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:

2021 Flowerfield Creek, MI Natural Color, Color Infrared and Hyperspectral Imagery

1.2. Summary description of the data:

Wild rice (Zizania palustris and Zizania aquatica), also known as manoomin, plays an integral role in the wetland ecosystems of the Great Lakes and is central to the culture, identity, and livelihood of Indigenous Peoples throughout the region. As manoomin faces increasing threats from climate change, land use change, pollution, invasive species, and other stressors, efforts are underway to protect and restore wild rice populations and habitat.

To support these efforts and help improve mapping and monitoring of wild rice in the Lake Michigan and Lake Huron basins, NOAA's Office for Coastal Management, in collaboration with tribal partners, identified twelve areas of interest (AOI) as pilot sites for airborne hyperspectral imagery and field data collection, which took place in August and September 2021.

In total, airborne hyperspectral imagery (with derived natural color and color infrared) was acquired for 43,493 acres. This imagery, in conjunction with field data and place-based knowledge and expertise of tribal partners, was used to help delineate ~13,775 acres of vegetated wetlands, including ~790 acres of wild rice.

AOI/Pilot Sites

1. Christiana Creek, MI

2. Fletcher Pond, MI

3. Flowerfield Creek, MI

4. French Farm Lake, MI*

5. Hamlin Lake, MI

6. Indiana Dunes, IN

7. Manistee River, MI

8. Miller Woods, IN

9. Nottawa Creek, MI

10. Potagannissing, MI

11. Rocky Creek, MI

12. Tawas Lake, MI

*To request imagery and associated vector and field data for this site, please contact:

Jon Mauchmar

Wildlife Technician

Little Traverse Bay Bands of Odawa Indians

Natural Resources Department - Inland Fish & Wildlife Program

Office: 231-242-1670

jmauchmar@ltbbodawa-nsn.gov

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:
2021-08-08

1.5. Actual or planned geographic coverage of the data:
W: -85.77027777778, E: -85.63388888889, N: 42.12666666667, S: 42.00194444444

1.6. Type(s) of data:
(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
Image (digital)

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:
NOAA Office for Coastal Management (NOAA/OCM)

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:
NOAA Office for Coastal Management (NOAA/OCM)

2.4. E-mail address:
coastal.info@noaa.gov

2.5. Phone number:
(843) 740-1202

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):
Process Steps:
- 2022-12-01 00:00:00 - Airborne Hyperspectral Data Collection - An AISA KESTREL 10 Visual through Near Infrared (VNIR) Hyperspectral Imaging Sensor System (400 - 1,000 nm spectral range) was utilized by Galileo Group Inc. (Galileo) for airborne collection operations. A total of 178 spectral bands for the VNIR (Visible Near Infrared) range were collected with a spectral resolution of around 3.5 nm and a Ground Sampling Distance (GSD) of 1.0m. The FOV (Field of View) was 40 degrees. An Oxford Solutions Survey+ 2nd Generation GPS/IMU simultaneously collected navigation and attitude data. TerraStar-C from Novatel Inc. was utilized for all

