



National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

NPS I&M Standard Operating Procedure: Creating HUC12 AOAs for use with Landscape Dynamics

Version Draft #2.0

Cite As: Kineth, M. 2016. NPS I&M Standard Operating Procedure: HUC12 AOAs for use with Landscape Dynamics. NPS/NRSS/IMD/SOP-1.0.

Summary

Using the Watershed Boundary Dataset (WBD) HUC12 watersheds as a source, all HUCs that are within or intersect IMD park boundaries are used to create Areas of Analysis for use with Landscape Dynamics.

Version History					
Previous Version No.	Date of Revision	Changes	Made by	Reason	Updated Version No.
xx.xx	YYYYMMDD	What	Who	Why	xx.xx

Contents

Summary	1
Overview	2
Requirements	2
AOA Processing – HUC12 AOAs	2
Step 1: Download data	3
Step 2: Run Tool.....	4
Select/Changed AOAs	5
Quality Control	5
Post-Processing	5
AOA Map Services – Creation and Publication	6
Appendices	7
Appendix 1: Known Issues and Other Information	7
Appendix 2: Required Attribute Fields	7

Overview

This SOP documents how areas of analysis representing HUC12 watersheds, are created from watershed boundary data obtained from the Watershed Boundary Dataset (WBD). All HUC12 watersheds that are within and/or intersect an IMD park boundary are included in the HUC12 AOA dataset. NPS/IMD related attribute fields are added to the AOA features, and features are projected to match standard required spatial extents for various geographical regions. HUC12 AOAs are otherwise unaltered from the source.

WBD Overview

The WBD is produced by 3 federal agencies, USDA, USGS, and EPA. The dataset was created from digitizing 1:24,000 K USGS Topographic Maps. The date range for original source data is 1884 to 2006. (<http://nhd.usgs.gov/wbd.html>)

Requirements

Users of this SOP are required to have:

- ArcGIS 10.2.2+
- Mapped drive, and read/write permissions (*inp2300fcsisro1\IMD_Data*)
- WBD HUC12 data download
- Remote desktop permissions and access to GIS Server to publish Map Services (*inp2300fcvhafo1*)
- **Local connection to code repository**
- *Optional: IDE for Python (i.e. Pyscripter) with .pyt extension recognition – this is only necessary if editing the python toolbox; access limited to IMD Central Office GIS staff.*

AOA Processing – HUC12 AOAs

- Create a temporary workspace on a local drive (i.e. D:\ProjectWorkspace\HUC12_Scratch).
- Copy to local temporary workspace NPScape AOAs and Terrestrial Areas geodatabases:
 - o X:\ProjectData\NPScape\DATA\SourceData\USData\Boundary\LandscapeDynamics_AOA.gdb
 - o X:\ProjectData\NPScape\DATA\SourceData\USData\Boundary\LandscapeDynamics_Geographical_Boundaries.gdb

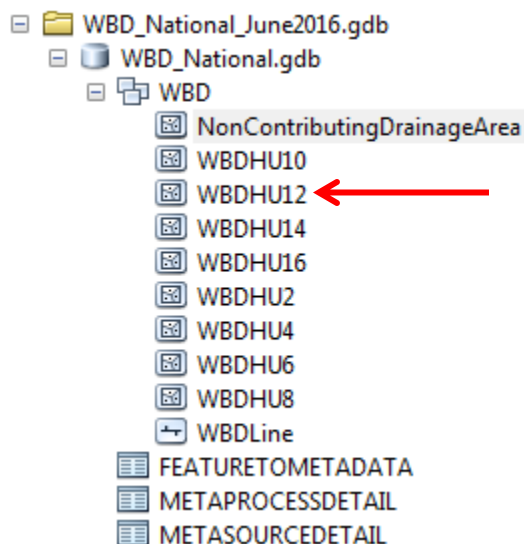
Step 1: Download data

- In X:\ProjectData\NPScape\DATA\SourceData\USData\Hydrology\WBD, create new date-stamped folder and move previous version of WBD_National database.
- Download new WBD National data to X:\ProjectData\NPScape\DATA\SourceData\USData\Hydrology\WBD, <http://prd-tnm.s3-website-us-west-2.amazonaws.com/?prefix=StagedProducts/Hydrography/WBD/>
- Download .xml and save to X:\ProjectData\NPScape\DATA\SourceData\USData\Hydrology\WBD, will upload to data store as metadata link

For additional information about the source data, consult the website, <http://nhd.usgs.gov/wbd.html>

- Extract and preview data in ArcMap.

