

*Please provide the following information, and submit to the NOAA DM Plan Repository.*

### **Reference to Master DM Plan (if applicable)**

*As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.*

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

## **1. General Description of Data to be Managed**

### **1.1. Name of the Data, data collection Project, or data-producing Program:**

Bridging the Gap between Quadrats and Satellites: Assessing Utility of Drone-based Imagery to Enhance Emergent Vegetation Biomonitoring - NERRS/NSC(NERRS Science Collaborative)

### **1.2. Summary description of the data:**

Monitoring plays a central role in detecting change in coastal ecosystems. The National Estuarine Research Reserve System (NERRS) invests heavily in assessing changes in tidal wetlands through the System-wide Monitoring Program (SWMP). This monitoring is conducted in 1m<sup>2</sup> permanent plots every 1-3 years via in situ sampling and at reserve-wide scales via airplane imagery every 5-10 years. While both approaches have strengths, important processes at intermediate spatial (i.e., marsh platform) and finer temporal (i.e., storm events) scales may be missed. Uncrewed Aerial Systems (UAS, i.e., drones) can provide high spatial resolution and coverage, with customizable sensors, at user-defined times. Based on a needs assessment and discussions with NERRS end users, we conducted a regionally coordinated effort, working in salt marshes and mangroves within six reserves in the Southeast and Caribbean to develop, assess and collaboratively refine a UAS-based tidal wetlands monitoring protocol aimed at entry-level UAS users. Using ground-based surveys for validation, we 1) assessed the efficacy of UAS-based imagery for estimating vegetation percent cover, delineating ecotones (e.g., low to high marsh), and generating digital elevation models, and 2) assessed the utility of multispectral sensors for improving products from #1 and developing vegetation indices to estimate aboveground biomass (e.g., normalized difference vegetation index, NDVI). UAS-derived elevation models and canopy height estimates were generally of insufficient accuracy to be useful when compared to field measures. Across sites, root mean squared error ranged from 0.25 to 0.59m for bare earth models, 0.15 to 1.58m for vegetation surface models, and 0.33 to 2.1m for canopy height. The accuracy of ecotones delineated from UAS imagery varied among ecotones. The average distance between image- and field-based delineations of the wetland-water ecotone was 0.18 +/- 0.01m, whereas differences of the low-high marsh ecotone were 1.25 +/- 0.11m. Overall accuracy of vegetated and unvegetated classifications among sites was 85 +/- 4%. Comparison of field- and image-based estimates of total percent vegetated cover

indicated modest agreement between the two approaches, although percent cover was generally overestimated from imagery. Average differences in percent cover between approaches was ~5% at one reserve, but >25% at four reserves. Overall accuracy of species-specific classifications among reserves was 74 +/- 6% when using both orthomosaics and surface vegetation models. Comparison of field- and image-based estimates of species-specific cover indicated minimal agreement between the two approaches; the interquartile ranges of the differences were wide for all species (>40%). Aboveground biomass in monospecific *Spartina alterniflora* plots was highly correlated to NDVI ( $R^2 > 0.69$ ), although the relationship was reserve- and sensor-specific. The strength of the relationship between NDVI and biomass was weaker in mixed-species plots ( $R^2 = 0.52$ ). This project serves as a critical first step for improving tidal wetland monitoring conducted as part of SWMP. Furthermore, the project increased the technical capacity of end users to conduct UAS-based wetland monitoring. This research collaboration was the first of its kind in the region and has catalyzed continued collaboration to identify regional management needs and expand UAS-based monitoring to additional coastal habitats (e.g., oyster reefs).