airborne collection operations to further enhance spatial accuracy. TerraStar is a Real Time Kinetic (RTK) airborne correction service that improves horizontal (~4-5 cm RMS) and vertical accuracy (~6.5 cm RMS). The sensor system was installed in a Cessna 172 Skyhawk which was used as the airborne imaging platform for the duration of the project. Ground Truthing Data Collection - Ground truthing was conducted primarily onboard a canoe and along the shoreline where accessible. An ASD FieldSpec Pro VNIR (400-1000nm) was utilized to collect spectrometry of wild rice when found. A Trimble Pro XRT DGPS system and two handheld digital cameras with integrated GPS were used to collect GPS points and geo-tagged imagery of target species and landmarks of interest. A specially modified iPhone 6 equipped with a Galileo custom created ground truthing application (ARMADA) and linked with a sub-meter accuracy Trimble Bluetooth antenna was utilized as a secondary GPS point logging device.
- 2022-12-01 00:00:00 - Processing Level 1a Radiometric Correction 1. Dark Noise Removal- Dark image data was acquired for every raw image at the end of every flight line by the sensor control software closing the shutter and recording 3 seconds of dark noise. To remove sensor noise the mean value of every line of the dark data was subtracted from the corresponding line of the raw data (dark noise removal or dark current removal). 2. Calibration from RAW data to radiance data using calibration file- After the dark noise removal, the raw data was calibrated to radiance units using a sensor specific calibration file. Every spatial and spectral pixel is multiplied with the corresponding value in the calibration file. The calibration values for each pixel on the CCD are calculated using an integrating sphere in the laboratory. The radiance units are equal to (mW/cm^2*str*um)*1000. 00. 3. Smile Correction- Spectral smile is defined as changes in wavelength over the field of view (FOV). Smile correction was performed by proprietary algorithms. 4. Crosstrack Correction- A crosstrack correction was performed using proprietary algorithms in order to normalize illumination in the across-track direction of each flight line. 5. Quality Control- Quality control was accomplished using ASD measurements, established radiometric quality protocols and systematic manual evaluations. Processing Level 1b Atmospheric Correction 1. Model-based Atmospheric Correction- The radiance data were converted to reflectance using the Atmospheric & Topographic Correction (ATCOR-4) software package. ATCOR uses the Modtran 4, a complex radiative transfer model, to correct for atmospheric absorption (O2, O3, and CO2), scattering (Mie and Rayleigh) and path radiance effects. The calibrated radiance data was then converted to reflectance pixel count (reflectance ranges 0.0 to 1.0 multiplied by 10000) using modeled solar irradiance and solar angle data from the time of acquisition. The reflectance pixel counts were then converted to 16-bit reflectance data. The reflectance units are equal to Reflectance*10000. 2. Quality Control- The quality control was accomplished using established atmospheric correction quality protocols and systematic manual evaluations. Ground based spectrometer data at impervious and spectrally intransient surfaces such as asphalt were utilized for rigorous QA/QC of the reflectance data. Spectral curves from the ground spectrometer data were

compared to the final reflectance results and found to be sufficiently consistent. Further parameter adjustment was then applied to the data to maximize spectral consistency between the flight lines.
- 2022-12-01 00:00:00 - Processing Level 2 Geometric Correction 1. Calculation of the sensor offset (Boresight correction) - During the aerial acquisition, four special Boresight flight lines were flown to geometrically calibrate the sensor and GPS/INS. The Boresight parameters were calculated using four overlapping flight lines flown in a crosshair pattern. 15 to 20 Ground Control Points per flight line pair (GCPs) were identified and used to calculate geometric correction values for Roll (0.180527), Pitch (-0.0533453) and Yaw (0.00885310). These values were then used as input parameters for the geometric correction process. 2. GPS/INS Data- The GPS/INS Data was encoded and processed for the use in the georectification process. 3. GLT files (Geographic Lookup Table)- A GLT file contains the geographic location of every pixel in the unrectified reflectance data. A GLT file was generated for every flight line using the GPS/INS Data, the Boresight Correction parameters and a Digital Elevation Model (DEM). Processing Level 3 Orthorectification 1. Georectification using GLT data- The unrectified reflectance data was then Georectified into North American Datum of 1983 (NAD83) and projected into the Universal Transverse Mercator (UTM) coordinate system using the corresponding GLT file. A DEM was used to correct for surface elevation variation across the scene. 2. Mosaicking- Individual flight lines for each AOI were combined into a single mosaic image which covered the entire AOI. This image was then masked to the AOI boundary and tiled according to the tiling scheme vectors included with this delivery. 3. Quality Control- Geo-accuracy was checked and confirmed to meet pre-established quality standards by systematic comparison of specific geo-locations acquired in the field with a GPS unit and high resolution RGB imagery of known geo-accuracy.

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):

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:
- 1.7. 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
- 5.2. Quality control procedures employed
- 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
- 8.3. 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/69219

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

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:
NOAA Office for Coastal Management (NOAA/OCM)

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:
https://coast.noaa.gov/dataviewer/#/imagery/search/where:ID=9725
https://coast.noaa.gov/dataviewer/#/imagery/search/where:ID=9726
https://coast.noaa.gov/dataviewer/#/imagery/search/where:ID=9727
https://coastalimagery.blob.core.windows.net/digitalcoast/GL_FC_CIR_2021_9727/index.html
https://coastalimagery.blob.core.windows.net/digitalcoast/GL_FC_HSI_2021_9725/index.html
https://coastalimagery.blob.core.windows.net/digitalcoast/GL_FC_RGB_2021_9726/index.html

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):
Office for Coastal Management - Charleston, SC

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.