Coastal Wetland Elevation and Carbon Flux Inventory with Uncertainty, USA, 2006-2011

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Documentation Revision Date: 2019-12-17

Dataset Version: 1

Summary

This dataset provides maps of coastal wetland carbon and methane fluxes and coastal wetland surface elevation from 2006 to 2011 at 30 m resolution for coastal wetlands of the conterminous United States. Total coastal wetland carbon flux per year per pixel was calculated by combining maps of wetland type and change with soil, biomass, and methane flux data from a literature review. Uncertainty in carbon flux was estimated from 10,000 iterations of a Monte Carlo analysis. In addition to the uncertainty analysis, this dataset also provides a probabilistic map of the extent of tidal elevation, as well as the geospatial files used to create that surface, and a land cover and land cover change map of the coastal zone from 2006 to 2011 with accompanying estimated median soil, biomass, methane, and total CO2 equivalent annual fluxes, each with reported 95% confidence intervals, at 30 m resolution. Land cover was quantified using the Coastal Change Analysis Program (C-CAP), a Landsat-based land cover mapping product.

This dataset includes 12 data files: 9 files in GeoTIFF (*.tif) format, one *.csv file, and 2 compressed files in Shapefile (*.zip) format. There are also five companion files that provide additional information.

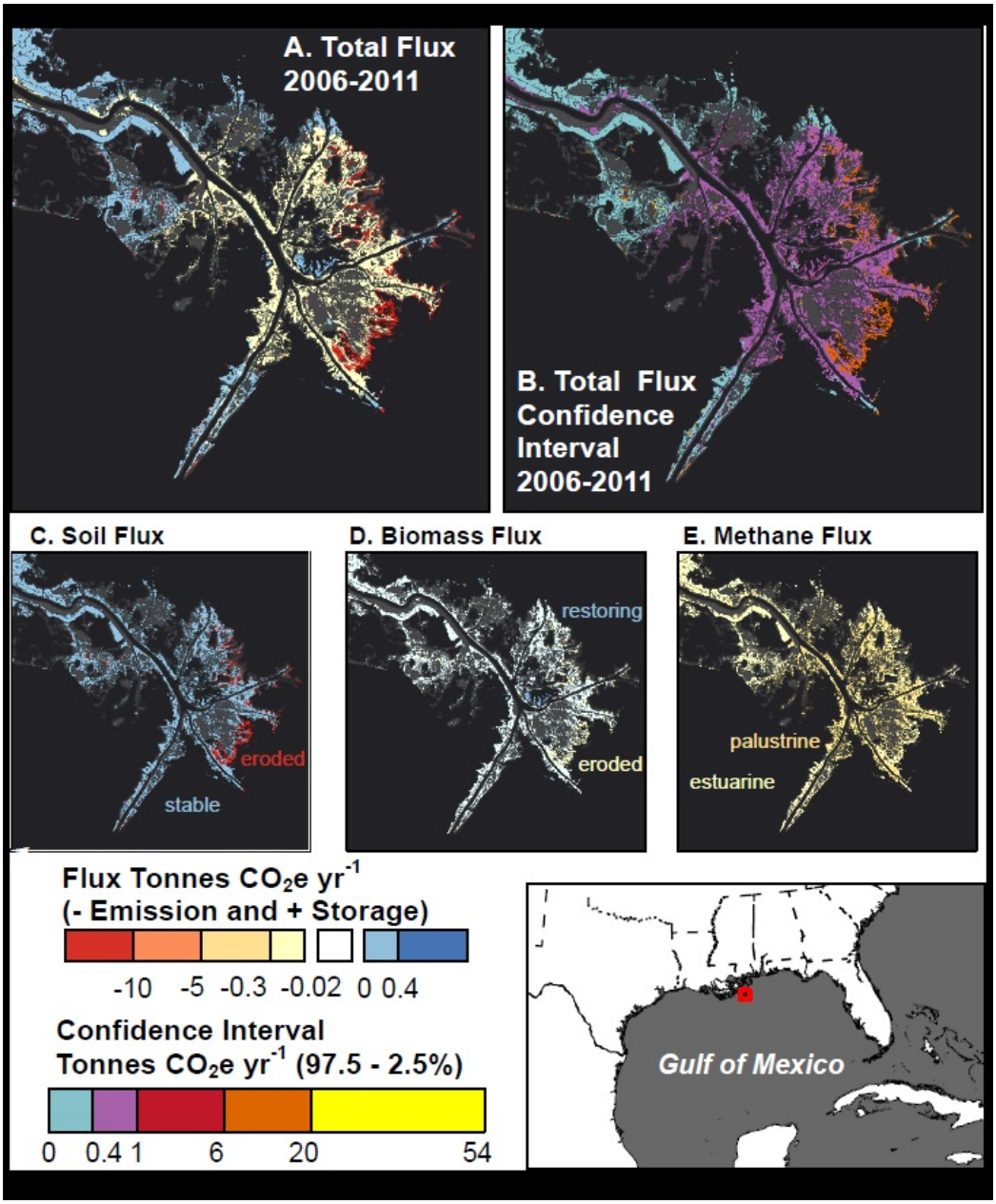

Figure 1. Estimated CO2e fluxes and confidence interval ranges for the Mississippi River outlet in Louisiana, United States. This area contains palustrine and estuarine wetlands, and includes stable wetlands, wetland gains and loss events from 2006 to 2011. A: Total flux from 2006 to 2011. B. Uncertainty, as represented by confidence interval range (0.975 - 0.025 quantile distributions of the results of the Monte Carlo Analysis). C-E. The relative contributions of soil, biomass, and methane to the total flux (A).

Citation

Holmquist, J.R., L. Windham-Myers, B. Bernal, K.B. Byrd, S. Crooks, M.E. Gonneea, N. Herold, S.H. Knox, K. Kroeger, J. Mccombs, P.J. Megonigal, L. Meng, J.T. Morris, A.E. Sutton-grier, T. Troxler, and D. Weller. 2019. Coastal Wetland Elevation and Carbon Flux Inventory with Uncertainty, USA, 2006-2011. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1650

Table of Contents

1. Dataset Overview

This dataset provides maps of coastal wetland carbon and methane fluxes and coastal wetland surface elevation from 2006 to 2011 at 30 m resolution for coastal wetlands of the conterminous United States. Total coastal wetland carbon flux per year per pixel was calculated by combining maps of wetland type and change with soil, biomass, and methane flux data from a literature review. Uncertainty in carbon flux was estimated from 10,000 iterations of a Monte Carlo analysis. In addition to the uncertainty