

Dataset: Field surveys and maps of mangrove habitat change at Rookery Bay, Florida

This document provides detailed information about two sets of data that were generated through a 2018 - 2019 collaborative science catalyst project titled *Using Advanced Mapping to Measure Changes in Mangrove Habitat over Time*. This document also provides information about [the project](#) that generated the data. The project was supported by the National Estuarine Research Reserve System (NERRS) Science Collaborative, which is funded by the National Oceanic and Atmospheric Administration. All Science Collaborative supported projects that collect new data adhere to federal data sharing and archiving requirements.

Two related datasets are described in this document:

1. Habitat maps derived from satellite images at Rookery Bay
2. Field survey of habitat types at Rookery Bay

Data access and archival:

The datasets and products from this project have been archived in several ways:

- Habitat maps are available for download from DataOne:
<https://search.dataone.org/view/10.24431/rw1k43j>
- Field survey data have been archived by the Rookery Bay Reserve and can be requested by contacting the Reserve Research Coordinator (see page 6 for contact info)
- This project and associated data are listed in a national metadata catalog, InPort:
<https://inport.nmfs.noaa.gov/inport/item/54589>
- More information and links to other products generated by project are available through the Science Collaborative:
www.nerrssciencecollaborative.org/project/MullerKarger18

About the Associated Project

Project title: Using Advanced Mapping to Measure Changes in Mangrove Habitat over Time

Reserves involved in the project: Rookery Bay National Estuarine Research Reserve, Florida

Project period: September 2018 - November 2019

Project lead and contact information:

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Purpose:

In recent years, seagrass and mangrove deaths have accelerated in the Rookery Bay National Estuarine Research Reserve and other parts of southern Florida. These losses are a result of chronic stresses from watershed alterations, sea level rise and invasive species, along with acute impacts from hurricanes. Reserve managers seeking to build the resiliency of these habitats need to map the extent of storm-related damage and distinguish it from ongoing chronic degradation. The goal of this project was to identify the location, extent, and severity of damage to terrestrial habitats throughout the reserve. In addition, the team was able to test and refine a new high-resolution, automated mapping technique based on satellite imagery.

Abstract:

This project evaluated ecosystem damage and recovery by developing a time series of habitat maps for the Rookery Bay National Estuarine Research Reserve. Habitat maps were created based on WorldView-2 and Landsat-8 satellite imagery from 2010-2018 using an automated technique and validated with a field campaign. Landsat images were mapped using the Support Vector Machine machine learning method in ENVI, and WorldView images were mapped using a preliminary version of the SOALCHI decision tree algorithm. Habitats mapped include healthy mangrove, degraded mangrove, marsh, upland vegetation, soil, and water. Habitat change maps document the damage caused by Hurricane Irma in September of 2017 as it made landfall in the reserve as a Category 4 storm. Project outputs include field-survey results with GPS points, a baseline habitat map, annual habitat seasons for 2016-2018, and habitat change assessments. Outcomes include the development of new research collaborations, quantitative characterization of reserve habitat change, improved understanding of critical habitat change dynamics, and assessment of chronic and extreme-event disturbance and recovery.

About Each Dataset

1. Habitat maps of mangrove, marsh, and vegetative change

General description of data:

Maps of reserve habitat types from WorldView and Landsat satellite sensors were created for multiple time periods from 2010 to 2018. Maps of habitat change were also developed.

More about the data:

- 91 WorldView-2 satellite images acquired in 2010 (3), 2016 (2), 2017 (36), and 2018 (50) were used to map a time-series of the study area.
- Image preparation and thematic classification of the WorldView-2 GeoTIFFs were completed using Matlab software. The team used a Decision Tree classifier to assign a thematic class to each image pixel based on spectral signatures of the target land-cover type. The Decision Tree was built to identify five thematic classes: healthy mangrove, degraded mangrove/marsh, upland, bare/developed, and water. The mapping process used a preliminary version of the SOALCHI decision tree algorithm. The following habitat types were distinguished in maps generated:

- Six Landsat-8 satellite images from years 2013, 2016, 2017 (Jan, May, Dec), and 2018 were used as a comparison to maps generated by WorldView images. Landsat images were mapped using the Support Vector Machine machine learning method in ENVI. The following habitat classes are used for these maps: Healthy mangrove, degraded mangrove/marsh, upland, developed, bare soil, and water. Developed and soil were distinguished in Landsat because the larger extent of the images included substantially more developed land than the WorldView maps.

Quality Control and Quality Assurance:

Habitat maps were evaluated for accuracy using the GPS points and found to be 82 % accurate overall, which is above the 80% benchmark for suitability. Degraded mangrove was the least-accurate class (58% accuracy). Preliminary and final maps were sent out or displayed via webinar to end users with local knowledge so that feedback could be received. Where end users identified errors in the maps, the images were remapped iteratively until end users were confident in their identification of habitats.

Data collection period: 2010, 2016, 2017 and 2018

Geographic extent: The focal study area was Rookery Bay Reserve, in southwest Florida, just south of Naples. See study area map below. An adjacent property, the Ten Thousand Island National Wildlife Refuge, was partially included in maps.

GPS Coordinates for study area polygon:

-81.80203199386597, 25.818435743058632
-81.80203199386597, 26.095638258998328
-81.55003309249878, 26.095638258998328
-81.55003309249878, 25.818435743058632
-81.80203199386597, 25.818435743058632

File format:

12 habitat maps are available for download as img and tif files. The data are available as mosaicked georeferenced TIFF (.GeoTiff) files using all images from the month and year indicated by the filename. This dataset also includes the .aux, .cpg, .dbf, .tfw, and .ovr files exported with the TIFF image. The image file and set of related files that can be opened in GIS software to view the habitat types that correspond to different locations within the image. The available README provides additional details. A metadata record following FGDC standards is provided and combines all maps into one record, explaining each dataset cohesively.

