

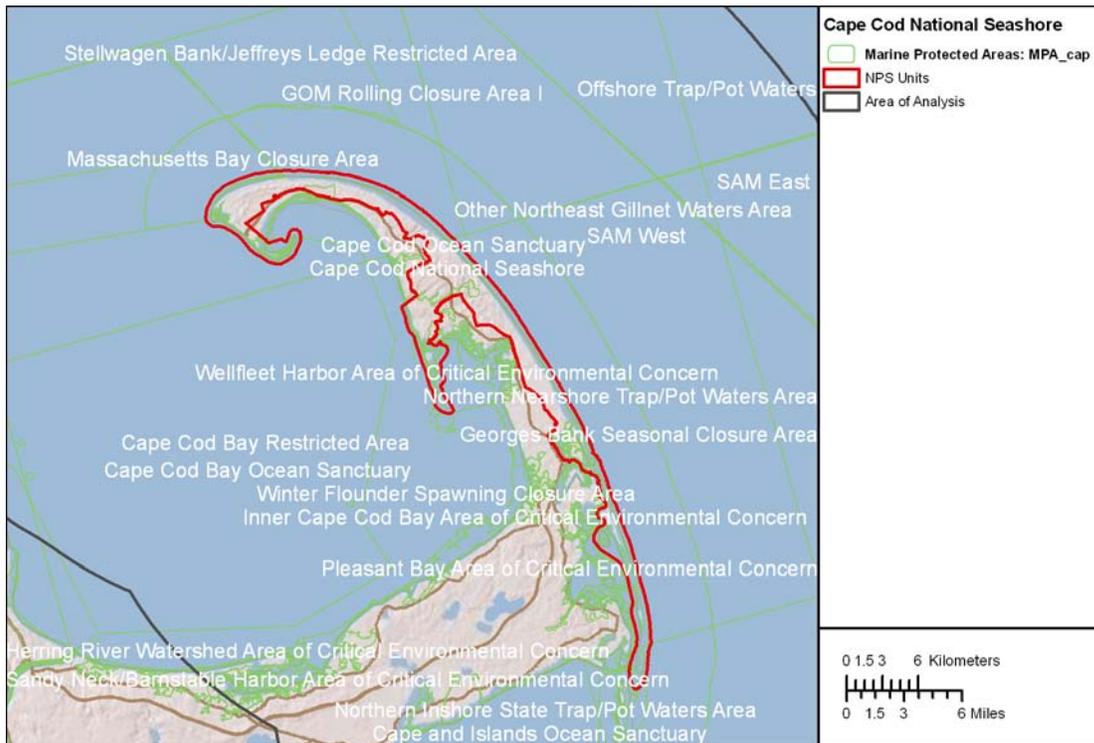
National Park Service  
U.S. Department of the Interior  
Natural Resource Program Center



**NOTE: This document reflects the processes used to generate the spring 2011 release of NPScape data. There may be revised processes and documentation available.**  
**Check Reference Application ( <http://nrinfo.nps.gov> ) for most current version.**

## NPScape Conservation Status Measure – Phase 2 Marine Protected Areas Metrics Processing SOP *Protected Area and Governance/Ownership Metrics*

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## 1. Overview

This SOP provides guidance on how to process the following metrics for the Conservation Status Measure: Marine Protected Areas Protected Area (MPA\_CAP) and Governance/Ownership (MPA\_COW).

Download the NPScape conservation status metrics methods zip file from the NPScape website (<http://science.nature.nps.gov/im/monitor/npscape/methods.cfm>). The zip file includes an ArcGIS™ toolbox containing NPScape conservation status script tools, an ArcMap™ document for displaying outputs, and a copy of this SOP document.

The purpose of this SOP is threefold. First, because these directions were followed for the processing of the NPS dataset, it provides detailed documentation on the methodology the NPS Landscape Dynamics Project (NPScape) used to calculate these metrics. Second, this SOP provides any user with the ability to replicate the creation of these data. Finally, if a Park or Network has a need to process conservation status metrics, this SOP provides a template for how protected areas data can be processed to generate these metrics.

