

Inventory & Monitoring Division

National Park Service



Standard Operating Procedure 3.11.15

Quality Assurance and Quality Control for Landscape Dynamics Metrics: Area Without Roads

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Summary

This internal Landscape Dynamics SOP provides guidance on QA/QC for Area without Roads statistics.

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Overview

This SOP provides instruction on how to QA\QC final summary statistics for Area without Roads, derived from US Census TIGER line/road data, updated annually (SOP 3.11.4; Kinseth and Nelson 2018a).

Statistics can represent various areas of analysis (AOA). At a minimum, AOAs for statistics include all HUC12 watersheds that intersect park boundaries (SOP 2.11.7; Kinseth and Nelson 2018c). Custom AOAs submitted by Networks or Cooperators for analysis can include island boundaries, watershed boundaries, or other ecological boundaries of interest (SOP 2.11.8; Kinseth and Nelson 2018b).

Summary statistics for Area without Roads, by AOA, include roadless patch area (in km²), and patch size frequency.

It is assumed users of this SOP have prior knowledge of data paths, file locations, and repositories referenced in this SOP.

Requirements

- Knowledge and ability to use SSMS (SQL Server Management Studio)
- Read/write database security privileges for StatsQA and LD_Stage
- Run area without roads summary statistics (SOP 3.11.4; Kinseth and Nelson 2018a).

QA Processing & Procedures

Steps 1 and 2 can be accomplished by any IMD-GIS staff. Steps 3 to 5 can only be accomplished by select IMD-GIS staff with the proper, elevated permissions within the database.

Before you start:

- Connect to SSMS and view the tables within the StatsQA database. There may be multiple area without roads statistics tables, by TIGER year.
- Repeat steps 1, 2 for each area without roads table present in StatsQA.

Naming convention for statistics tables:

AWR_<YYYY>_<Geography>_<AOA>_<stat>

Where:

YYYY = four-digit year for source data

Geography = CONUS, ALASKA, HAWAII, USVI, GUAM, SAIPAN, AMSAM

AOA = AOA type (i.e. HUC12, other Custom AOA, etc.)

Stat = CLIPPED, or FREQ

Step 1: Quality Assurance

ALL TABLES:

1. View table and look for any NULL fields in DATE_CALC. If there are any, stop. Statistics may have to be rerun. If there are no NULLs, continue with QA.
2. Check all AOAs are represented in each table. The number of rows should match the number of features from the input AOA feature class list (if there is a discrepancy, stop immediately):

```
SELECT Count(  
    [THRESHOLD_DISTANCE])  
    , [AOA_NAME]  
FROM [StatsQA].[dbo].[STATS TABLE NAME GOES HERE]  
group by [AOA_NAME]  
order by [AOA_NAME]
```

3. Sort by Patch Area. There should be no patches or area smaller than 0.0144km² (0.0009km² for island-based AOAs), except for AOAs where no area without roads is found. If PATCH_AREA_SQKM has ZERO reported, (for “_FREQ” table) FREQUENCY should also show ZERO, and (for “_CLIPPED” table) COUNT_ should also show ZERO.

```
order by [PATCH_AREA_SQKM]
```

“CLIPPED” TABLE ONLY

1. Compare TOTAL_AOA_AREA_SQKM to AREA_SQKM. There should be no results as TOTAL_AOA_AREA_SQKM should always be larger than (or equal to) AREA_SQKM. If there are any results, stop immediately:

```
SELECT [AOA_NAME], [TOTAL_AOA_AREA_SQKM], [AREA_SQKM]  
FROM [StatsQA].[dbo].[STATS TABLE NAME GOES HERE]  
where [TOTAL_AOA_AREA_SQKM] < [AREA_SQKM]
```

2. Compare TOTAL_AOA_AREA_SQKM and AREA_SQKM values of all AOAs. Look for any negative values in the DIFF column. If any exist, stop immediately:

```
SELECT [AOA_NAME], [TOTAL_AOA_AREA_SQKM], [AREA_SQKM],  
    [TOTAL_AOA_AREA_SQKM] - [AREA_SQKM] AS [DIFF]  
FROM [StatsQA].[dbo].[STATS TABLE NAME GOES HERE]  
ORDER BY [DIFF]
```

