

National Coastal Condition Assessment 2015 Coastal Estuarine Survey Design

Description of Coastal 21 State Survey Design

Target population: All coastal waters of the United States from the head-of-salt to confluence with ocean including inland waterways and major embayments such as Florida Bay and Cape Cod Bay.

Sample Frame: The sample frame was derived from prior National Coastal Assessment sample frame developed by ORD Gulf Breeze Ecology Division. The prior GED sample frame was enhanced as part of the National Coastal Monitoring Network design by including information from NOAA's Coastal Assessment Framework, boundaries of National Estuary Programs and identification of major coastal systems. For NCA 2010 information on salinity zones was obtained from NOAA. For Delaware Bay, Chesapeake Bay, Puget Sound and state of South Carolina, the prior NCA sample frames were replaced by GIS layers provided by those organizations, ensuring that no prior areas in NCA were excluded and any differences clearly identified in the new NCA 2010 sample frame. For the Californian Province excluding San Francisco Bay, the GED sample frame was changed to match 2004 sample frame used for NCA 2004 study. In 2013, the sample frame was updated to include information related to 1999-2001 and 2005-2006 NCA sample frames. This is necessary to provide the information required to estimate change between these periods, 2010 and 2015.

Survey Design: The NCCA 2015 survey design consists of two independent designs. One design re-samples sites sampled during NCCA 2010. The other design selects new sites using essentially the same survey design used for NCCA 2010. Both survey designs are a stratified design with unequal probability of selection based on area within each stratum. A Generalized Random Tessellation Stratified (GRTS) survey design for an area resource is used. The details are given below.

Stratification: Stratification is by major estuaries based on the NOAA Coastal Assessment framework, NEP estuaries and state. The strata by state are

State	Stratum
Maine	AP_Casco_Bay, AP_Penobscot_Bay, AP_Other_ME
New Hampshire	AP_New_Hampshire_Estuaries
Massachusetts	AP_Buzzards_Bay, AP_Massachusetts_Bay, AP_Other_MA
Rhode Island	VP_Narragansett_Bay, VP_Other_RI
Connecticut	VP_Long_Island_Sound,
New York & New Jersey	VP_NY_NJ_Harbor, VP_Peconic_Bay, VP_Other_NY, VP_NJ_Barnegat_Inland_Bays
Delaware	VP_Delaware_Bay, VP_Other_DE
Maryland & Virginia	VP_Chesapeake_Bay, VP_Other_MD, VP_Other_VA

North Carolina	CarP_Albemarle_Pamlico_Sounds, CarP_Other_NC
South Carolina	CarP_SC_OPEN, CarP_SC_CREEK
Georgia	CarP_Other_GA
Florida	CarP_Indian_River, CarP_Other_FL, WIP_Biscayne_Bay, WIP_Charlotte_Harbor, WIP_Florida_Bay, WIP_Tampa_Bay, WIP_Other_FL, LP_Apalachee_Bay, LP_Apalachicola_Bay, LP_Pensacola_Bay, LP_Other_FL
Alabama	LP_Mobile_Bay, LP_Other_AL
Mississippi	LP_Other_MS
Louisiana	LP_West_Mississippi_Sound, LP_Atchafalaya_Vermilion_Bay, LP_Barataria_Terrabonne, LP_Breton_Chandeleur_Sound, LP_Mississippi_River, LP_Other_LA
Texas	LP_Coastal_Bend_Bays, LP_Galveston_Bay, LP_Matagorda_Bay, LP_San_Antonio_Bay, LP_Other_TX
California	CalP_San_Francisco_Bay, CalP_Other_CA, ColP_Other_CA
Oregon	ColP_Lower_Columbia_River, ColP_Other_OR
Washington	ColP_Puget_Sound, ColP_Other_WA

Major estuaries that occur in two states (e.g., Chesapeake Bay, Delaware Bay, and Lower Columbia River) are not split between the states. The sites are assigned to the state in which they occur. Long Island Sound is assigned to New York as the major polygon is divided into the portion within each state. Consequently, most Long Island Sound sites are assigned to New York.

