

Search ORNL DAAC

in Search

DAAC Home > Get Data > NASA Projects > Carbon Monitoring System (CMS) > User guide

Global Salt Marsh Change, 2000-2019

Get Data

Documentation Revision Date: 2022-12-29

Dataset Version: 1

Summary

This dataset provides global salt marsh change, including loss and gain for five-year periods from 2000-2019. Loss and gain at a 30 m spatial resolution were estimated with Normalized Difference Vegetation Index (NDVI) anomaly algorithm using Landsat 5, 7, and 8 collections within the known extent of salt marshes. The data are provided in cloud-optimized GeoTIFF format.

There are two data files in cloud-optimized GeoTIFF (.tif) format with this dataset.

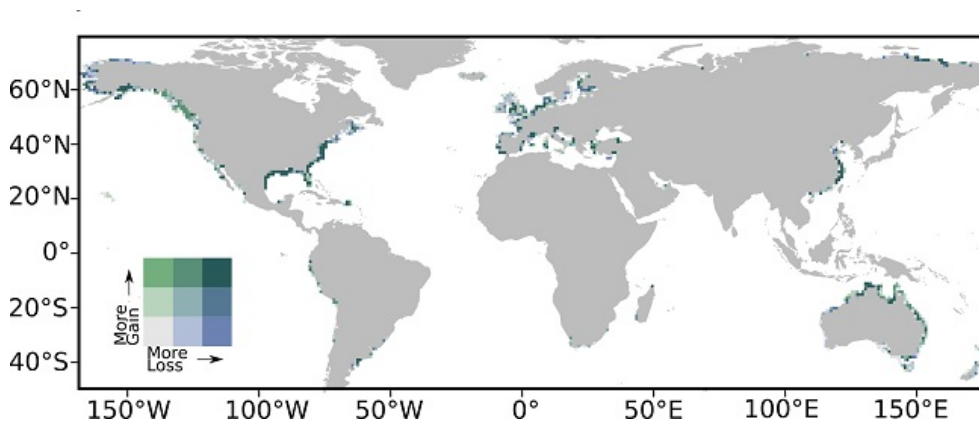


Figure 1. Global salt marsh change represented in a bivariate color scheme.

Citation

Campbell, A., T. Fatoyinbo, and L. Goldberg. 2022. Global Salt Marsh Change, 2000-2019. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/2122>

Table of Contents

1. [Dataset Overview](#)
2. [Data Characteristics](#)
3. [Application and Derivation](#)
4. [Quality Assessment](#)
5. [Data Acquisition, Materials, and Methods](#)
6. [Data Access](#)
7. [References](#)

1. Dataset Overview

This dataset provides global salt marsh change, including loss and gain for five-year periods from 2000-2019. Loss and gain at a 30 m spatial resolution were estimated with Normalized Difference Vegetation Index (NDVI) anomaly algorithm using Landsat 5, 7, and 8 collections within the known extent of salt marshes. The data are provided in cloud-optimized GeoTIFF format.

Project: [Carbon Monitoring System \(CMS\)](#)

The NASA Carbon Monitoring System (CMS) program 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 uses 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 data products are designed to inform near-term policy development and planning.

Related Publications

Campbell, A.D., T. Fatoyinbo, S.P. Charles, L.L. Bourgeau-Chavez, J. Goes, H. Gomes, M. Halabisky, J. Holmquist, S. Lohrenz, C. Mitchell, L. M. Moskal, B. Poulter, H. Qiu, C.H.R. De Sousa, M. Sayers, M. Simard, A.J. Stewart, D. Singh, C. Trettin, J. Wu, X. Zhang, and D. Lagomasino. 2022. A review of carbon monitoring in wet carbon systems using remote sensing. *Environmental Research Letters* 17:025009. <https://doi.org/10.1088/1748-9326/ac4d4d>

Campbell, A.D., Fatoyinbo, L., Goldberg, L. *et al.* Global hotspots of salt marsh change and carbon emissions. *Nature* 612, 701–706 (2022). <https://doi.org/10.1038/s41586-022-05355-z>

Acknowledgement

This research was supported by the NASA Carbon Monitoring System, grant number 16-CMS16-0073.

2. Data Characteristics

Spatial Coverage: Global extent of salt marsh ecosystems

Spatial Resolution: ~30 m

Temporal Coverage: 2000-01-01 to 2019-12-31

Temporal Resolution: 5-year epochs

Study Area: All latitudes and longitudes given in decimal degrees.

Site	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
Global	-169.03	179.17	73.87	-47.00

Data file information

There are two data files with this dataset in cloud optimized GeoTIFF format.

The files are named **sm_loss.tif** and **sm_gain.tif**, which show periods of salt marsh loss or gain, respectively.

In each file, the grid cells have values of 2000, 2005, 2010, or 2015, or 0. These values denote the time of marsh loss or gain by the starting year of five periods: 2000-2004, 2005-2009, 2010-2014, and 2015-2019. Grid cells with value 0 indicate no change in salt marsh presence during 2000-2019. Cells over open ocean and dry land have value 0.