3. Compare TERRESTRIAL_AOA_AREA_SQKM and AREA_SQKM values of all AOAs. DIFF should range between -0.000x and 0.000x. If any values exist outside this range, stop immediately:

```
SELECT [AOA_NAME], [TERRESTRIAL_AOA_AREA_SQKM], [AREA_SQKM],
[TERRESTRIAL_AOA_AREA_SQKM] - [AREA_SQKM] AS [DIFF]
FROM [StatsQA].[dbo].[STATS TABLE NAME GOES HERE]
ORDER BY [DIFF]
```

4. Run this query. The resulting SUM_AREA should be LESS THAN TOTAL_AOA_AREA_SQKM and AREA_SQKM, for each AOA. DIFF_SUM_TOTAL should be '0' or greater. If there are any negative values, stop immediately:

```
SELECT SUM ([PATCH_AREA_SQKM]) AS [SUM_AREA], [AOA_NAME],
[TOTAL_AOA_AREA_SQKM], [AREA_SQKM], [TOTAL_AOA_AREA_SQKM] - SUM
([PATCH_AREA_SQKM]) AS [DIFF_SUM_TOTAL]
FROM [StatsQA].[dbo].[STATS TABLE NAME GOES HERE]
group by [AOA_NAME], [TOTAL_AOA_AREA_SQKM], [AREA_SQKM]
order by [DIFF_SUM_TOTAL], [AOA_NAME]
```

5. Right click on table → Design. Edit field “COUNT_” to “COUNT” and save.

Step 2: Combine Statistics

Where applicable, combine data with matching source/year/metric/AOA to create one table of area without roads statistics.

Go to Step 4 if there are no tables to combine.

“FREQ” TABLE ONLY

1. Create a new “freq” table for combined area without roads frequency stats (by year, AOA). Add the following to the select statement, on the line above ‘From’:

```
INTO [StatsQA].[dbo].[NEW BASE TABLE HERE]
```

Naming convention for new tables should match table names in LD_Stage, for the same metric (if any):

Example New Table = [StatsQA].[dbo].[tiger2015_awr_stats_freq_HUC12]

2. Refresh StatsQA and look for the new table.
3. Insert additional road geography frequency stats to new table, as needed:

```
INSERT INTO [StatsQA].[dbo].[NEW BASE TABLE HERE]
([FREQUENCY]
```

```

, [PATCH_AREA_SQKM]
, [AOA_NAME]
, etc. for remaining fields)

SELECT [FREQUENCY]
, [PATCH_AREA_SQKM]
, [AOA_NAME]
, etc. for remaining fields

FROM [StatsQA].[dbo].[ADDITIONAL SOURCE TABLE(S)]

```

4. When done, check combined table:

```

SELECT Count(
    [THRESHOLD_DISTANCE])
, [AOA_NAME]

FROM [StatsQA].[dbo].[NEW BASE TABLE HERE]

group by [AOA_NAME]

```

The number of rows should equal the total of all AOAs from the individual tables that were merged.

“CLIPPED” TABLE ONLY

1. Create a new ‘clipped_stats’ table (by year, AOA type). Add the following statement, on the line above ‘From’:

```
INTO [StatsQA].[dbo].[NEW BASE TABLE HERE]
```

Naming convention for new tables should match table names in LD_Stage, for the same metric (if any):

Example New Table = [StatsQA].[dbo].[tiger2015_awr_stats_HUC12]

2. Refresh StatsQA and look for the new table.
3. Insert additional area without roads stats to new base table as needed:

```

INSERT INTO [StatsQA].[dbo].[NEW TABLE HERE]
    ([AOA_NAME]
, [PATCH_AREA_SQKM]
, [COUNT]

```

```
,etc. for remaining fields)

SELECT [AOA_NAME]

      , [PATCH_AREA_SQKM]

      , [COUNT]

      ,etc. for remaining fields

FROM [StatsQA].[dbo].[ADDITIONAL SOURCE TABLE(S)]
```

4. When done, check counts on new table:

```
SELECT Count(

      [THRESHOLD_DISTANCE] )

      , [AOA_NAME]

FROM [StatsQA].[dbo].[NEW BASE TABLE HERE]

group by [AOA_NAME]
```

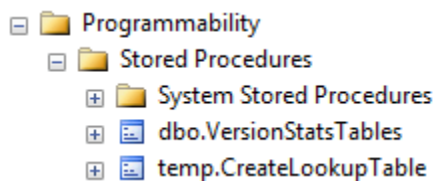
The number of rows should equal the total of all AOAs from the individual tables that were merged.

