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:
Developing a semi-automated CoralNet Bleaching Classifier: annotations and imagery from survey sites across the Hawaiian Archipelago between 2014 and 2019

1.2. Summary description of the data:
This data package includes datasets and benthic imagery that support the development of a semi-automated coral bleaching classifier in CoralNet. The datasets in this package include annotations of imagery produced to test and train the CoralNet Bleaching Classifier, the annotation label set used in CoralNet, and site-level metadata for annotated imagery. The datasets were generated by scientists of the Ecosystem Sciences Division (ESD) at the Pacific Islands Fisheries Science Center (PIFSC) at NOAA, funded by the Coral Reef Conservation Program (CRCP). This data package includes non-ESD imagery used to develop this classifier, including images of sites in the Papahanoumokuakea National Monument (collected in 2014 by Courtney Couch, a scientist of the ESD), and of sites in Kaneohe Bay, Oahu (in 2015 by The Nature Conservancy). Other source imagery that was used to develop this classifier was collected by the ESD during the 2019 Hawaii coral bleaching event, as well as during the 2015, 2016, and 2019 NWHI National Coral Reef Monitoring Program (NCRMP) survey missions following the traditional photoquadrat collection methodology for NCRMP surveys; this imagery has already been archived, or is a pending archive package; they are described and accessible at https://www.fisheries.noaa.gov/inport/item/59193 and https://www.fisheries.noaa.gov/inport/item/36152.

To create this classifier, named the NOAA ESD Coral Bleaching Classifier (accessible at: https://coralnet.ucsd.edu/source/2947/), a set of training imagery with corresponding point coordinates and label annotations were uploaded to the classifier's source. The training annotations were made by human annotators on both randomly generated and targeted points. Once the training imagery and annotations were uploaded, the automated classification abilities of the classifier were tested by uploading imagery and point locations, but without corresponding label annotations. The machine generated labels for these points were then compared against the human generated labels, which had not been uploaded. See the CoralNet Bleaching Classifier SOP for more information: https://doi.org/10.25923/d0re-9y93.

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:
2014-08-20 to 2019-11-14

1.5. Actual or planned geographic coverage of the data:
W: -178.383718, E: -155.8366193, N: 28.459215, S: 19.31344
Main Hawaiian Islands (MHI), including Hawaii, Maui, Oahu, Molokai, and Lanai, and the Northwestern Hawaiian Islands (NWHI), including French Frigate Shoals, Lisianski Island, Pearl & Hermes Reef, Midway Atoll, and Kure Atoll.

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:
Lori H Luers

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:

2.4. E-mail address:
lori.luers@noaa.gov

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:

Morgan S Winston

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?

Yes

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

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:

To create this classifier, named the NOAA ESD Coral Bleaching Classifier (see 'URLs' in this InPort record for a link to the CoralNet source), a set of training imagery with corresponding point coordinates and label annotations were uploaded to the classifier's source. The training annotations (hard coral, bleached hard coral, and unknown) were made by human annotators on both randomly generated and targeted points. Once the training imagery and annotations were uploaded, the automated classification abilities of the classifier were tested by uploading imagery and point locations, but without corresponding label annotations. The machine generated labels for these points were then compared against the human generated labels, which had not been uploaded. See the CoralNet Bleaching Classifier SOP for more information (link included under 'URLs' in this InPort record).

Process Steps:

- To train a bleaching classifier using CoralNet, the ESD created a new source (CREP-HAWAII BLEACHING v2: Classifier ID 23472) (steps 1-4) containing imagery collected across 178 sites in the Hawaiian Archipelago during the 2019 mass coral bleaching event. A total of 5207 images were used, with approximately 30 images for each site; however, image numbers ranged from 5 - 72 images per site. The imagery was manually annotated using the simple labelset. Once the initial round manual of annotations were completed, a subset of sites with the highest prevalence of coral bleaching were selected and targeted annotations were added manually. CREP-HAWAII BLEACHING v2 served as an experimental test source to

confirm that annotations created using steps 5-40 could be uploaded to CoralNet and be used to train a new source.

- To test the machine accuracy of the bleaching classifier, 80% of the sites were designated as training sites and uploaded to the NOAA ESD Coral Bleaching Classifier source using the default feature extractor EfficentNet, while the remaining 20% served as test sites for the source. Sites were randomly sorted. There were a total of 143 training sites selected for NOAA ESD Coral Bleaching Classifier; 129 sites had only random annotations and 14 sites had targeted and random annotations. The resulting 48,622 training annotations were uploaded to NOAA ESD Coral Bleaching Classifier and automated machine classification accuracy was obtained.

- A total of 35 sites were randomly selected as test sites (sites with only random annotations). Test site imagery was uploaded without annotation labels to the NOAA ESM Coral Bleaching Classifier source. Machine suggestions were downloaded and compared to the original human annotations. From this comparison, machine accuracy was calculated as the proportion of machine points that matched with the human annotations.

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):
Quality control is enforced by means of point-to-point, inter-observer calibration exercises that are conducted before each image analysis production series. Training modules and standard operating procedures have also been developed and documented to ensure improved performance and consistent imagery analysis results produced by multiple analysts.

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)

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/67962

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?
    Yes

**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:
    National Centers for Environmental Information - Silver Spring, Maryland (NCEI-MD)

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

7.2.2. URL of data access service, if known:
    https://www.ncei.noaa.gov/archive/accession/0269246
    https://www.ncei.noaa.gov/archive/accession/0269246
    https://www.ncei.noaa.gov/archive/accession/0269246
    https://www.ncei.noaa.gov/archive/accession/0269246
    https://www.ncei.noaa.gov/archive/accession/0269246
    https://www.ncei.noaa.gov/archive/accession/0269246

7.3. Data access methods or services offered:
    Data can be accessed online via the NOAA National Centers for Environmental
    Information (NCEI) Ocean Archive.

7.4. Approximate delay between data collection and dissemination:
Unknown

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)
NCEI_MD

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):
Pacific Islands Fisheries Science Center - Honolulu, HI

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

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
NOAA IRC and NOAA Fisheries ITS resources and assets.

9. Additional Line Office or Staff Office Questions
Line and Staff Offices may extend this template by inserting additional questions in this section.