Workflow - 2016 MPA Database Update for NWRS

Evaluate Coastal Refuges without a previously established MPA

The first step of the project was to go through the list of coastal refuges without a previously established MPA and determine if they contained a marine component as defined by NOAA (see MPA definition and classification report for definition of marine - https://drive.google.com/open?id=0B6PqbndI3KmPc056YW5JMHIibVE). This process consisted of multiple steps including checking refuge websites for habitat descriptions, reviewing Comprehensive Conservations Plans when available for habitat descriptions, conversations with refuge staff, and overlay with NWI estuarine and marine wetland areas. Progress was tracked on a spreadsheet in Google Drive (https://drive.google.com/open?id=18fvj-x6h8sgLP8oFqMvxVCM9BpYkY9tHxGYGAcv8y9Q). Columns A-Q of the spreadsheet include organizational information about each of the refuges.

The remaining columns include:

- MPA Present (Updated Status) (Column R) - Yes/No. This reflects whether or not the refuge is included in the updated MPA database.
- Marine areas Delineated/ Verified for Special Designation Feature Class - Yes/No/NA (Column T). This was another column I used to track my progress. Yes represents refuges for which I delineated the marine areas only. NA is for those refuges which do not have an MPA.
- MPA attributes added to table (Column V) - This column indicates whether or not the refuge had attributes in the MPA Database. Refuges with a No are ones that have been recently added, but still need the attribute information. Mimi was going to add this information and update the MPA database. NA indicates that the refuge does not have an MPA.
- Comments (Column W) - Information mostly for those refuges not previously included in the MPA database and reasons for either adding them or not. Includes reference to the information that was used to make this decision.

Evaluate Coastal Refuges with a previously established MPA

The next step was to verify if refuges with an existing MPA should remain in the database. Refuges in previous versions of the MPA database utilized the approved acquisition boundaries (FWS Approved) to determine if the refuge contained a marine component and qualified as a MPA. Using the approved acquisition boundaries in some cases extended the boundaries beyond the parcels which are owned or managed by the U.S. Fish and Wildlife Service. For the 2016 update, the refuge boundaries were reviewed using only parcels which are currently acquired (FWS Interest minus inholdings from the FWS cadastral database). To determine if the refuges should still be included in the database, the FWS Interest boundary was overlaid on the appropriate NWI layer, selecting only estuarine and marine wetlands, with the exception of wetlands within the Great Lakes region, to determine if there was overlap between the layers. The exception to this was for coastal refuges within the Great Lakes regions. In that area, all wetlands within the 8 digit HUC adjacent to any of the Great Lakes were considered a

marine component and were used to determine the inclusion of the refuge in the MPA database. If there were no wetlands within the refuge parcels, it was recommended that the refuge be removed from the MPA database. This conclusion was verified with refuge. Three refuges were removed from the MPA database as a result (Featherstone, Occoquan Bay, and Waccamaw).

<u>**Update boundaries for all refuges included in the 2016 MPA database update**</u>

After review of all the coastal refuges, it was determined that 153 refuges have a marine component and should be included in the MPA database. The boundaries for the refuges which were already included in the MPA database, refuges in the MPA database which did not require an update, and refuges with a previously establish MPA for which the boundaries were revised, were standardized to included only parcels currently owned by the Fish and Wildlife Service (FWSInterest minus inholdings).

A shapefile was created (NWRS with a MPA – Interest Boundaries Only - August 24, 2016) which includes all of the refuges included in the 2016 update to the MPA Database.

Identification of marine areas for each NWR in the MPA Database

The next step was to identify only the marine areas within refuges with an MPA. For this task, a definition query on the wetland type column of the NWI layer was used to identify only the estuarine and marine wetlands that fit the definition of an MPA. The exception to this is for refuges near the Great Lakes, for which all wetlands were used. The selected wetland areas were then clipped to the refuge acquisition boundaries that were identified in the 2016 MPA database update.

The MPAs for the Alaskan refuges (Arctic, Alaska Maritime, and Yukon Delta) had recently been identified by Bret Christensen, the Navigable Waters Specialist in the Water Resource Branch, Alaska Regional Office and were added to the special designation feature class of the FWS cadastral database. For this project, the same areas were used to identify the marine area boundaries. In some cases this included riverine habitat according to NWI. These areas were kept to remain consistent with the layers that were previously identified by Bret Christensen.

Note that not all of the refuges had complete wetland data available, including:
- Arctic
- Baker Island
- Hawaiian Islands
- Howland Island
- Jarvis Island
- Johnston Atoll
- Kakahaia
- Key West
- Kingman Reef
- Mariana Trench
- Midway Atoll
- Navassa Island
- Palmyra Atoll

- Passage Key
- Rose Atoll
- Wake Atoll
- Yukon Delta

For some of the above mentioned refuges, the marine component included all of the parcels in the FWS Interest layer and the entire polygon from the 2016 MPA database update was used to identify the marine areas.

For Johnston Atoll, parcels which overlaid the terrestrial areas were removed (based on aerial imagery from ArcGIS Online – see citation below). All other parcel boundaries remained the same.

