Field Report

Alaska Monitoring and Assessment Program (AKMAP)

2015 Arctic Streams Survey

July 10 – July 28, 2015

Alaska Natural Heritage Program
University of Alaska Anchorage

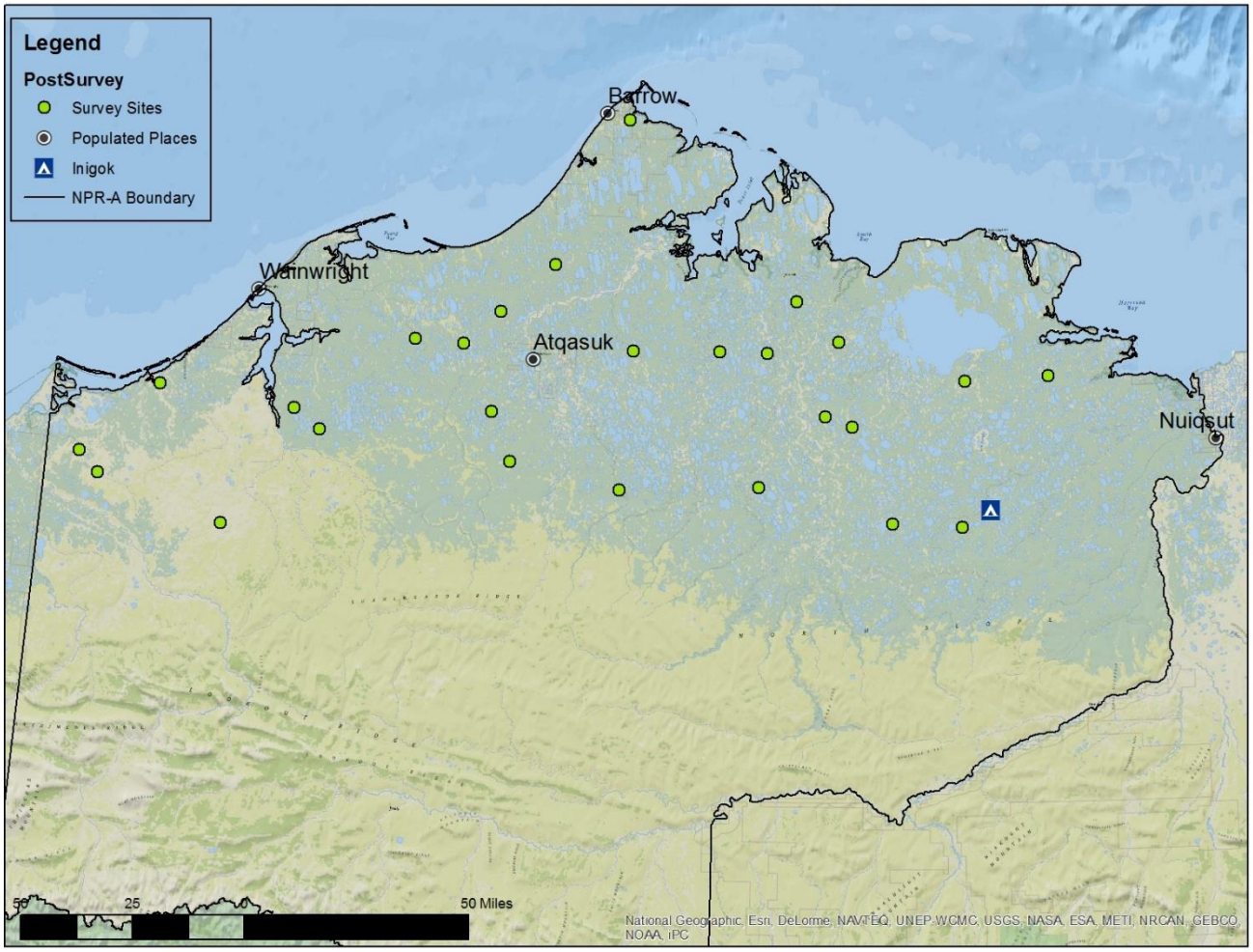

Figure 1 Sites surveyed during the 2015 Arctic Coastal Plain streams survey.

