL	0	0	3311394	0	35946	9214653	34136743	1784049	48482785
GFL	2482748	2690574	0	61025	0	0	0	0	5234348
GPL	0	0	2028600	0	3970	8753988	1073167	457102	12316826
NCE	0	0	6092439	0	23789	6444900	20269081	1060699	33890907
PAC	125718	80424	0	27087	0	0	0	0	233230
SAP	2	0	2452141	0	6519	2480256	2788725	1746543	9474186
TPL	0	0	1615596	0	28906	7367449	3802818	971326	13786093
WMT	0	0	1902575	0	18521	5469099	1355735	487878	9233808
XER	0	0	5114093	0	28770	11077044	1211176	317677	17748759
Sum	3693360	4363980	22516838	156793	146421	50807387	64637444	6825273	153147497

Note that the summary accounts for assignment of small assignments of ecoregions in some states to other ecoregions for the purpose of eliminating rare categories within a state.

Site Selection Summary

See accompanying excel worksheet for details.

Summary by Aggregated Ecoregions

	Base	Over	Total
CPL	225	3639	3864
NAP	58	926	984
NPL	27	509	536
SAP	94	1437	1531
SPL	57	1008	1065
TPL	107	1761	1868
UMW	59	864	923
WMT	133	1974	2107
XER	144	2571	2715
Total	904	14689	15593

Summary by Reporting Unit.

Includes three Minnesota ecoregions (MWP, MWS, NPL)

	Base	Over	Total
ATL	48	830	878
CPL	128	2004	2132
GFL	57	882	939
GPL	76	1468	1544
MWP	10	140	150
MWS	10	140	150
NCE	82	1283	1365
NPL	8	53	61
PAC	48	860	908
SAP	101	1628	1729
TPL	107	1720	1827
WMT	113	1730	1843
XER	116	1951	2067
Total	904	14689	15593

Description of Sample Design Output:

PSTL_CODE	
siteID	Site ID for 2021
LON DD83	Longitude in decimal degrees NAD83
LAT DD83	Latitude in decimal degrees NAD83
STRATUM	Stratum 2021: ReSamp_2016, Inland, Estuarine
PANEL USE	Panel used for site replacement

siteID_16	Site ID from NWCA 2016
EVAL_2016	Site evaluation from NWCA 2016
PROB_CAT	Unequal probability selection category for NWCA 2021
AG_ECO9	Aggregated ecoregion (see above)
RPT_UNIT	NWCA reporting unit (see above)
WETCLS_DSN	NWCA wetland class based on NWI for survey design
WETGRP_DSN	NWCA wetland group (EST, PRLH, PRLW)
WETCLS_NWI	NWI wetland class from sample frame
WGT	Initial design weight (acres)

Projection Information

PROJCS["Albers",
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