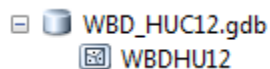
Database should look similar this:



When viewed at the full extent the HUC12 feature class should look like this (outlying Pacific Islands are to the far right):



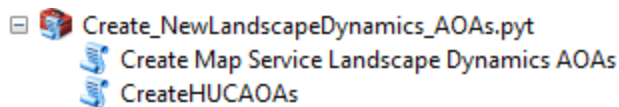
- Extract HUC12 feature class to new geodatabase, X:\ProjectData\NPScape\DATA\SourceData\USData\Hydrology\WBD



- Copy WBD_HUC12.gdb to local workspace before running the AOA tool.
- Check all field names in WBD_HUC12.gdb haven't changed from how they are referenced in script tool.

Step 2: Run Tool

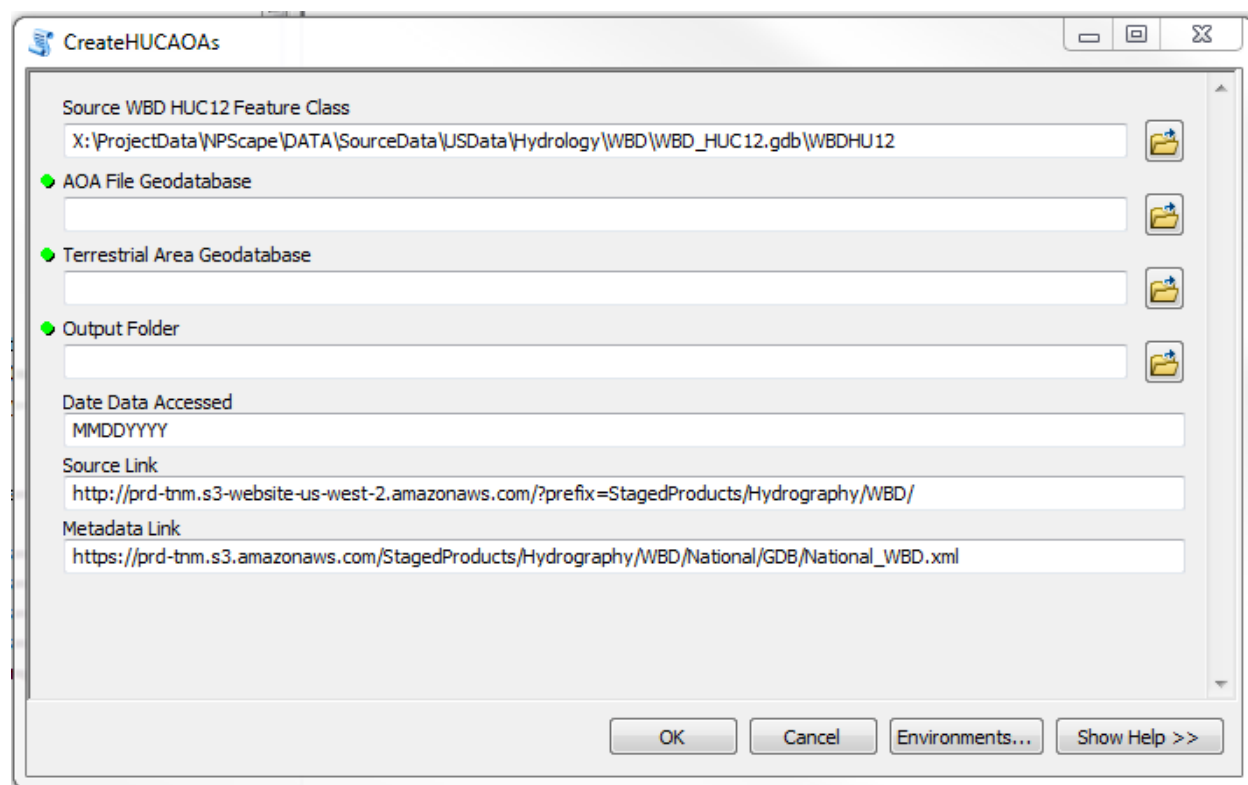
In ArcMap, from **Create_NewLandscapeDynamics_AOAs.pyt**, run tool **CreateHUCAOAs**



NOTE: if any permanent updates or changes are made to the underlying Python – make sure the code repo is updated to reflect the changes BEFORE the tool is run.