Multi-density categories: Unequal probability categories were created based on area of polygons within each major estuary. The number of categories ranged from 3 to 7. The categories were used to ensure that sites were selected in the smaller polygons.

Panels: The combined designs have the following panels:

1. Base10_RVT2: Sites from NCCA 2010 that will be re-sampled twice in 2015
2. Base10: Sites from NCCA 2010 that will be re-sampled once in 2015
3. Base15: New sites that will be sampled once in 2015
4. Base10_OverSamp: Sites from NCCA 210 that are over sample sites that will only be used if any Base10_RVT2 or Base10 sites cannot be sampled in 2015
5. Base15_OverSamp: New sites that are over sample sites that will only be used if any Base15 site cannot be sampled in 2015

Expected sample size: The expected sample size is 684 unique sites for the conterminous 21 coastal states. The total number of site-visits is 750 where 66 sites will be sampled twice in 2015. Of the 684 unique sites, 336 sites are sites that were sampled in NCCA 2010 and 348 are new sites selected for NCCA 2015.

Site Use: When a “base” site cannot be sampled for any reason, the site must be replaced using the following rules:

1. Base10_RVT2: When a site in this category cannot be sampled it should be replaced by the next available site in the Base10_OverSamp list within the same

state and STRATUM_15 (where sites are in SITEID_15 order within the state and stratum) and the replacement site should be sampled twice in 2015.

2. Base10: When a site in this category cannot be sampled it should be replaced by the next available site in the Base10_OverSamp list within the same state and STRATUM_15 (where sites are in SITEID_15 order within the stratum).
3. Base15: When a site in this category cannot be sampled it should be replaced by the next available site in the Base15_OverSamp list within the same state and STRATUM_15 (where sites are in SITEID_15 order within the stratum)

Sample Frame Summary

Area (square miles) of sample frame by state and whether included or excluded from NCCA 2010 and NCCA 2015 survey designs

State	Area include in both 2015 and 2010	Area Included in 2015 but excluded in 2010	Total Area Included in 2015	Area excluded in 2015 but included in 2010	Area excluded from both 2010 and 2015	Total Sample Frame Area
AL	594.8	0	594.8	0	14.1	608.9
CA	541.4	8	549.4	0	52.7	602.1
CT	57.4	0	57.4	0	8.2	65.7
DE	789.6	0	789.6	0	33.7	823.3
FL	4558.5	0	4558.5	0	13.7	4572.2
GA	250.4	0	250.4	0	8	258.3
LA	4959.2	0	4959.2	0	0	4959.2
MA	1525.1	0.5	1525.6	0	553.7	2079.4
MD	2450.1	0	2450.1	0	0	2450.1
ME	1511.1	5.1	1516.2	0	14.4	1530.7
MS	661.5	0	661.5	0	0	661.5
NC	3343.4	0.6	3344	0	5.2	3349.1
NH	18.2	0.5	18.7	0	0	18.7
NJ	306.9	0	306.9	0	0	306.9
NY	1747.8	0	1747.8	0	38.9	1786.7
OR	112.6	0	112.6	0	146	258.6
RI	574.8	0	574.8	0	0.4	575.3
SC	339.2	0	339.2	0	0.1	339.4
TX	2236.6	0	2236.6	351.4	15.1	2603.1
VA	2745.9	9.5	2755.4	0	0.1	2755.4
WA	2516.9	0	2516.9	0	1676.4	4193.2
Total	31841.4	24.1	31865.5	351.4	2580.8	34797.7

New area included in 2015 that was not included in 2010 is the result of adding a number of small estuaries that were included in the survey design for NCA 2005-6 in east coast states and a portion of San Francisco Bay. In Texas, the tidal flat region of Lower Laguna Madre was excluded as it was in NCA 2005-6. Note that no sites from NCCA 2010 were sampled in this region. Regions excluded in 2010 and 2015 are mainly tidal rivers above head-of-salt. In Massachusetts, the Stellwagen Bank is excluded, In Washington, the strait of Juan de Fuca and the portion of Puget Sound in Canada are excluded.