The Marine Protected Areas (MPA) dataset is a polygon feature class of protected areas extending from Mexico to the Arctic. The outlying Pacific and Caribbean islands are also included. The MPA source data can be downloaded from the producer using links provided on the NPScape website. See section 2.1 below for details. Output metrics derived from this data source include:

1. MPA\_CAP: Protected Area from MPA polygons
2. MPA\_COW: Governance from MPA polygons

Outputs include these two clipped polygon feature classes and summary tables with percent protected and percent governance values.

This document summarizes the methods used to generate these outputs for any area of analysis from the NPScape pre-processed source data. For details on how the pre-processed source data were created, see Appendix 6.2.

Unless noted, the data sources and tools used are assumed to be in ESRI ArcGIS™ format, version 9.3.1 Service Pack 1.

## 2. Data Acquisition and Preprocessing

### 2.1. Source Data

Two datasets are required for processing these metrics: the pre-processed Marine Protected Areas (MPA) polygon feature class and area of analysis polygons.

GIS data were obtained from the following sources:

- **Source 1:** NPScape pre-processed source version of National Marine Protected Areas Center Marine Protected Areas Inventory (National Marine Protected Areas Center 2011):

<http://nrinfo.nps.gov/Reference.mvc/Profile?Code=2169782>

This polygon feature class includes marine protected area features from the U.S. including outlying islands. This version of the MPA Inventory contains geospatial boundaries for 1214 of the 1619 identified marine protected areas and is considered complete as of January 2010.

The feature class' native spatial reference is WGS84 (geographic). The dataset was re-projected to the NPScape standard projection.

Polygons with a Prot\_Lvl value of 'To Be Determined' and a Mgmt\_Plan value that was null or that was equal to 'Community Agreement' or 'Not Management Plan' were excluded. See Appendix 6.2.3 for details.

- **Source 2:** Area of Analysis Polygons

An Area of Analysis (AOA) polygon may be any topologically correct polygon feature covering an area of interest. AOA polygon geometries must be free of topological errors like slivers or donuts. Example AOAs include buffered NPS park areas, watershed boundaries, study areas, or ecoregion boundaries.

## ***2.2. Re-Projection of Source Data***

Each source dataset must be re-projected into a common spatial reference. For CONUS areas (including Puerto Rico and the Virgin Islands), the NPScape project uses USA Contiguous Albers Equal Area Conic USGS as its standard projection. For Alaska, Alaska Albers Equal Area Conic is used. NAD\_83 is the datum for both projections. For Hawaii, UTM Zone 5N NAD83 is used. The NPScape pre-processed source polygons are already re-projected.

## **3. Processing and Analysis**

### ***3.1. Processing Step 1 – Re-project Source Data***

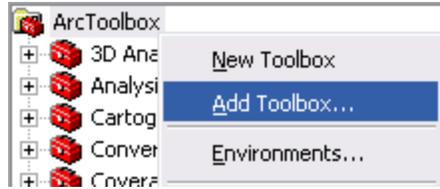
If the source AOA polygon(s) are not in the standard projection, use ArcGIS to create re-projected versions of these sources.

ArcToolbox → Data Management Tools → Projections and Transformations → Feature → Project

### ***3.2. Processing Step 3 – Clip AOA Polygons and Create Summary Tables***

ArcGIS™script tools using Python scripts are used to produce MPA metric outputs.

Open ArcMap™, add layers for the desired area of analysis and the MPA source feature class. Open ArcToolbox. Right-click on ArcToolbox and choose 'Add Toolbox...'.