analysis, this data set also provides a probabilistic map of the extent of tidal elevation, as well as the geospatial files used to create that surface, and (2) a land cover and land cover change map of the coastal zone from 2006 to 2011 with accompanying estimated median soil, biomass, methane, and total CO2 equivalent annual fluxes, each with reported 95% confidence intervals, at 30 m resolution. Land cover was quantified using the Coastal Change Analysis Program (C-CAP), a Landsat-based land cover mapping product.

Project: Carbon Monitoring System (CMS)

The NASA Carbon Monitoring System (CMS) is designed to make significant contributions in characterizing, quantifying, understanding, and predicting the evolution of global carbon sources and sinks through improved monitoring of carbon stocks and fluxes. The System will use the full range of NASA satellite observations and modeling/analysis capabilities to establish the accuracy, quantitative

uncertainties, and utility of products for supporting national and international policy, regulatory, and management activities. CMS will maintain a global emphasis while providing finer scale regional information, utilizing space-based and surface-based data and will rapidly initiate generation and distribution of products both for user evaluation and to inform near-term policy development and planning.

Related Publication

Holmquist, J.R., Windham-Myers, L., Bernal, B., Byrd, K.B., Crooks, S., Gonneea, M.E., Herold, N., Knox, S.H., Kroeger, K.D., McCombs, J. and Megonigal, J.P., 2018. Uncertainty in United States coastal wetland greenhouse gas inventorying. Environmental Research Letters, 13(11), p.115005. https://doi.org/10.1088/1748-9326/aae157

Acknowledgments

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2. Data Characteristics

Spatial Coverage: Oceanic coastal regions of the Continental United States

Spatial Resolution: 30 m (300 m for tide gauge datum transformation and uncertainty layers)

Temporal Coverage: 2006-01-01 to 2011-12-31

Temporal Resolution: annual

Study Area: (all latitudes and longitudes given in decimal degrees)

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Continental USA	-135.0275111	-56.66266111	48.9917	20.38312778

Data File Information

This dataset includes 12 data files: 9 files in GeoTIFF (*.tif) format, one *.csv file, and 2 compressed shapefiles (*.zip). Abbreviations in the filenames include:

MHHW = Mean Higher High Water

MHHWS = Mean Higher High Water Spring

NAVD88 = North American Vertical Datum 1988

For all files:

- The projection is EPSG:42303
- The no data value is -9999, except for *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif*, which uses 0 as the no data value.
- The resolution for all GeoTIFF files is 300 m except for *probability_elevation_is_below_MHHWS.tif* and *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif*, which have a resolution of 30 m.