Site Selection Summary

Number of Sites by State and by type of site.

	Number of Unique Sites				Number of Site Visits	Number of Over Sample Sites		Total Number of Sites Available
	2010 Sites Sampled Twice in 2015	2010 Sites Sampled Once in 2015	New Sites for 2015	Total Unique Sites		2010 Over Sample Sites	2015 Over Sample Sites	
AL	2	5	10	17	19	10	13	40
CA	4	26	21	51	55	29	29	109
CT	1	3	0	4	5	4	3	11
DE	0	4	10	14	14	6	9	29
FL	9	37	45	91	100	47	45	183
GA	0	3	5	8	8	4	4	16
LA	11	32	43	86	97	43	48	177
MA	5	11	20	36	41	17	21	74
MD	1	15	14	30	31	15	15	60
ME	3	17	20	40	43	23	16	79
MS	0	4	4	8	8	6	6	20
NC	4	15	18	37	41	17	22	76
NH	2	4	6	12	14	6	5	23
NJ	3	8	12	23	26	17	7	47
NY	5	14	20	39	44	16	20	75
OR	2	10	7	19	21	9	5	33
RI	2	5	9	16	18	7	7	30
SC	2	8	12	22	24	10	12	44
TX	5	20	30	55	60	28	31	114
VA	2	9	11	22	24	12	18	52
WA	3	20	31	54	57	29	31	114
Sum	66	270	348	684	750	355	367	1406

Number of sites by NCCA Report Region

NCCA Report Region	# Base Sites	# Over Sample Sites	Total
East Coast	322	336	658

Gulf Coast	238	254	492
West Coast	124	132	256
Total	684	722	1406

Description of Sample Design Output:

Variable Name	Description
ORDER	Variable that orders sites by type of design, Great Lake, state, and site number (DSGN_TYPE, NCA_NM, PSTL_CODE, and SITEID_15) to facilitate identification of site use by a state
SITEID_15	Unique site identification (character)
LON_DD	Longitude in decimal degrees using North American 1983 datum (see below)
LAT_DD	Latitude in decimal degrees using North American 1983 datum (see below)
ALBERS_X	Albers x-coordinate from map projection (see below)
ALBERS_Y	Albers y-coordinate from map projection (see below)
DSGN_TYPE	Identifies if site is associated from Near Shore design, Embayment design, or special design (NPS and Illinois state design)
NCA_NM	Name of Great Lake
PSTL_CODE	State and province two letter code
PANEL_15	Panel assignment for site for NCCA 2015. See above for values
DESIGN	Identifies the specific survey design used to select the sites in either NCCA 2010 for sites to be resampled in 2015 or NCCA 2015 for new sites
WGT_DSGN15	Design weight (in square miles), inverse of inclusion probability, to be used in statistical analyses
STRATUM_15	Strata used in the survey design
MDCAT_15	Multi-density categories used for unequal probability selection
SITEID_10	NCCA 2010 SITE ID
RSRC_CLASS	Resource class in which the site is located. Possible values are Great_Lakes_Embayments, Great_Lakes_Embayments_Harbors, Great_Lakes_Near_Shore_NotBays, Great_Lakes_Near_Shore_NotBays_Harbors, Great_Lakes_Near_Shore_Islands
COUNTRY	Location of site in USA or Canada
NCA_REGION	NCCA region: Great Lakes
PROVINCE	Biogeographical province
NCA_EST_NM	Name of Great Lake
NPS_PARK	Four letter abbreviation of the name of National Park Service park

Projection Information

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