Data are in a geographic coordinate system, WGS 84, (EPSG: 4326).

Grid cell size is 0.0002778 x 0.0002778 degrees, or approximately 30 m.

3. Application and Derivation

This dataset will be useful for studies of changes in coastal ecosystems and related biogeochemical cycles.

4. Quality Assessment

An accuracy assessment of the analyses was conducted with 12,600 validation points split evenly by 5-year epoch. The overall accuracy was 93%, 91%, 91%, and 90% in 2000-2004, 2005-2009, 2010-2014, and 2015-2019, respectively. A source of uncertainty is spatial overlap between salt marsh and mangrove.

5. Data Acquisition, Materials, and Methods

Trends in the global loss and gain of salt marsh ecosystems were measured for 2000 to 2019. Loss and gain at the scale of 30 m was estimated by examining changes in Normalized Difference Vegetation Index (NDVI) derived from Landsat 5, 7, and 8 collections. These collections were filtered to ensure limited cloud cover (<50%), geometric accuracy, image quality, and pixel quality; low quality scenes and pixels were removed. For validation, Google Earth Engine was used to compare a baseline NDVI for 1984-1999 to images from four 5-year periods: 2000-2004, 2005-2009, 2010-2014, and 2015-2019.

A time-series NDVI anomaly approach was used to minimize the effect of seasonal and tidal variability and to assess accuracy. Anomalies were defined as pixels that experienced greater than an absolute 0.2 magnitude of NDVI change (Goldberg *et al.*, 2020; Lagomasino *et al.*, 2019). Salt marsh NDVI was compared during peak biomass months of August and September for the Northern Hemisphere and February and March for the southern hemisphere.

An accuracy assessment was conducted using 12,600 stratified random points, each representative of a 30-m Landsat pixel and split into loss, gain, and stable change categories for each period. Points were selected within the known global extent of salt marsh (Mcowen *et al.*, 2017). For each point, salt marsh status was assessed using high resolution imagery from Maxar, Airbus, United States Geological Survey (USGS), and NASA via Google Earth Pro. The overall accuracy was 93%, 91%, 91%, and 90% in 2000-2004, 2005-2009, 2010-2014, and 2015-2019, respectively. A source of uncertainty is spatial overlap between salt marsh and mangrove.

Examples of the code used to process the data are available: https://github.com/campban/Global_saltmarsh

See Campbell *et al.* (2022, submitted) for details of project methods and findings.

6. Data Access

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

[Global Salt Marsh Change, 2000-2019](#)

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References

Campbell, A.D., T. Fatoyinbo, S.P. Charles, L.L. Bourgeau-Chavez, J. Goes, H. Gomes, M. Halabisky, J. Holmquist, S. Lohrenz, C. Mitchell, L. M. Moskal, B. Poulter, H. Qiu, C.H.R. De Sousa, M. Sayers, M. Simard, A.J. Stewart, D. Singh, C. Trettin, J. Wu, X. Zhang, and D. Lagomasino. 2022. A review of carbon monitoring in wet carbon systems using remote sensing. *Environmental Research Letters* 17:025009. <https://doi.org/10.1088/1748-9326/ac4d4d>

Campbell, A.D., Fatoyinbo, L., Goldberg, L. *et al.* Global hotspots of salt marsh change and carbon emissions. *Nature* 612, 701–706 (2022). <https://doi.org/10.1038/s41586-022-05355-z>

Goldberg, L., D. Lagomasino, N. Thomas, and T. Fatoyinbo. 2020. Global declines in human-driven mangrove loss. *Global Change Biology* 26: 5844–5855. <https://doi.org/10.1111/gcb.15275>

Lagomasino, D., T. Fatoyinbo, S. Lee, E. Feliciano, C. Trettin, A. Shapiro, and M.M. Mangora. 2019. Measuring mangrove carbon loss and gain in deltas. *Environmental Research Letters* 14:08302. <https://doi.org/10.1088/1748-9326/aaf0de>

Mcowen, C.J., L.V. Weatherdon, J. Van Bochove, E. Sullivan, S. Blyth, C. Zockler, D. Stanwell-Smith, N. Kingston, C.S. Martin, M. Spalding, and S. Fletcher. 2017. A global map of saltmarshes. *Biodiversity Data Journal* 5:e11764. <https://doi.org/10.3897/BDJ.5.e11764>



[Privacy Policy](#) | [Feedback](#) | [Help](#)



🏠 Home

About Us

Mission
Data Use and Citation
Policy
User Working Group
Partners

Get Data

Science Themes
NASA Projects
All Datasets

Submit Data

Submit Data Form
Data Scope and
Acceptance
Data Authorship Policy
Data Publication Timeline
Detailed Submission
Guidelines

Tools

MODIS
THREDDS
SDAT
Daymet
Airborne Data Visualizer
Soil Moisture Visualizer
Land - Water Checker

Resources

Learning
Data Management
News
Earthdata Forum [↗](#)

🗨️ Contact Us