Table 1. A summary of the 12 primary data files included in this dataset.

File Name	Units	Description
coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif		Value corresponding to land cover class or change type; see Table 2 fo land change classes.
coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.csv		A lookup table for each of the 'Value' fields in the data file above. Provides the same information as the companion file *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif.vat.dbf* described in Table 3.
MHHW_NAVD88_gauges.zip	meters	Point data from tide gauges showing MHHW elevation relative to NAVD88 and station datum.
MHHW_NAVD88_interpolated.tif	meters	MHHW relative to NAVD88, interpolated between tide gauges
MHHW_NAVD88_datum_error.tif	meters	Standard error of datum, interpolated between tide gauges
MHHW_NAVD88_interpolation_error.tif	meters	Standard error resulting from empirical bayesian kriging between tide gauges
MHHWS_MHHW_gauges.zip	meters	MHHWS relative to MHHW, point data from tide gauges
MHHWS_MHHW_interpolated.tif	meters	MHHWS relative to MHHW, interpolated between tide gauges
MHHWS_MHHW_datum_error.tif	meters	Standard error of datum, interpolated between tide gauges
MHHWS_MHHW_interpolation_error.tif	meters	Standard error resulting from empirical bayesian kriging between tide gauges
MHHWS_NAVD88_propagated_uncertainty.tif	meters	Propagated uncertainty in converting elevation relative to NAVD88 to

		elevation relative to MHHWS
probability_elevation_is_below_MHHWS.tif		Probability elevation is lower than MHHWS

Data File Details

Table 2. Details for file *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif*. The column 'Value' corresponds to each class, which is described as the "Coastal Change Analysis Program (C-CAP) change class from 2006 to 2010/11." See Table 3 for additional information.

Value	Cell Count	class
39	3	High Intensity Developed to Palustrine Scrub/Shrub Wetland
40	19	High Intensity Developed to Palustrine Emergent Wetland
41	3	High Intensity Developed to Estuarine Forested Wetland
42	1	High Intensity Developed to Estuarine Scrub/Shrub Wetland
43	363	High Intensity Developed to Estuarine Emergent Wetland
63	5	Medium Intensity Developed to Palustrine Forested Wetland
64	22	Medium Intensity Developed to Palustrine Scrub/Shrub Wetland
65	72	Medium Intensity Developed to Palustrine Emergent Wetland
66	1	Medium Intensity Developed to Estuarine Forested Wetland
67	3	Medium Intensity Developed to Estuarine Scrub/Shrub Wetland
68	529	Medium Intensity Developed to Estuarine Emergent Wetland
88	100	Low Intensity Developed to Palustrine Forested Wetland
89	117	Low Intensity Developed to Palustrine Scrub/Shrub Wetland
90	274	Low Intensity Developed to Palustrine Emergent Wetland
91	5	Low Intensity Developed to Estuarine Forested Wetland
92	21	Low Intensity Developed to Estuarine Scrub/Shrub Wetland
93	979	Low Intensity Developed to Estuarine Emergent Wetland
113	161	Developed Open Space to Palustrine Forested Wetland
114	248	Developed Open Space to Palustrine Scrub/Shrub Wetland
115	246	Developed Open Space to Palustrine Emergent Wetland
116	5	Developed Open Space to Estuarine Forested Wetland
117	44	Developed Open Space to Estuarine Scrub/Shrub Wetland
118	447	Developed Open Space to Estuarine Emergent Wetland
138	888	Cultivated to Palustrine Forested Wetland
139	3336	Cultivated to Palustrine Scrub/Shrub Wetland
140	2244	Cultivated to Palustrine Emergent Wetland
141	1	Cultivated to Estuarine Forested Wetland
142	115	Cultivated to Estuarine Scrub/Shrub Wetland
143	2612	Cultivated to Estuarine Emergent Wetland
163	133	Pasture/Hay to Palustrine Forested Wetland
164	880	Pasture/Hay to Palustrine Scrub/Shrub Wetland
165	724	Pasture/Hay to Palustrine Emergent Wetland
167	299	Pasture/Hay to Estuarine Scrub/Shrub Wetland
168	3560	Pasture/Hay to Estuarine Emergent Wetland
188	304	Grassland to Palustrine Forested Wetland
189	324	Grassland to Palustrine Scrub/Shrub Wetland
190	304	Grassland to Palustrine Emergent Wetland
191	69	Grassland to Estuarine Forested Wetland
192	151	Grassland to Estuarine Scrub/Shrub Wetland
193	946	Grassland to Estuarine Emergent Wetland
213	304	Deciduous Forest to Palustrine Forested Wetland
214	184	Deciduous Forest to Palustrine Scrub/Shrub Wetland
215	137	Deciduous Forest to Palustrine Emergent Wetland
218	236	Deciduous Forest to Estuarine Emergent Wetland