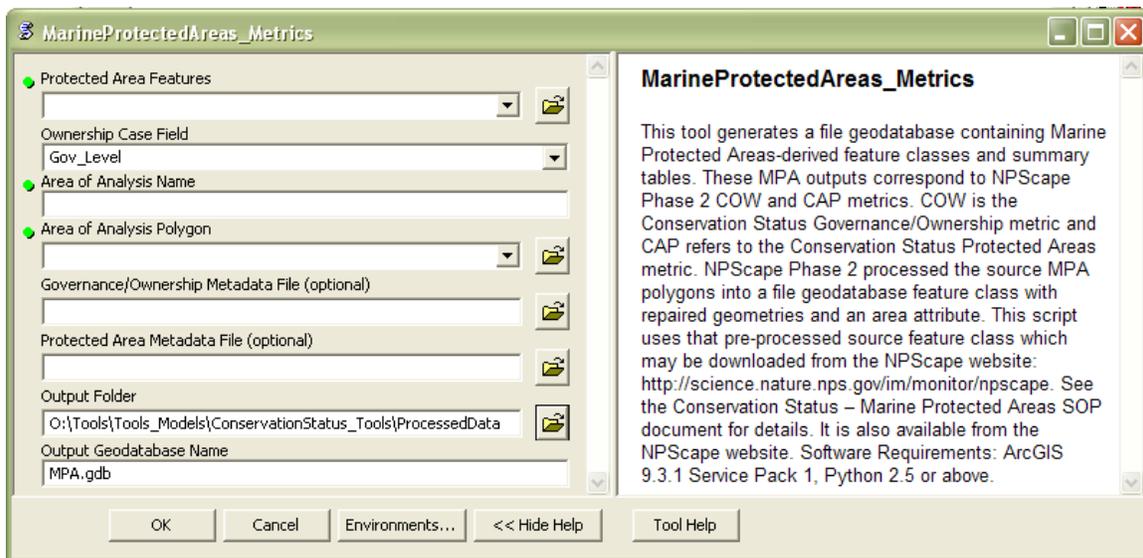
Navigate to the folder where the methods zip file was unzipped. Select the NPScape\_ConservationStatusTools.tbx file to add.



General processing steps are:

- Clip source polygon features to the area of analysis
- Generate summary statistics tables for the protected area polygons (MPA\_CAP) and the governance polygons (MPA\_COW)
- Import metadata

Open the MarineProtectedAreas\_Metrics tool and enter the parameters as shown. The output folder defaults to the ConservationStatus\_Tools\ProcessedData subfolder from the unzipped archive but may be set to any folder to which you have write permissions. Depending on the size of the area of analysis, the script may take several minutes to run.



The following parameters are necessary to run the Python script:

- Protected Area Features: MPA source feature layer from the map or full path to the pre-processed NPScape MPA source polygons
- Ownership Case Field: Case field used to group ownership/governance area calculations.

- AOA Name: name of the area of analysis (60 character limit)
- Area of Analysis: AOA polygon feature layer from the map or full path to the AOA polygon feature class
- Governance/Ownership Metadata File (optional): full path to the governance metadata XML file
- Protected Area Metadata File (optional): full path to the protected area metadata XML file
- Output Folder: full path location of output folder

Output Feature Classes and Table:

MPA\_CAP = clipped MPA protected area polygons for the AOA

MPA\_COW = clipped MPA governance polygons for the AOA

A summary statistics table is produced for each feature class: MCAP\_stats and MCOW\_stats

Summary table attributes include:

FREQUENCY: number of polygons contributing to the area statistics

TAREA\_SQKM: total area in square kilometers of the area of analysis:

$$\text{TAREA\_SQKM} = (\text{AOA area in square meters}) / 1,000,000$$

AREA\_SQKM: total area in square kilometers of each Protected Level or Governance/Ownership category:

$$\text{AREA\_SQKM} = (\text{feature category area in square meters}) / 1,000,000$$

PCT\_AREA: percent total area of each Protected Level or Governance/Ownership category:

$$\text{PCT\_AREA} = (\text{AREA\_SQKM} / \text{TAREA\_SQKM}) / * 100$$

AOA\_NAME = the name entered in the script tool parameter

## 4. Quality Control

### 4.1. Verify spatial and thematic integrity

Use the ArcMap™ document (ConservationStatus\_Tools\ConservationStatus\_Metrics.mxd) provided to open the MPA feature classes. Overlay them with area of analysis polygon.

Verify that edges align correctly and that the polygon features align from feature class to feature class. Use the Effects → Swipe tool to help verify this. Note that the NPScene layer files for conservation status (ConservationStatus\_Tools\ProcessedData\\*.lyr) are used to standardize the polygon symbology.