The Hawaiian Islands refuge was previously established as an MPA within the Papahānaumokuākea Marine National Monument MPA established in 2006. For FWS purposes, this refuge was included in the shapefile of marine areas only. However, the existing MPA actually extends beyond these boundaries as part of a collaborative effort between the National Marine Sanctuaries, Hawaii Department of Land and Natural Resources and the U.S. Fish and Wildlife Service.

For Kakahaia, wetlands above the road are palustrine and were not considered. However, the beach area on the southern end of the road, even though it was not identified as an NWI Wetland, was included as it is part of the intertidal zone after reviewing the aerial imagery. The refuge website also states that this parcel is included the intertidal zone.

For the remaining refuges with a clear terrestrial component, aerial imagery was used to delineate the terrestrial component. The terrestrial area was then removed from the refuge boundaries in the revised MPA database (FWS acquired parcels only) to identify the marine areas. The aerial imagery information is provided below for each of the refuges.

Aerial Imagery Citation (from ArcGIS Online)**:**

World Imagery provides one meter or better satellite and aerial imagery in many parts of the world and lower resolution satellite imagery worldwide. The map includes NASA Blue Marble: Next Generation 500m resolution imagery at small scales (above 1:1,000,000), i-cubed 15m eSAT imagery at medium-to-large scales (down to 1:70,000) for the world, and USGS 15m Landsat imagery for Antarctica. The map features 0.3m resolution imagery in the continental United States and 0.6m resolution imagery in parts of Western Europe from Digital Globe. In other parts of the world, 1 meter resolution imagery is available from GeoEye IKONOS, i-cubed Nationwide Prime, Getmapping, AeroGRID, IGN Spain, and IGP Portugal. Additionally, imagery at different resolutions has been contributed by the GIS User Community. For more information on this map, including the terms of use, visit http://goto.arcgisonline.com/maps/World_Imagery.

- Baker Island National Wildlife Refuge
    - Date: 3/30/2011
    - Resolution: 0.5 meters
    - Accuracy: 10.2 meters
    - Source: DigitalGlobe

- Hawaiian Islands National Wildlife Refuge
    - o Date: 9/15/2011
    - o Resolution: 0.5 meters
    - o Accuracy: 10.2 meters
    - o Source: DigitalGlobe
- Jarvis Island National Wildlife Refuge
    - o Date: 10/06/2011
    - o Resolution: 0.5 meters
    - o Accuracy: 10.2 meters
    - o Source: DigitalGlobe
- Midway Atoll National Wildlife Refuge
    - o Date: 1/25/2011
    - o Resolution: 0.5 meters
    - o Accuracy: 10.2 meters
    - o Source: DigitalGlobe
- Navassa Island National Wildlife Refuge
    - o Date: 9/7/2011
    - o Resolution: 0.5 meters
    - o Accuracy: 10.2 meters
    - o Source: DigitalGlobe
- Howland Island National Wildlife Refuge
    - o Date: 3/30/2011
    - o Resolution: 0.5 meters
    - o Accuracy: 10.2 meters
    - o Source: DigitalGlobe

Aerial Imagery Source:
Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

A shapefile was created identifying only the marine areas for refuges included in the 2016 MPA database update (Marine Areas within NWRs in the 2016 MPA Database Updat).

For refuges with wetland data available, a summary table was created to include acreage totals for each of the wetland attribute types. The attribute is from the NWI Cowardin Classification code. A code diagram (NWI_Wetlands_and_Deepwater_Map_Code_Diagram) for understanding the NWI wetland codes was created.

Acreages were calculated using the appropriate state plane zone when available (shapefile remained in NAD 83 GCS and the data frame projection system was changed to the desired state plane coordinate system). For the remaining refuges, UTM projections in the appropriate zone were used.

An Excel spreadsheet summarizes the wetland totals for each refuge. The spreadsheet contains two worksheets. The first of these (MPA Acres by Wetland) includes an acreage value for each wetland attribute type for all of the refuges with an MPA. The second worksheet is a pivot table which provides a summary of the wetland acreage totals for each refuge (Summary of Acres by NWR).

Compile a Feature Class consisting of parcel level data for each MPA with an attribute describing whether each parcel is Terrestrial or Marine/Estuarine:

Executed a spatial join between feature classes ALL_NWR_marine_areas_Final and NWRs_with_MPA_name_and_orgcode_Interest_Only_Update2 which were created by NWR GIS staff. The joined data was exported as a temporary shapefile. The Attribute "Category" was added to this shapefile and populated with M/E (Marine/Estuarine) if the feature had a previously assigned Wetland Type as described in the processes above. Features that did not have a Wetland Type were populated with T (Terrestrial). The resulting data was saved as Feature Class "MPA_Parcels".

Dissolve the Parcel Level MPA data to show only one feature for M and one for T/E for each NWR:

The MPA_Parcel dataset was dissolved based on "OrgName" and "Category" to produce one Marine/Estuarine and one Terrestrial feature for each National Wildlife Refuge. The resulting data was saved as Feature Class "MPA".