238	453	Evergreen Forest to Palustrine Forested Wetland
239	256	Evergreen Forest to Palustrine Scrub/Shrub Wetland
240	179	Evergreen Forest to Palustrine Emergent Wetland
242	6	Evergreen Forest to Estuarine Scrub/Shrub Wetland
243	34	Evergreen Forest to Estuarine Emergent Wetland
263	122	Mixed Forest to Palustrine Forested Wetland
264	271	Mixed Forest to Palustrine Scrub/Shrub Wetland
265	141	Mixed Forest to Palustrine Emergent Wetland
267	11	Mixed Forest to Estuarine Scrub/Shrub Wetland
268	11	Mixed Forest to Estuarine Emergent Wetland
288	418	Scrub/Shrub to Palustrine Forested Wetland
289	229	Scrub/Shrub to Palustrine Scrub/Shrub Wetland
290	255	Scrub/Shrub to Palustrine Emergent Wetland
291	14	Scrub/Shrub to Estuarine Forested Wetland
292	139	Scrub/Shrub to Estuarine Scrub/Shrub Wetland
293	220	Scrub/Shrub to Estuarine Emergent Wetland
302	760	Palustrine Forested Wetland to High Intensity Developed
303	2507	Palustrine Forested Wetland to Medium Intensity Developed
304	3967	Palustrine Forested Wetland to Low Intensity Developed
305	3627	Palustrine Forested Wetland to Developed Open Space
306	554	Palustrine Forested Wetland to Cultivated
307	57	Palustrine Forested Wetland to Pasture/Hay
308	1561	Palustrine Forested Wetland to Grassland
309	1	Palustrine Forested Wetland to Deciduous Forest
310	19	Palustrine Forested Wetland to Evergreen Forest
311	6	Palustrine Forested Wetland to Mixed Forest
312	869	Palustrine Forested Wetland to Scrub/Shrub
313	13946313	Palustrine Forested Wetland to Palustrine Forested Wetland
314	136988	Palustrine Forested Wetland to Palustrine Scrub/Shrub Wetland
315	64948	Palustrine Forested Wetland to Palustrine Emergent Wetland
317	187	Palustrine Forested Wetland to Estuarine Scrub/Shrub Wetland
318	454	Palustrine Forested Wetland to Estuarine Emergent Wetland
319	180	Palustrine Forested Wetland to Unconsolidated Shore
320	7833	Palustrine Forested Wetland to Bare Land
321	6610	Palustrine Forested Wetland to Water
322	283	Palustrine Forested Wetland to Palustrine Aquatic Bed
323	1523	Palustrine Forested Wetland to Estuarine Aquatic Bed
327	209	Palustrine Scrub/Shrub Wetland to High Intensity Developed
328	634	Palustrine Scrub/Shrub Wetland to Medium Intensity Developed
329	1368	Palustrine Scrub/Shrub Wetland to Low Intensity Developed
330	1606	Palustrine Scrub/Shrub Wetland to Developed Open Space
331	174	Palustrine Scrub/Shrub Wetland to Cultivated
332	17	Palustrine Scrub/Shrub Wetland to Pasture/Hay
333	328	Palustrine Scrub/Shrub Wetland to Grassland
335	11	Palustrine Scrub/Shrub Wetland to Evergreen Forest
336	2	Palustrine Scrub/Shrub Wetland to Mixed Forest
337	6	Palustrine Scrub/Shrub Wetland to Scrub/Shrub
338	27239	Palustrine Scrub/Shrub Wetland to Palustrine Forested Wetland
339	2141166	Palustrine Scrub/Shrub Wetland to Palustrine Scrub/Shrub Wetland
340	30446	Palustrine Scrub/Shrub Wetland to Palustrine Emergent Wetland
342	30	Palustrine Scrub/Shrub Wetland to Estuarine Scrub/Shrub Wetland
343	87	Palustrine Scrub/Shrub Wetland to Estuarine Emergent Wetland

