

National Park Service
U.S. Department of the Interior
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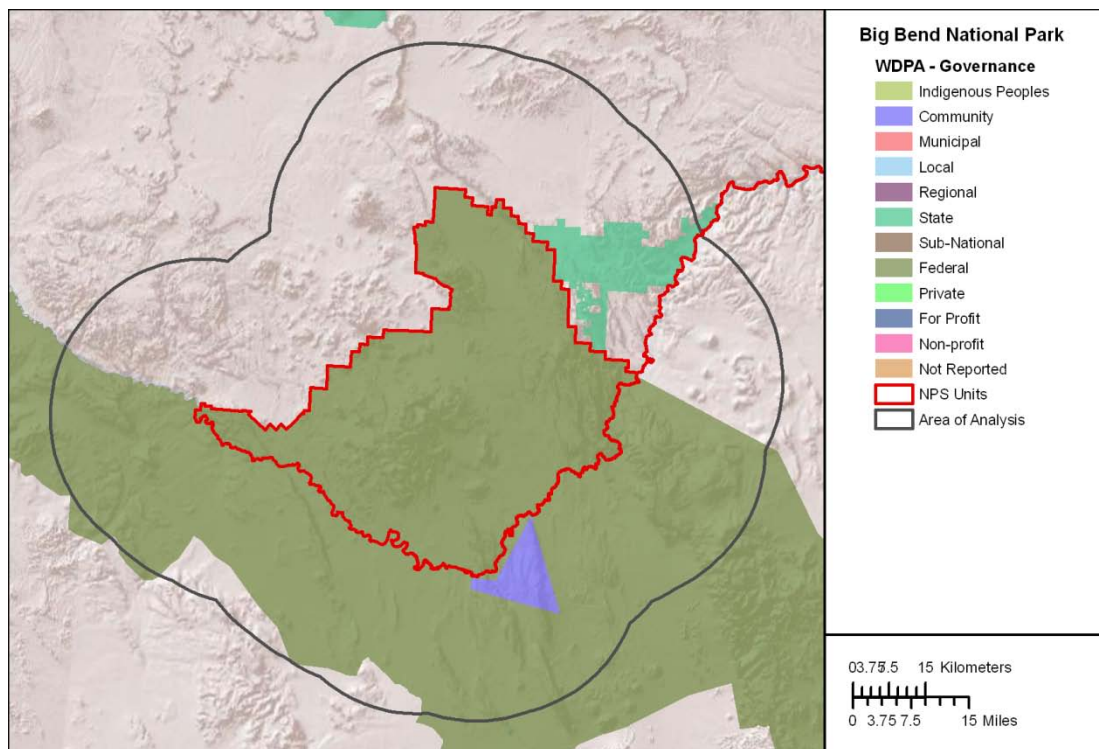


NOTE: This document reflects the processes used to generate the spring 2011 release of NPScope data. There may be revised processes and documentation available.
Check Reference Application (<http://nrinfo.nps.gov>) for most current version.

NPScope Conservation Status Measure – Phase 2 World Database of Protected Areas Metrics Processing SOP

Protected Area and Governance/Ownership Metrics

Version: 20110405



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1. Overview

This SOP provides guidance on how to process the following metrics for the Conservation Status Measure: World Database of Protected Areas Protected Area (WDPA_CAP) and Governance/Ownership (WDPA_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 World Database of Protected Areas (WDPA) dataset is a polygon feature class of protected areas. The NPScape project extracted and pre-processed the area extending from Mexico to the Arctic plus the outlying Pacific and Caribbean islands. The source dataset can be downloaded from the NPScape website. See section 2.1 below for details. Metrics derived from this data source include:

1. WDPA_CAP: Protected Area from WDPA polygons
2. WDPA_COW: Governance from WDPA polygons

Outputs include two clipped polygon feature classes and summary tables with percent area 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 World Database of Protected Areas (WDPA) polygon feature class and area of analysis polygons.

GIS data were obtained from the following sources:

- **Source 1:** NPScape pre-processed source version of World Database of Protected Areas (World Commission on Protected Areas 2011):

<http://nriminfo.nps.gov/Reference.mvc/Profile?Code=2169781>

For Governance calculations and displays, the WDPA GOV_TYPE attribute was reclassified to populate the OWNER attribute. See Appendix 6.2.3 for details.