**1.3. Is this a one-time data collection, or an ongoing series of measurements?**

One-time data collection

**1.4. Actual or planned temporal coverage of the data:**

2020-10 to 2022-03

**1.5. Actual or planned geographic coverage of the data:**

W: -77.96, E: -75.65, N: 36.5, S: 33.85

North Carolina NERR, NC

W: -79.285, E: -79.15, N: 33.375, S: 33.204

North Inlet-Winyah Bay NERR, SC

W: -81.31, E: -81.25, N: 31.5, S: 31.375

Sapelo Island NERR, GA

W: -66.262, E: -66.2, N: 17.97, S: 17.91

Jobos Bay NERR, PR

W: -81.39, E: -81.15, N: 30.18, S: 29.59

Guana Tolomato Matanzas NERR, FL

W: -80.67, E: -80.2, N: 32.68, S: 32.33

Ashepoo Combahee Edisto Basin NERR, SC

**1.6. Type(s) of data:**

*(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)*

**1.7. Data collection method(s):**

*(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy,*

*research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)*

**1.8. If data are from a NOAA Observing System of Record, indicate name of system:**

**1.8.1. If data are from another observing system, please specify:**

**2. Point of Contact for this Data Management Plan (author or maintainer)**

**2.1. Name:**

Jeremy Cothran

**2.2. Title:**

Metadata Contact

**2.3. Affiliation or facility:**

**2.4. E-mail address:**

jeremy.cothran@gmail.com

**2.5. Phone number:**

**3. Responsible Party for Data Management**

*Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.*

**3.1. Name:**

**3.2. Title:**

Data Steward

**4. Resources**

*Programs must identify resources within their own budget for managing the data they produce.*

**4.1. Have resources for management of these data been identified?**

**4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):**

**5. Data Lineage and Quality**

*NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.*

**5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible**

(describe or provide URL of description):

Lineage Statement:

This information is detailed within the project links.

Process Steps:

- N/A

**5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:****5.2. Quality control procedures employed (describe or provide URL of description):**

This information is detailed within the project links.

**6. Data Documentation**

*The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.*

**6.1. Does metadata comply with EDMC Data Documentation directive?**

No

**6.1.1. If metadata are non-existent or non-compliant, please explain:**

Missing/invalid information:

- 1.6. Type(s) of data
- 1.7. Data collection method(s)
- 3.1. Responsible Party for Data Management
- 4.1. Have resources for management of these data been identified?
- 4.2. Approximate percentage of the budget for these data devoted to data management
- 7.1. Do these data comply with the Data Access directive?
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.1.2. If there are limitations to data access, describe how data are protected
- 7.3. Data access methods or services offered
- 7.4. Approximate delay between data collection and dissemination
- 8.1. Actual or planned long-term data archive location
- 8.2. Data storage facility prior to being sent to an archive facility
- 8.3. Approximate delay between data collection and submission to an archive facility
- 8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

**6.2. Name of organization or facility providing metadata hosting:**

NMFS Office of Science and Technology

**6.2.1. If service is needed for metadata hosting, please indicate:****6.3. URL of metadata folder or data catalog, if known:**

<https://www.fisheries.noaa.gov/inport/item/67640>

**6.4. Process for producing and maintaining metadata**

*(describe or provide URL of description):*

Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: [https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC\\_PD-Data\\_Documentation\\_v1.pdf](https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf)

**7. Data Access**

*NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.*

**7.1. Do these data comply with the Data Access directive?**

**7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?**

**7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:**

**7.2. Name of organization of facility providing data access:**

Office for Coastal Management (OCM)

**7.2.1. If data hosting service is needed, please indicate:****7.2.2. URL of data access service, if known:**

<http://www.nerrssciencecollaborative.org/project/Puckett20>

**7.3. Data access methods or services offered:****7.4. Approximate delay between data collection and dissemination:**

**7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:**

## **8. Data Preservation and Protection**

*The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.*

### **8.1. Actual or planned long-term data archive location:**

*(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)*

#### **8.1.1. If World Data Center or Other, specify:**

#### **8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:**

### **8.2. Data storage facility prior to being sent to an archive facility (if any):**

### **8.3. Approximate delay between data collection and submission to an archive facility:**

### **8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?**

*Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection*

## **9. Additional Line Office or Staff Office Questions**

*Line and Staff Offices may extend this template by inserting additional questions in this section.*