344	725	Palustrine Scrub/Shrub Wetland to Unconsolidated Shore
345	2101	Palustrine Scrub/Shrub Wetland to Bare Land
346	5915	Palustrine Scrub/Shrub Wetland to Water
347	68	Palustrine Scrub/Shrub Wetland to Palustrine Aquatic Bed
348	258	Palustrine Scrub/Shrub Wetland to Estuarine Aquatic Bed
352	809	Palustrine Emergent Wetland to High Intensity Developed
353	1857	Palustrine Emergent Wetland to Medium Intensity Developed
354	3181	Palustrine Emergent Wetland to Low Intensity Developed
355	3406	Palustrine Emergent Wetland to Developed Open Space
356	501	Palustrine Emergent Wetland to Cultivated
357	49	Palustrine Emergent Wetland to Pasture/Hay
358	87	Palustrine Emergent Wetland to Grassland
359	2	Palustrine Emergent Wetland to Deciduous Forest
360	16	Palustrine Emergent Wetland to Evergreen Forest
362	16	Palustrine Emergent Wetland to Scrub/Shrub
363	3898	Palustrine Emergent Wetland to Palustrine Forested Wetland
364	52675	Palustrine Emergent Wetland to Palustrine Scrub/Shrub Wetland
365	8220283	Palustrine Emergent Wetland to Palustrine Emergent Wetland
367	72	Palustrine Emergent Wetland to Estuarine Scrub/Shrub Wetland
368	573	Palustrine Emergent Wetland to Estuarine Emergent Wetland
369	5731	Palustrine Emergent Wetland to Unconsolidated Shore
370	10497	Palustrine Emergent Wetland to Bare Land
371	130138	Palustrine Emergent Wetland to Water
372	5231	Palustrine Emergent Wetland to Palustrine Aquatic Bed
373	339	Palustrine Emergent Wetland to Estuarine Aquatic Bed
377	119	Estuarine Forested Wetland to High Intensity Developed
378	371	Estuarine Forested Wetland to Medium Intensity Developed
379	676	Estuarine Forested Wetland to Low Intensity Developed
380	122	Estuarine Forested Wetland to Developed Open Space
383	107	Estuarine Forested Wetland to Grassland
385	12291	Estuarine Forested Wetland to Evergreen Forest
387	190	Estuarine Forested Wetland to Scrub/Shrub
389	1	Estuarine Forested Wetland to Palustrine Scrub/Shrub Wetland
390	2	Estuarine Forested Wetland to Palustrine Emergent Wetland
391	2201959	Estuarine Forested Wetland to Estuarine Forested Wetland
392	3736	Estuarine Forested Wetland to Estuarine Scrub/Shrub Wetland
393	14982	Estuarine Forested Wetland to Estuarine Emergent Wetland
394	6	Estuarine Forested Wetland to Unconsolidated Shore
395	322	Estuarine Forested Wetland to Bare Land
396	5888	Estuarine Forested Wetland to Water
398	8	Estuarine Forested Wetland to Estuarine Aquatic Bed
402	60	Estuarine Scrub/Shrub Wetland to High Intensity Developed
403	261	Estuarine Scrub/Shrub Wetland to Medium Intensity Developed
404	628	Estuarine Scrub/Shrub Wetland to Low Intensity Developed
405	517	Estuarine Scrub/Shrub Wetland to Developed Open Space
406	6	Estuarine Scrub/Shrub Wetland to Cultivated
407	1	Estuarine Scrub/Shrub Wetland to Pasture/Hay
408	46	Estuarine Scrub/Shrub Wetland to Grassland
410	139	Estuarine Scrub/Shrub Wetland to Evergreen Forest
412	23133	Estuarine Scrub/Shrub Wetland to Scrub/Shrub
413	16	Estuarine Scrub/Shrub Wetland to Palustrine Forested Wetland
414	7	Estuarine Scrub/Shrub Wetland to Palustrine Scrub/Shrub Wetland
415	6	Estuarine Scrub/Shrub Wetland to Palustrine Emergent Wetland

