

Alaska Monitoring & Assessment Program (AKMAP)

2015 Arctic Coastal Plain NPR-A Rivers and Streams

Survey Design

Description of Sample Design

Target population: Wadeable streams and rivers within the NPR-A Arctic Coastal Plain that have flowing water during the study index period excluding portions of tidal rivers up to head of salt.

Sample Frame: The sample frame was derived from the high resolution National Hydrography Dataset (NHD). NHD attributes and additional attributes added to the sampling frame and considered were:

- Omernik and North American ecoregions Levels II and III*
- Strahler stream order (see methodology below)*
- Strahler category, where categories are Rivers (5th order), Large Streams (3rd,4th), and Small Streams (1st, 2nd order)*
- Helicopter base camps and flight distances*

Because the AK NHD contains a larger number of braided stream kilometers, disconnected stream segments and artificial flow paths, we categorized all stream segments using a unique coding system for determining whether a particular segment would be included or excluded from the sample frame. Specifically, all stream segments were visually inspected and classified using the following codes (the coded NHD file is available upon request):

Codes included in the draft design:

- 0 = Stream or River (F-codes: 33400 [connector], 46000 [stream/river], 46003 [stream/river intermittent], 46006 [stream/river perennial]) - Intermittent streams were included because they were only distinguished in one specific area of a single 8 digit HUC.
- 5 = Isolated Unconnected Segment: Stream segments that were not connected to the network, were a significant distance from the rest of the stream, and where no channel was visible on the aerial imagery

Codes excluded from the design:

- 1 = Artificial Path in a Waterbody (F-codes: 55800): split by whether go through waterbody or not; include those that don't go through lentic
- 2 = Canal Ditch (F-code: 33600)
- 3 = Pipeline (F-codes: 42803 and 42813)
- 4 = Side Channel, Cutoff, or Oxbow: identified manually in ArcMap using aerial imagery for each 8 digit HUC
- 6 = Unknown: Stream segments that were likely incorrectly coded in the NHD (e.g., canals that flowed parallel to the surrounding topography); such stream segments were rarely encountered
- 8 = Coastline (F-code: 56600)

Due to the lack of NHD plus for Alaska streams, we derived stream order using a geoprocessing tool. Based on the above classifications, streams with codes 0 and 1 were used to determine stream order using the NVS Vector Stream Tool (http://store.nvisionsolutions.com/index.php?main_page=product_info&products_id=3). The remaining streams were converted to a coverage and the resulting arcs were used as the input into the tool. The output from the tool is polylines with Strahler stream order. QAQC was manually performed on the resulting stream order polylines and errors in stream order were corrected (The majority of streams were assigned the correct stream order by the tool).

Once stream order was computed, we noticed that the resolution of the NHD was not consistent among HUCs or other imposed boundaries. Therefore, we created polygons to identify areas with very high stream density. 1st order streams within these polygons were removed and stream order was recalculated (2nd order streams became 1st order and so on). The resulting representation of the hydrography had similar stream density to streams outside of our identified polygon areas.

Watershed Delineations

Digital Elevation Models (DEMs) were obtained from <http://nationalmap.gov/viewer.html>. DEMs were merged into one continuous DEM and resampled to a 30m resolution. The resulting raster was subset by 8-digit HUCs in order to facilitate delineation. Each of the DEMs at the 8-digit HUC level was used to create the needed Flow Direction and Flow Accumulation rasters for delineation of individual watersheds.

QA – All watersheds and their corresponding segment polygons were checked individually. Sliver polygons were deleted and some segments were manually edited to make sure they represented a buffer around the stream (segment level polygons sometimes get affected by artifacts in the flow accumulation rasters). Areas (sq km) were recalculated for both watersheds and segments.

Survey Design:

Multi-density categories: Within the Artic Coastal Plain unequal probability selection was by SmallStreams (Strahler order 1st, 2nd), LargeStreams (Strahler order 3rd, 4th) and Rivers (5th) and by helicopter basecamps and flight distances (Center, East, and West). NHD polylines with stream order greater than 5th order were excluded because of the focus on wadeable streams. The expected sample sizes was 50, with the number of sites assigned in approximate proportion to the availability of stream length by the three stream order categories within each logistical area, with the exception of sampling a larger number of 5th order streams to obtain adequate sample sizes for this stream order category (minimum of 3 sites per multi-density category combinations [e.g., rivers Strahler stream order category and the center logistics polygon]).