This polygon feature class includes protected area features from the U.S. including Alaska and the outlying islands, Mexico, and Canada.

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

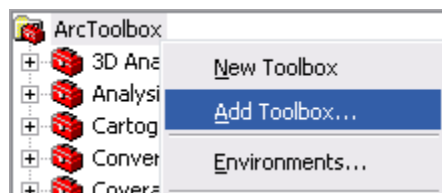
If the source AOA polygon(s) are not in the standard projection, use ArcGIS to create re-projected versions of these sources.

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

3.2. Processing Step 2 – Clip WDPA Polygons and Create Summary Tables

ArcGIS TMscript tools using Python scripts are used to produce WDPA metric outputs.

Open ArcMapTM, add layers for the desired area of analysis and the WDPA source feature class. Open ArcToolbox. Right-click on ArcToolbox and choose ‘Add Toolbox...’.



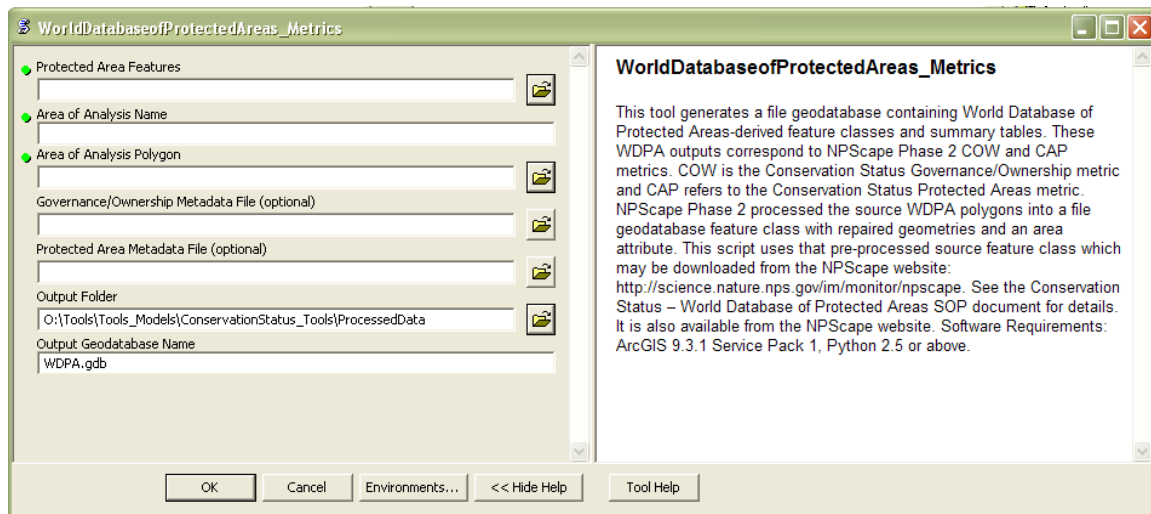
Navigate to the folder where the methods zip file was unzipped. Select the NPScape_ConservationStatusTools.tbx file to add.



General processing steps are:

- Clip source polygon features to the area of analysis
- Generate summary statistics tables for the protected area polygons (WDPA_CAP) and the governance polygons (WDPA_COW)
- Import metadata

Open the WorldDatabaseofProtectedAreas_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. When finished, the layers and statistics tables should be added to the map.



The following parameters are necessary to run the script tool:

- Protected Area Features: WDPA source feature layer from the map or full path to the source NPScape WDPA source polygons
- 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 location 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:

WDPA_CAP = clipped WDPA protected area polygons for the AOA

WDPA_COW = clipped WDPA governance polygons for the AOA

A summary statistics table is produced for each feature class: WDPA_CAP_stats and WDPA_COW_stats

Summary table attributes include:

FREQUENCY: the number of polygons contributing the area statistics

TAREA_SQKM: total area in square kilometers of the area of analysis:

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

AREA_SQKM: total area in square kilometers of each Protected Level or Governance/Ownership category:

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

PCT_AREA: percent total area of each Protected Level or Governance/Ownership category:

$$PCT_AREA = (AREA_SQKM / TAREA_SQKM) * 100$$

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 WDPA 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 NP Scape 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 GOV_TYPE value for the output WDPA feature class should equal the GOV_TYPE value in the input 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 \neq 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:

$$\text{PCT_AREA} = (\text{AREA_SQKM} / \text{TAREA_SQKM}) * 100$$

5. Literature Cited

World Commission on Protected Areas. 2011. World Database on Protected Areas (WDPA). <http://www.wdpa.org/Default.aspx>. Last accessed April 12, 2011.