416	1852	Estuarine Scrub/Shrub Wetland to Estuarine Forested Wetland
417	1111724	Estuarine Scrub/Shrub Wetland to Estuarine Scrub/Shrub Wetland
418	7381	Estuarine Scrub/Shrub Wetland to Estuarine Emergent Wetland
419	310	Estuarine Scrub/Shrub Wetland to Unconsolidated Shore
420	726	Estuarine Scrub/Shrub Wetland to Bare Land
421	1624	Estuarine Scrub/Shrub Wetland to Water
423	62	Estuarine Scrub/Shrub Wetland to Estuarine Aquatic Bed
427	2006	Estuarine Emergent Wetland to High Intensity Developed
428	3893	Estuarine Emergent Wetland to Medium Intensity Developed
429	6362	Estuarine Emergent Wetland to Low Intensity Developed
430	6182	Estuarine Emergent Wetland to Developed Open Space
431	809	Estuarine Emergent Wetland to Cultivated
432	59	Estuarine Emergent Wetland to Pasture/Hay
433	1785	Estuarine Emergent Wetland to Grassland
434	19	Estuarine Emergent Wetland to Deciduous Forest
435	7298	Estuarine Emergent Wetland to Evergreen Forest
436	1	Estuarine Emergent Wetland to Mixed Forest
437	74	Estuarine Emergent Wetland to Scrub/Shrub
438	108	Estuarine Emergent Wetland to Palustrine Forested Wetland
439	161	Estuarine Emergent Wetland to Palustrine Scrub/Shrub Wetland
440	131	Estuarine Emergent Wetland to Palustrine Emergent Wetland
441	758	Estuarine Emergent Wetland to Estuarine Forested Wetland
442	4342	Estuarine Emergent Wetland to Estuarine Scrub/Shrub Wetland
443	21035881	Estuarine Emergent Wetland to Estuarine Emergent Wetland
444	31005	Estuarine Emergent Wetland to Unconsolidated Shore
445	13319	Estuarine Emergent Wetland to Bare Land
446	425773	Estuarine Emergent Wetland to Water
448	30082	Estuarine Emergent Wetland to Estuarine Aquatic Bed
463	705	Unconsolidated Shore to Palustrine Forested Wetland
464	773	Unconsolidated Shore to Palustrine Scrub/Shrub Wetland
465	18274	Unconsolidated Shore to Palustrine Emergent Wetland
466	4	Unconsolidated Shore to Estuarine Forested Wetland
467	93	Unconsolidated Shore to Estuarine Scrub/Shrub Wetland
468	20418	Unconsolidated Shore to Estuarine Emergent Wetland
488	187	Bare Land to Palustrine Forested Wetland
489	820	Bare Land to Palustrine Scrub/Shrub Wetland
490	2462	Bare Land to Palustrine Emergent Wetland
491	22	Bare Land to Estuarine Forested Wetland
492	745	Bare Land to Estuarine Scrub/Shrub Wetland
493	8574	Bare Land to Estuarine Emergent Wetland
513	1234	Water to Palustrine Forested Wetland
514	10407	Water to Palustrine Scrub/Shrub Wetland
515	104635	Water to Palustrine Emergent Wetland
517	622	Water to Estuarine Scrub/Shrub Wetland
518	81553	Water to Estuarine Emergent Wetland
538	1269	Palustrine Aquatic Bed to Palustrine Forested Wetland
539	1603	Palustrine Aquatic Bed to Palustrine Scrub/Shrub Wetland
540	8350	Palustrine Aquatic Bed to Palustrine Emergent Wetland
543	16	Palustrine Aquatic Bed to Estuarine Emergent Wetland
565	8	Estuarine Aquatic Bed to Palustrine Emergent Wetland
567	431	Estuarine Aquatic Bed to Estuarine Scrub/Shrub Wetland
568	5704	Estuarine Aquatic Bed to Estuarine Emergent Wetland

Table 3. Data fields in *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.csv* (and *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif.vat.dbf).* These files provide a lookup table for each of the 'Value' fields in *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif*. The first three columns are provided above in Table 2.