Based on the LandscapeDynamicsAOA.gdb input, geographies are defined by feature classes present in the database (Alaska_AOA_Park, CONUS_AOA_Park, etc).

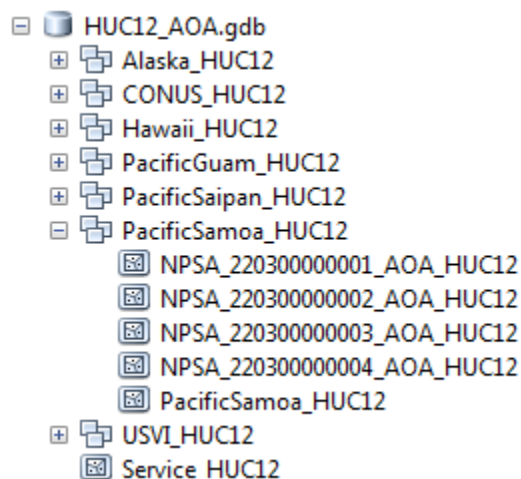
This tool will take up to a week to run. Make sure to update Source and Metadata links if they have changed.

**General Processing steps:**

For the spatial extent of each geography (Alaska, Conus, Hawaii, American Samoa, Guam, Saipan, USVI), the HUC12 data is reprojected to the standard spatial reference (see Appendix xx). From the input AOA feature class, a list of Parks is created (4-digit park codes) and for each park code, all HUC12 watersheds that intersect or are within that park boundary are extracted. Various attributes are added to the data and the selected features are inserted into a new feature class. This repeats for each park code on the list for a specific geography. When all HUC12s for all AOAs have been added, the new HUC12 list is used to create individual feature classes for each HUC on the list. Additional field changes are made and the final result is a single HUC12_AOA.gdb with Feature Datasets, by geography, which contain feature classes for each individual HUC12 that intersects/is within a park, as well as a combined feature class of all HUC12s for that geographical region. Finally, a HUC12 webmercator feature class is created, to be used as a map service.

See Appendix 2 for list of fields in each feature class.

The final geodatabase will look like this:



Within each feature dataset should be multiple feature classes: one feature class for each unique HUC12 watershed, and one combined feature class that includes ALL HUC12s for the respective geography/dataset.

Select/Changed AOAs

When updating Landscape Dynamics statistics, only those AOAs that have changed will be recalculated (Park, 3km, 30km, HUC12). To determine the list of changed AOAs:

- **HUC12**, using the list of changed Park AOAs created in (LandscapeDynamics_AOA_Boundaries_SOP.docx), create a Temp feature class of HUC's intersecting those parks.
- Find new/changed HUC's to run stats for

Quality Control

Using ArcMap, the AREA_SQKM values are spot-checked for a selected set of park-based AOAs. Using Field Calculator, the AOA area in square kilometers is calculated and checked against the AREA_SQKM value in the AOA feature class.

Using ArcMap, visually check the merged HUC12 feature class with the source Landscape Dynamics Bounds polygons to check for spatial congruency. Spot check specific parks.

- Check for any known new or changed AOAs from last AOA update.
- Check Metadata on at least one feature class per feature dataset, edit as needed.
- From a random selection of feature classes, check that basic metadata is populated.
- Additionally, for individual feature classes as well as the combined feature class, check that all required attribute fields are present (Appendix xx), and that all fields are populated.
- Cross check the number of HUC12 features in the Service feature class with the number of HUC12 features in the config.HUC12Parks table in NPScape_Stats. Edit the latter as needed so the number of features is equal.

Post-Processing

- After QA/QC, manually COPY HUC12_AOA.gdb from local drive to X:\ProjectData\NPScape\DATA\SourceData\USData\Boundary AND X:\ProjectData\Data_Processing\Bounds_Processing\Data

- In Bounds_Processing\Data:
 - Manually date stamp previous version HUC12_AOA.gdb and delete any older date stamp versions
- In USData\Boundary:
 - Delete current HUC12_AOA.gdb and copy the new one to this location
- Upload new AOAs (and SOP) to Data Store:
 - HUC12s: *data store link*
 - Zip new AOAs gdb, upload as holding, also reupload SOP
 - Check website after new reference created, make sure AOAs link points to the correct version of the AOAs
(http://science.nature.nps.gov/im/monitor/npscape/methods_aoas.cfm)
- If any changes to the Python toolbox script were made – make sure to update the repo.
- Rerun Landscape Dynamics Stats for new/updated/alterd AOA boundaries. See LD Stats SOPs for each Landscape Dynamics Metric.