Step 3: Replace Statistics Data – All AOAs

Skip to Step 4 if updating/adding a partial list of AOA statistics

Move the final tables from StatsQA to the LD_Stage database when all QA checks are done and all data values are as they should be (requires elevated privileges). If adding new YYYY data/statistics, go to #2.

1. Version existing area without roads tables (if necessary):
 - a. In LD_Stage expand Programmability → Stored Procedures:



- b. Right click on dbo.VersionStatsTables → “Script Stored Procedure As” → EXECUTE TO → New Query Window.
 - c. Replace @fromTable with the name of the table to be versioned, in single quotes (example below in red):

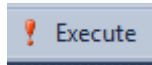
```

DECLARE @RC int
DECLARE @fromTable varchar(60)

-- TODO: Set parameter values here.

EXECUTE @RC = [dbo].[VersionStatsTables]
        'nlcd2011_Forest_pden_grouped_sector_stats_30km'
GO

```



- d. When ready to replace the table, click
 - e. Refresh Tables to see table(s) with date stamp appended.
2. Copy the new statistics table into LD_Stage, repeat as needed for all new tables.
 - a. Right click on table → Script Table As → Select To → New Query Editor Window
 - b. Run as appropriate:

- i. For “stats_freq” table:

```

SELECT **all table fields here**

INTO [StatsQA].[dbo].[NEW TABLE HERE]

FROM [StatsQA].[dbo].[STATS TABLE NAME HERE]

```

- ii. For “clipped” table:

```

SELECT **all table fields here**

INTO [LD_Stage].[dbo].[NEW TABLE HERE]

FROM [StatsQA].[dbo].[STATS TABLE NAME HERE]

```

Name new LD_Stage tables as follows:

[SourceYYYY_Metric_stats_AOA] → [tiger2016_awr_stats_30km]

[SourceYYYY_Metric_stats_AOA] → [tiger2016_awr_stats_freq_30km]

(see existing tables in LD_Stage for additional examples)

- c. Refresh LD_Stage and look for the table. It should be adjacent to the date-stamped table (if any).
3. In LD_Stage, change schema of date-stamped table(s) from dbo to zArchive:

```
ALTER SCHEMA zArchive TRANSFER dbo.[DATE STAMP TABLE NAME HERE] ;
```

- a. Refresh LD_Stage and check all date-stamp tables are moved from dbo to zArchive:

Tables, example, zArchive:

```
+ zArchive.tiger2010_awr_HUC12_freq_stats_2017-04-10
+ zArchive.tiger2010_awr_HUC12_stats_2017-04-10
```

4. Delete the moved tables from StatsQA.

5. Go to Step 5 – Manage Data Views

Step 4: Replace Statistics Data – Select AOAs

Move stats table of interest from LD_Stage to StatsQA and replace data for AOAs that have been updated, or add data for new AOAs to the table.

1. To append updated AOA statistics, or to add new AOA statistics to existing statistics tables:

- a. COPY the table to be updated FROM LD_Stage TO StatsQA:

Right click LD_Stage table → Script Table As → Select To → New Query Window

```
INTO [StatsQA].[dbo].[STATS TABLE NAME_copy]
```

```
FROM [LD_Stage].[dbo].[STATS TABLE NAME]
```

- b. Get initial count of AOAs:

```
SELECT Count(
    [RDD] )
    , [AOA_NAME]
FROM [StatsQA].[dbo].[STATS TABLE NAME_copy]
group by [AOA_NAME]
```

2. Delete from the “_copy” table all AOAs/rows to be updated/replaced

- a. Right click → Edit Top 200 Rows → click white sql button and edit query as needed

- i. Select and delete AOAs/rows that are updated

Edits are immediate and cannot be undone – make sure you are editing the appropriate table.