Column name	Units	Description
Value	integer	value corresponding to land cover class or change type
Count	integer	pixel count for this product
class	character	Coastal Change Analysis Program (C-CAP) change class from 2006 to 2010/11
class_2006	character	C-CAP 2006 land cover class
class_2010	character	C-CAP 2010/11 land cover class
mapped_med	pixel count	median mapped area
mapped_min	pixel count	2.5% lower mapped area
mapped_max	pixel count	97.5% upper mapped area
mapped_ci	pixel count	2.5 to 97.5% mapped area confidence interval (CI)
estima_med	pixel count	median estimated area
estima_min	pixel count	2.5% lower estimated area
estima_max	pixel count	97.5% upper estimated area
estima_ci	pixel count	2.5 to 97.5% estimated area CI
total_med	tonnes CO2e/year/pixel	median total flux
total_min	tonnes CO2e/year/pixel	2.5% lower total flux
total_max	tonnes CO2e/year/pixel	97.5% upper total flux
total_ci	tonnes CO2e/year/pixel	2.5 to 97.5% total flux CI
soil_med	tonnes CO2e/year/pixel	median soil flux
soil_min	tonnes CO2e/year/pixel	2.5% lower soil flux
soil_max	tonnes CO2e/year/pixel	97.5% upper soil flux
soil_ci	tonnes CO2e/year/pixel	2.5 to 97.5% soil flux CI
bmass_med	tonnes CO2e/year/pixel	median biomass flux
bmass_min	tonnes CO2e/year/pixel	2.5% lower total flux
bmass_max	tonnes CO2e/year/pixel	97.5% upper total flux
bmass_ci	tonnes CO2e/year/pixel	2.5 to 97.5% biomass flux CI
ch4_med	tonnes CO2e/year/pixel	median methane flux
ch4_min	tonnes CO2e/year/pixel	2.5% lower methane flux
ch4_max	tonnes CO2e/year/pixel	97.5% upper methane flux
ch4_ci	tonnes CO2e/year/pixel	2.5 to 97.5% methane flux CI

Table 4. File attributes table for *MHHW_NAVD88_gauges.zip*.

Column name	Units	Description
FID	integer	unique object identifier
Shape	character	defines shape type
Station_Na	character	station name
STATION_ID	integer	station identifier
Lat	decimal degrees	latitude
Long	decimal degrees	longitude
datum_peri	MM/DD/YYYY	date ranges of datum period
navd88	meters	NAVD88 relative to station datum

mhhw	meters	MHHW relative to station datum
mhhw_navd88	meters	Mean Higher High Water Relative to North American Vertical Datum of 1988.
error_in_m	meters	standard error of MHHW

Table 5. File attributes table for *MHHWS_MHHW_gauges.zip*.

Column name	Units	Description
FID	integer	unique object identifier
Shape	character	defines shape type
Station_Na	character	station name
STATION_ID	integer	station identifier
Lat	decimal degrees	latitude
Long	decimal degrees	longitude
datum_peri	MM/DD/YYYY	date ranges of datum period
mhhws_offs	meter	MHHWS relative to MHHW
mhhws_sd	meter	standard deviation of MHHWS observations
mhhws_n	integer	count of MHHWS instances
mhhws_se	meter	estimated standard error of MHHWS

Companion Files

A1_Supplemental_Information.pdf provides methods for creating a probabilistic mean higher high water spring (MHHWS) elevation map and methods on mapping total and sector level fluxes.

A2_Supplemental_Table_1.csv provides source information for the NOAA sea-level rise digital elevation models (NOAA 2016) that were used to create a probabilistic coastal lands map.

coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif.vat.dbf is an ESRI file format that will assign colors and labels to the values of *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.tif* when the Unique Values Symbology is activated in ArcMap. This file is intended to allow users to choose which of the columns described in Table 3 is displayed across the pixels.

MHHW_NAV88_gauges.kmz and *MHHWS_MHHW_gauges.kmz* provide the same data as the corresponding shapefiles, but in kmz format for visualization in Google Earth.