AOA Map Services – Creation and Publication

During processing, AOA dissolved features (Park, 3km, 30km, HUC12) are copied to SDE for use in a map service (GDB_NRSS.DBO.INPNISCVDBNRSSST_IMDGIS.sde); accessed in service mxds from (GDB_NRSS.SDE_Data_Viewer.DBO.INPNISCVDBNRSSST_IMDGIS.sde)

 GDB_NRSS.DBO.LandscapeDynamics_30km_webmercator
 GDB_NRSS.DBO.LandscapeDynamics_3km_webmercator
 GDB_NRSS.DBO.LandscapeDynamics_HUC12_webmercator
 GDB_NRSS.DBO.LandscapeDynamics_Park_webmercator

- From ArcGIS Server connection:
 - Delete HUC12AOA map services from the LandscapeDynamics folder
 - Open:
 - X:\ProjectData\Data_Processing\Bounds_Processing\MapServices\LandscapeDynamics_HUC12Boundaries.mxd (Albers prj)
 - X:\ProjectData\Data_Processing\Bounds_Processing\MapServices\LandscapeDynamics_HUC12Boundaries_WebMercator.mxd (webmercator prj)
 - For both - confirm any new/changed AOAs are reflected
 - Edit Data Frame Properties (Description, add new date)
 - Edit Data Layer Properties (Description, add new date)
 - Edit Map Doc Properties (Description, add new date)
 - Publish service(s)
 - In Service Editor → Parameters → Output Directory change Directory to “proxy output”
 - Turn on Feature Access and make sure only Query and Extract is allowed.
 - Log in to ArcGIS Online and make sure Landscape Dynamics Map Viewer is working and AOAs are showing in the app.
 - See SOP_How_To_Update_LandscapeDynamics_Viewer.doc

Appendices

Appendix 1: Known Issues and Other Information

HUC12 AOAs are updated annually, around September/October. They reflect the accuracy and currency of HUC12 source boundary data as provided by <http://nhd.usgs.gov/wbd.html> at that time.

Spatial References:

All AOA data must be in the following spatial reference, based on represented geography:

- North America (US, Canada, Mexico) = USA Contiguous Albers Equal Area Conic USGS (NAD83) (WKID: 102039)
- CONUS = USA Contiguous Albers Equal Area Conic USGS (NAD83) (WKID: 102039)
- Puerto Rico and USVI = USA Contiguous Albers Equal Area Conic USGS (NAD83) (WKID: 102039)
- Alaska = Alaska Albers Equal Area Conic (NAD83) (WKID: 3338)
- Hawaii = UTM Zone 5N NAD83 (WKID: 26905)
- American Samoa = NAD_1983_HARN_UTM_Zone_2S (WKID: 2195)
 - If necessary, when re-projecting use Transformation = WGS_1984_(ITRF00)_To_NAD_1983 + NAD_1983_HARN_To_WGS_1984_2
- Guam = WGS_1984_UTM_Zone_55N (WKID: 32655)
 - If necessary, when re-projecting use Transformation = "WGS_1984_(ITRF00)_To_NAD_1983"
- CN Mariana Islands = WGS_1984_UTM_Zone_55N (WKID: 32655)
 - If necessary, when re-projecting use Transformation = "WGS_1984_(ITRF00)_To_NAD_1983"

Appendix 2: Required Attribute Fields

The following fields should be present and populated with meaningful values for each feature class within HUC12_AOA.gdb. No fields outside those listed here should be included in any feature class.

- *OBJECTID – unique id, index field, auto generated
- *Shape – point, line, polygon, auto generated
- HUC12 – 12-digit HUC code
- NAME - WBD assigned name of watershed
- HUType – WBD defined type of watershed
- HUMOD – ?
- TOHUC – downstream HUC12
- AOA_NAME - <PARK_CODE>_<HUC12>
- PARK_CODE – NPS 4-letter park code
- FULL_NAME – WBD assigned name of watershed
- UnitName – NPS Park Unit Name
- NetworkCode – NPS Network Code
- NetworkName – NPS Network Name
- RegionName – NPS Region Name
- DATE_EDIT – date the AOAs were created
- SOURCE – source url for WDB data
- CREATED_BY – who/where created the source data
- AREA_SQKM – calculated Area after all processing is complete
- (Data_DateAccessed)? – date the WBD data were accessed and downloaded for use
- *Shape_Length – auto-generated, meters
- *Shape_Area – auto-generated, meters