- b. Or, edit sql statement as needed. Run.

```
DELETE FROM [StatsQA].[dbo].[STATS TABLE NAME_copy]
where AOA_NAME like 'APIS%'
OR AOA_NAME like 'AZRU%'
OR AOA_NAME like 'BIBE%'
```

```

OR AOA_NAME like 'BITH%'
OR AOA_NAME like 'BLCA%'
OR AOA_NAME like 'CARL%'
,...add/edit as needed

```

- i. Deleted rows cannot be undone. Make sure to delete from the appropriate table.

3. Query for new count on edited table:

```

SELECT Count(
    [THRESHOLD_DISTANCE] )
, [AOA_NAME]
FROM [StatsQA].[dbo].[STATS TABLE NAME_copy]
group by [AOA_NAME]

```

4. Insert new/updated statistics from the newly created table into the ‘_copy’ of the table (make sure to match fields based on table being updated; exclude field ‘OBJECTID’):

```

INSERT INTO [StatsQA].[dbo].[STATS TABLE NAME_copy]
    ([FIELD LIST HERE]
SELECT
    FIELD LIST HERE
FROM [StatsQA].[dbo].[NEW STATS TABLE]

```

5. Check Count. The number of rows should have increased by the number of AOAs added in the previous step and should now reflect required total for AOA type.

```

SELECT Count(
    [THRESHOLD_DISTANCE] )
, [AOA_NAME]
FROM [StatsQA].[dbo].[STATS TABLE NAME_copy]
group by [AOA_NAME]

```

6. Visually check “_copy” table for updates.

- a. Right click → “Select Top 1000 rows”

- i. Order by AOA_Name – look for updated AOA data

- ii. Order by OBJECTID
 - iii. Other types of queries
7. **Go to STEP 3 – Replace Statistics Data – All AOAs** and follow steps to replace/update table in LD_Stage.

Step 5: Manage Data Views

If required, go to Inventory and monitoring database documentation: Environmental Setting Protocol SOP (SOP 7.1.1; Kinseth et al. 2018) and check the Landscape Dynamics portion.

Literature Cited

- Kineth, M. and L. Nelson. 2018a. Calculating statistics for national landscape dynamics metrics: Area without roads. Inventory & Monitoring Program Standard Operating Procedure NPS/NRSS/IMD/SOP—3.11.4. National Park Service, Fort Collins, Colorado.
- Kineth, M. and L. Nelson. 2018b. Creating custom areas of analysis for use as a part of the IMD Environmental Settings Protocol. Inventory & Monitoring Program Standard Operating Procedure NPS/NRSS/IMD/SOP—2.11.8. National Park Service, Fort Collins, Colorado.
- Kineth, M. and L. Nelson. 2018c. Creating HUC12 areas of analysis for use with the IMD Environmental Settings Protocol. Inventory & Monitoring Division Standard Operating Procedure NPS/IMD/SOP—2.11.7. National Park Service, Fort Collins, Colorado.
- Kineth, M., L. Nelson, and S. Schupbach. 2018. Inventory and monitoring database documentation: Environmental Setting Protocol. Inventory & Monitoring Division Standard Operating Procedure NPS/NRSS/IMD/SOP—7.1.1. National Park Service, Fort Collins, Colorado.

Appendix 1: Data Availability and Known issues

Data availability

Tiger Roads is a product of the US Census. It is released annually. NHD water data is updated by USGS throughout the year, but is obtained annually (at the same time TIGER road data is updated/obtained) and is used to remove significant water area from patch size calculation.

Additional issues

Area without roads statistics are derived using multiple data sources with varying levels of detail and with limited and/or no topological rules established.

AOAs that extend beyond terrestrial boundaries, or that are entirely contained by water bodies will result in no statistics. The last step of the tool will insert placeholder rows for these AOAs. **CONUS**, **Alaska**, and **American Samoa** all have HUC12 AOAs that don't intersect the Terrestrial Area Boundary and produce no summary statistics. In all cases, placeholder entries, with 0 values reported, are inserted into the statistics table for reporting purposes to account for all HUS12 AOAs in the AOA dataset.

PARK_CODE is valid for AOAs derived specifically from individual parks. Some Custom AOAs are not park-based and therefore will not have a PARK_CODE value.