Add the source feature class to the map and use the Swipe tool to verify that the processed feature classes' polygons align with the source polygons.

Look for the existence of donuts or slivers (polygons may not cover the entire AOA extent).

Zoom into an area and visually compare the outputs of each feature class by identifying all layers for a few points using the Identify tool. Verify the following values:

The Prot\_Lvl value for the MPA feature class should equal the Prot\_Lvl value in the source feature class.

The Gov\_Level value for the MPA feature class should equal the Gov\_Level value in the source feature class.

## **4.2. Verify Values for Calculated Areas**

Open each statistics table and verify that the TAREA\_SQKM values are equivalent across all the tables. Sort the PCT\_AREA field in descending order and look for outlying (zero or negative values, more than one value near 100, sum of values > 100).

Select one record from each statistics table and double-check the result column values by re-calculating them by hand:

1. Select one record from each statistics table and double-check the result column values by re-calculating it by hand:

$$\text{PCT\_AREA} = (\text{AREA\_SQKM} / \text{TAREA\_SQKM}) * 100$$

If the sum of PCT\_AREA exceeds 100%, verify that the area of analysis contains ‘duplicate’ polygons for various Gov\_Level or Prot\_Lvl values. This is a known issue with the MPA dataset and may result in PCT\_AREA protected sums greater than 100%.

## 5. Literature Cited

National Marine Protected Areas Center. 2011. Marine Protected Areas Inventory (MPA). <http://www.mpa.gov/>. Last accessed April 12, 2011.

## 6. Appendices

### 6.1. *Known Issues*

#### Data Availability

The Marine Protected Areas Inventory dataset includes the continental U.S, the Caribbean, Alaska, and Hawaii.

#### NPS Features

The Marine Protected Areas Inventory dataset does not distinguish coastal NPS areas from inland NPS areas. For example, the inland area of Olympic National Park is included in the MPA feature class in addition to the coastal parcels. It appears the stewards of the MPA Inventory used the full NPS feature class when including it in their dataset.

#### Duplicate Polygon Features

The source MPA dataset contains duplicate polygon features with different Prot\_Lvl and/or Gov\_Level attribute values. These duplicate features were retained in the feature class and may skew resulting statistics by counting the polygon area more than once (i.e. the polygon's area contributes to more than one protected area or governance category).

### 6.2. *Source Data Processing*

#### 6.2.1. Source Data

Two datasets are required for processing these metrics: the pre-processed Marine Protected Areas (MPA) polygon feature class and area of analysis polygons.

GIS data were obtained from the following sources:

- **Source 1:** National Marine Protected Areas Center Marine Protected Areas Inventory: <http://mpa.gov/dataanalysis/mpainventory/>

This polygon feature class includes marine protected area features from the U.S. including outlying islands. This version of the MPS Inventory contains geospatial boundaries for 1452 of the 1619 identified marine protected areas and is considered complete as of January 2010.

The feature class' native spatial reference is WGS84 (geographic).

- **Source 2: Area of Analysis Polygons**

The NPScape project uses two AOA sources: NPS parks buffered by 30 kilometers and USFWS Landscape Conservation Cooperative areas.

### **6.2.2. Re-Projection of Source Data**

Each source dataset was re-projected into a common spatial reference. For CONUS areas (including Puerto Rico and the Virgin Islands), the NPScape project uses USA Contiguous Albers Equal Area Conic USGS as its standard projection. For Alaska, Alaska Albers Equal Area Conic is used. NAD\_83 is the datum for both projections. For Hawaii, UTM Zone 5N NAD83 is used.

### **6.2.3. Select Protected Areas from Full MPA Source**

When using MPA, protected areas were defined as follows. This logic was used to extract protected area polygons from the full MPA feature class. Polygons with a Prot\_Lvl value of 'To Be Determined' and a Mgmt\_Plan value that was null or that was equal to 'Community Agreement' or 'Not Management Plan' were excluded.

Protected areas selection criteria:

Prot\_LVL <> 'To Be Determined' AND Mgmt\_Plan Not In (' ', 'Community Agreement', 'No Management Plan')

Governance (COW) calculations and display layers use the Gov\_Level attribute which was not altered from the source feature class.