6. Appendices

6.1. Known Issues

Definition of Protected Area

All features within the WDPA dataset are considered protected areas.

Discrepancies between WDPA and NPS Administrative Boundaries

The World Database of Protected Areas dataset includes NPS areas. It is likely that these features came from the NPS Current Administrative Boundaries dataset and therefore may be out-of-date, may lack topology, or may have incorrect attribution. Note that updates done by NPS groups in the Fall of 2010 are NOT included in the WDPA database.

Duplicate Polygons for Certain Protected Areas

The source WDPA feature class contains replicated polygons for some protected areas. An example is the trans-border Glacier-Waterton area in Montana and Canada. Three polygons are attributed as Glacier National Park (two may be duplicates). Two polygons are attributed as Waterton (with one potential duplicate). These instances will result in inflated area calculations and potentially duplicated governance values for processed outputs.

Spatial Integrity Issues

Every effort was made to retain the WDPA features as received from the source. The only spatial alteration made to the source was to run a Repair Geometry operation to remove significant errors in feature integrity. However, other spatial integrity issues exist that may arise from incorrect source projection information. An example of this issue is the presence of a protected area polygon from northwestern Colorado off the coast of South Carolina.

IUCN Categories

Modified from A. Granziera (pers. comm. 26 Oct. 2010): All protected areas included in the WDPA must meet the IUCN definition of protected areas. This is WDPA's first criterion for inclusion. However, it is important to note that the definition and the assignment of the category are de facto two different processes in many countries. When submitting data to the WDPA, most providers know whether or not the sites are protected areas according to IUCN definition, but they might not know which categories they belong to. A blank or 'not reported' IUCN category field means that no information about the IUCN category has been provided. A 'Not applicable' IUCN category field means that the site is internationally recognized and, therefore, IUCN categories do not formally apply.

Precision and Scale Settings for File Geodatabases

Fields used for calculating road densities have a float data type. In a file geodatabase, the float data type (single-precision floating point) does not allow explicit setting of precision and scale beyond the default precision setting of 6 digits

(http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=Geodatabase_field_data_type_s). Given the generally coarse resolution of source data for NPScape, this limitation was deemed acceptable.

6.2. Source Data Processing

6.2.1. Source Data

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

GIS data were obtained from the following sources:

- **Source 1:** World Database of Protected Areas: <http://www.wdpa.org>

This polygon feature class includes protected area features across the globe. However, only protected area features within the US, Mexico, and Canada were used in the NPScape project.

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

The source WDPA feature class 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. Populate Owner Attribute

All features in the source WDPA feature class are considered protected. Therefore, for Area Protected calculations and displays, all WDPA features are used. For Governance calculations and displays, the following reclassification of the GOV_TYPE attribute was used to populate the OWNER attribute.

Governance categories are classified based on GOV_TYPE values:

GOV_TYPE	Owner/Governance
Community Conserved Areas	Community
Federal or National ministry or agency in charge	Federal
Federal/National Agency in charge	Federal
For Profit Organisation	For Profit
For Profit Organisations	For Profit
Governance by Indigenous Peoples and/or Local Communities	Indigenous Peoples
Local/municipal ministry or agency in charge	Municipal
Non-for Profit Organisation	Non-profit
Not Reported	Not Reported
Private Governance	Private
Private Protected Areas	Private
Sub-National Agency in charge	Sub-National
Sub-National Agency in charge. Local Government	Sub-National
Sub-National Agency in charge. Regional Agency	Regional
Sub-National Agency in charge. State Agency	State

Sub-National Agency in charge.Local Government	Local
Sub-National Agency in charge: State Agency	State
All others	unchanged