Data access and archival:

Habitat maps along with metadata are freely available for download from DataOne:
<https://search.dataone.org/view/10.24431/rw1k43j>

Contact information:

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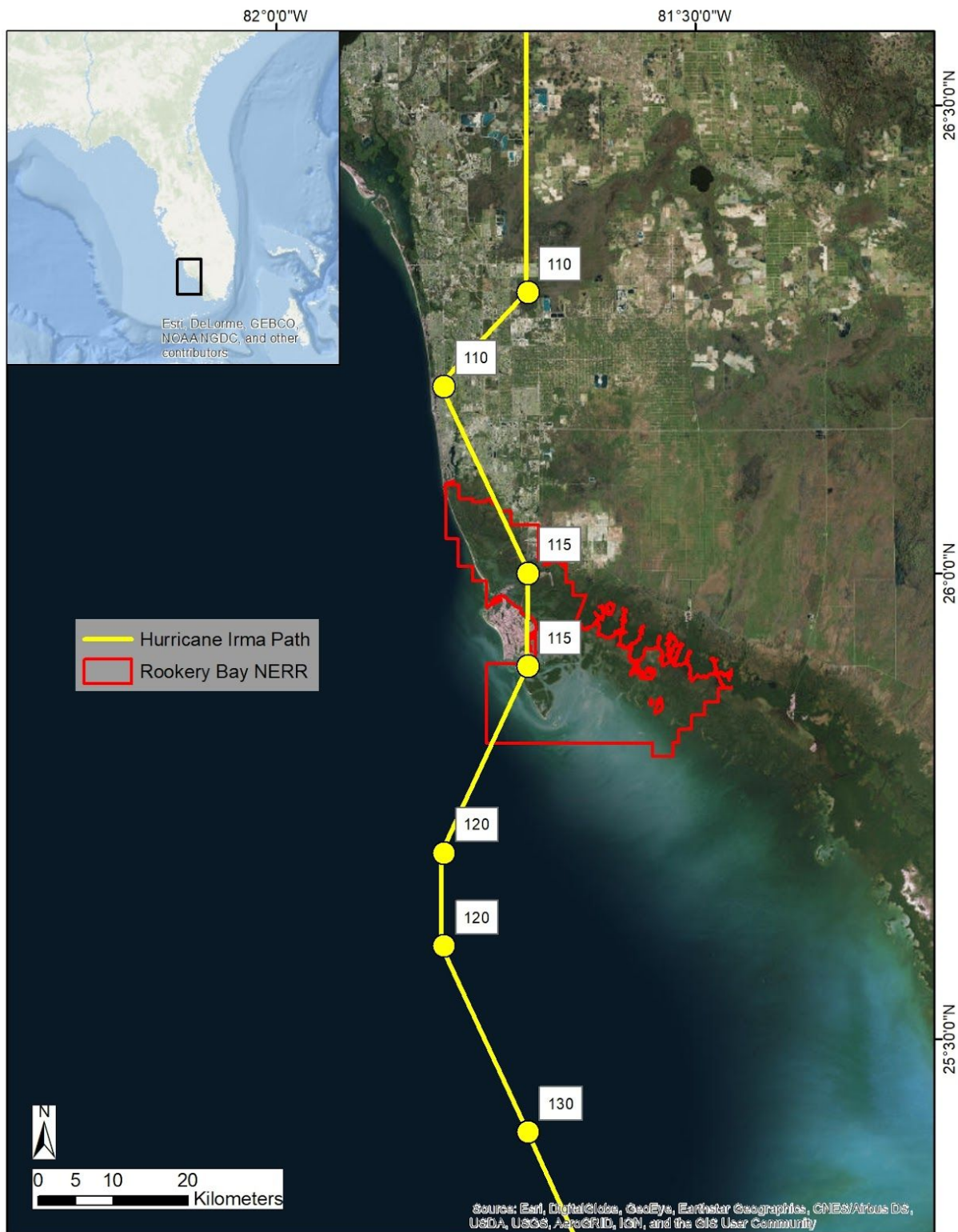


Figure 1. Map of Rookery Bay National Estuarine Research Reserve in southwest Florida (red line) and path Hurricane Irma which made landfall in the reserve as a Category 4 Storm in September of 2017 (yellow line).

2. Habitat type field surveys at Rookery Bay

General description of data:

Field surveys were conducted to document habitat types and vegetation characteristics at 2,700 discrete points throughout the study area. These point observations and GPS coordinates were used to develop habitat classifications and then a separate set of points were used to perform an accuracy check of the maps.

More about the data: Ground reference points (GRPs; 3-m horizontal accuracy) were collected throughout the reserve during a series of field surveys. Transects were walked as feasible, and data were collected as polylines for homogenous habitats (i.e. a new polyline was started when one habitat transitioned to a different habitat). Photographs and detailed comments were included in the data collection protocol. Polylines were then converted to points in ArcMap 10.1 at 20-meter intervals to avoid spatial autocorrelation.

Quality assurance and quality control: The raw points were quality-controlled by eliminating all points that were within 20 meters of each other to avoid spatial autocorrelation, and were visually evaluated with independent imagery to ensure that the point overlaid correctly with the documented habitat.

Data collection period: September to December of 2018

Geographic extent: Same as described for the habitat maps above.

File format: Field data are available as a GIS file that can be viewed and analyzed using a program like ArcMap. CERP standards were used. A metadata record using the CERP standard is available and covers all points in a single record.

Data access and archival: Field notes and GPS points have been archived by the Rookery Bay Reserve and can be requested by contacting:

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