Stratification: N/A

Panels: We did not a priori assign sites to be sampled in year one or year two of the project because of logistical constraints. If one wants to ensure a random sample is obtained in year one alone, we recommend that the first 50% of base sites within each mdcaty category be sampled in year one and the second 50% in year 2. Regardless, of how it is achieved, we should strive for a balance of sites selected from each mdcaty category in each of the two years. Lastly, it should be determined whether all sites falling on non-BLM lands need to be sampled in year one.

Expected sample size: Expected sample size includes 50 GRTS sites.

Over sample: 400% (200 sites) for GRTS sites.

Site Use: When a site cannot be sampled for any reason, sites should be replaced within the respective stream order category and helicopter basecamp category (e.g., a SmallStream in the Center region should be replaced by a Year 1, SmallStream oversample site from the Center polygon [the combinations of the two multi-density categories can be found in the mdcaty column]). The oversample sites should be used in sequential order, and not cherry-picked to select the closest site; however, based on anticipated failure rates we recommend the activation of a certain proportion of oversample sites to be treated as base (e.g., 20% for potential scouting and sampling).

Sample Frame Summary (km)

	Center	East	West	Total
Small Streams	3328	2758	5573	11658
Large Streams	1407	1828	1557	4791
Rivers	596	354	345	1295
Total	5330	4939	7475	17745

Site Selection Summary

Base Number of Sites

	Center	East	West	Total
Small Streams	6	9	10	25
Large Streams	6	2	6	14
Rivers	3	3	5	11
Total	15	14	21	50

Over Sample Number of Sites

	Center	East	West	Total
Small Streams	30	21	36	87
Large Streams	17	22	31	70
Rivers	13	13	17	43
Total	60	56	84	200

Description of Sample Design Output:

The dbf file for the shapefiles for the BLM designs (BLM_AK_NPRA_Arctic_Coastal_plain_2015_Design6) have the following variable definitions:

Variable Name	Description
siteID	Unique identification label for each site in the design
xcoord	x-coordinate of stream/river site (see Albers projection information below)

ycoord	y-coordinate of stream/river site (see Albers projection information below)
mdcaty	Stream order and logistical area category used to assign unequal probability selection of the sample stream/river
streamsize	Strahler category, where categories are RV (5th order), LS (3rd,4th), and SS (1st, 2nd order)
Logistical	Logistical helicopter basecamp used to facilitate easy logistical oversample replacement
wgt	Weight (in m) to be used in the statistical analyses. It is the inverse of the inclusion probability
stratum	Strata used in design
panel	Year1 or Year2 identifies the sites in the base design. OverSamp identifies sites to be used as replacements as necessary
EvalStatus	Used to record site evaluation status of site
EvalReason	Used to record the reason associated with the site evaluation
STR_ORDER	Calculated stream order (see above)
LengthKM	Length of NHD stream segment that the site is on in km
FTYPE	NHD feature type name
FCODE	NHD feature type code
Lok_class	Stream Identification class (see above)
US_L3CODE	Omernik ecoregion Level III code
US_L3NAME	Omernik ecoregion Level III name
Plan_name	BLM planning boundary polygon of the site
NatAllot	Does the site streamline of the site fall in a Native hunting allotment (1=yes)
BLMown	Does the streamline of the site fall on BLM land (1=yes)
Lat	Latitude of the selected site in decimal degrees
Long	Longitude of the selected site in decimal degrees
GNIS_Name	NHD stream name associated with the selected point

Projection and Geographic Information

Projection: USA Contiguous Albers Equal Area Conic USGS version

False Easting: 0.0

False_Northing: 0.0

Central_Meridian: -96.0

Created 3/5/2015

Created by Jennifer Courtwright & Scott Miller

Standard_Parallel_1: 29.5

Standard_Parallel_2: 45.5

Latitude_Of_Origin: 37.5

Linear Unit: Meter (1.0)

Geographic Coordinate System: GCS_North_American_1983

Angular Unit: Degree (0.0174532925199433)

Prime Meridian: Greenwich (0.0)

Datum: D_North_American_1983

Spheroid: GRS_1980 (6378137.0, 298.257222101)

For further information, contact

Amber Bethe
Alaska Department of Environmental Conservation
Alaska Monitoring & Assessment Program
907-269-7955
Amber.Bethe@alaska.gov

Alaska References

Design References

National Aquatic Resource Survey Info - Website: <http://www2.epa.gov/national-aquatic-resource-surveys>