3. Application and Derivation

Coastal wetlands store carbon dioxide (CO2) and emit CO2 and methane making them an important part of greenhouse gas inventorying. It is important to assess uncertainty in this developing carbon monitoring system in order to both quantify confidence in the inventory process itself and to prioritize future research opportunities.This dataset improves uncertainty estimates for greenhouse gas inventories at the national scale.

4. Quality Assessment

These data are the result of a propagated uncertainty analysis in a version of the 2017 U.S. coastal wetland greenhouse gas inventory (EPA 2017). The tidal datum transformations contain associated datasets showing uncertainty in the datum extrapolated between tide gauges and uncertainty inherent in the extrapolation process. The tidal elevation map is a probabilistic representation of the likelihood of a pixel falling below the mean higher high water spring (MHHWS) tide line, given the uncertainty in elevation mapping, and multiple datum transformations. The flux map median and confidence intervals for mapped area, estimated area, soil, biomass, methane, and total CO2 equivalent were all estimated from 10,000 iterations of a Monte Carlo analysis.

5. Data Acquisition, Materials, and Methods

This data release is a supplement to a paper by Holmquist et al. (2018). In that paper the analysis merged tide gauge data and coastal digital elevation maps with the Coastal Change Analysis Program in order to map the extent of the coastal zone, as well as the area of wetland types and conversion events. Maps were merged with burial and emissions datasets, and uncertainty was estimated by simulating 10,000 Monte Carlo iterations of the inventory.

Code used in generating these analyses is available at https://github.com/Smithsonian/Coastal-Wetland-NGGI-Sensitivity-Analysis.

Coastal Wetland Carbon Fluxes

Total greenhouse gas emissions and removals (i.e., carbon flux) from coastal wetlands were quantified by mapping the estimated area of different classes of stable wetlands and land cover change events (while taking into account potential errors in change detection), then multiplying the estimated land areas by the summed fluxes of soil, biomass, and methane from 2006 to 2011.

Land area was quantified using the Coastal Change Analysis Program (C-CAP), which is a Landsat-based land cover mapping product with 23 land cover classes, including six types of intertidal wetlands defined by two types of salinity (palustrine and estuarine) and three types of vegetation (emergent, scrub/shrub, and forested). Two hundred-forty different land cover types were mapped from 2006 to 2011, including classes of stable wetlands and land cover change events.

Emissions factors for soils and methane were based on literature review and synthesis. When estimating soil flux over the estimated area, if the land cover type did not change or changed but did not result in soil loss, then soil carbon flux was estimated as the annual soil carbon burial rate multiplied by the number of years that wetlands were present. If the 2006 to 2011 class changed and represented a soil loss event, then emissions from soil flux were estimated to be the product of mean soil carbon density, depth lost, and the fraction of that returns to the atmosphere. Methane flux for a class was calculated from methane emissions associated with two salinity types measured in 2006 and 2011. Emissions factors for biomass came from a remote sensing calibration and validation effort and a literature review that is part of continued inventory development. Biomass flux was estimated from transitions between three vegetation types (forested, scrub/shrub, and emergent vegetation) or from vegetated to unvegetated surfaces between 2006 and 2011.

Tide Elevation

Coastal wetland surface elevation data were derived from digital elevation models (DEMs) created using Light Detection and Ranging (LiDAR) and aggregated for the Sea-Level Rise Viewer (NOAA 2016). All DEMs were relative to the NAVD88 datum. See the companion files for details on datum transformations. A map of Mean Higher High Water Spring (MHHWS) heights was created using empirical Bayesian kriging to interpolate between the NOAA tide gauges, and a corresponding uncertainty map was created by incorporating random error in LiDAR mapping, datum transformations, and distance between tide gauges. The DEMs, the MHHWS map, and the associated uncertainty surfaces were combined into a single spatial layer representing the probability of elevation being below MHHWS.

Data Center Processing

Submitted data files were restructured by staff at the ORNL DAAC and several were transformed from .img to .tif format for long-term archival. The data file *coastal_wetland_downscaled_carbon_fluxes_2006_to_2011.csv* was created by ORNL DAAC staff from the .dbf file.

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Coastal Wetland Elevation and Carbon Flux Inventory with Uncertainty, USA, 2006-2011

Contact for Data Center Access Information:

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- Telephone: +1 (865) 241-3952

7. References

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