Acknowledgements

This survey was funded in part through Environmental Protection Agency (EPA) Section 106 Clean Water Act grants I-00J85101, I-00J80701 and I-00J63401. Work was completed in cooperation with University of Alaska's Alaska Natural Heritage Program (AKNHP), EPA, Bureau of Land Management (BLM), North Slope Borough, and Ukpeagvik Inupiat Corporation.

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The Alaska Department of Environmental Conservation (DEC) established the Alaska Monitoring and Assessment Program (AKMAP) in 2004. It focuses on conducting applied environmental research that uses a statistical survey design to provide estimates of the spatial extent of water quality based on a variety of indicators. Examples of indicators include chemical contaminants, macroinvertebrate community structure and water chemistry. Environmental managers use this information to support the protection and restoration of freshwater lake environments and mitigate damage to these ecosystems. The purpose of this project was for DEC, EPA, BLM and AKNHP to complete the fifth of a series of six of aquatic resource surveys within the Arctic Coastal Plain of the National Petroleum Reserve – Alaska. This survey assessed freshwater rivers and streams, other surveys that have been completed include wetlands, lakes, estuaries and coastal.

EPA partners with states and tribes to complete the National Rivers and Streams Assessment and other aquatic resource surveys to characterize the state of the nation's aquatic resources. These types of surveys are designed based on a random selection and have been used in a variety of fields (health surveys or election polls, for example) to determine the status of populations or resources using a representative sample of relatively few members or sites. Probability based surveys provide scientifically-defensible assessments of the nation's waters and can be used to track changes in condition over time.

For the purposes of this study, the target population included all 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. Approximately 11,025 stream miles were identified in the study area. The sample frame was derived from the high resolution National Hydrography Dataset (NHD). NHD attributes and additional attributes considered were Omernik and North American ecoregions Levels II and III, Strahler stream order, Strahler category, and helicopter base camps and flight distances. Because the Alaska NHD contains a large number of braided stream kilometers, disconnected stream segments and artificial flow paths, we categorized all stream segments using a coding system to determine whether a particular segment would be included or excluded from the sample frame. Stream segments were visually inspected and classified using the below codes:

Codes included in design:

- 0 = Stream or River
- 5 = Isolated Unconnected Segment

Codes excluded from design:

- 1 = Artificial Path in a Waterbody
- 2 = Canal Ditch
- 3 = Pipeline
- 4 = Side Channel, Cutoff, or Oxbow
- 6 = Unknown: Stream segments that were likely incorrectly coded in the NHD
- 8 = Coastline

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.

Table 1. Summary of sites surveyed during the 2013 Arctic Streams Survey. GPS coordinates were collected using North American Datum of 1983.

Site	Latitude	Longitude	Date Sampled
NRSA15-AK167	71.2686	-156.5699	7/10/2015
NRSA15-AK056	70.0497	-161.5738	7/13/2015
NRSA15-AK222	70.2953	-160.8923	7/13/2015
NRSA15-AK147	70.7822	-157.2348	7/14/2015
NRSA15-AK155	70.6197	-157.7346	7/14/2015
NRSA15-AK210	70.1287	-157.5712	7/15/2015
NRSA15-AK223	70.2898	-157.7710	7/15/2015
NRSA15-AK057	70.5126	-158.5302	7/16/2015
NRSA15-AK059	70.5086	-158.0663	7/17/2015
NRSA15-AK208	70.2578	-159.6135	7/17/2015
NRSA15-AK220	70.1927	-159.3607	7/17/2015
NRSA15-AK001	70.0521	-156.5475	7/18/2015
NRSA15-AK008	70.5086	-156.4553	7/18/2015
NRSA15-AK048	69.8588	-160.2046	7/19/2015
NRSA15-AK238	69.9837	-161.3805	7/19/2015
NRSA15-AK002	70.5129	-155.1909	7/20/2015
NRSA15-AK015	70.5145	-155.6429	7/20/2015
NRSA15-AK175	69.9567	-154.0060	7/22/2015
NRSA15-AK194	70.0731	-155.2492	7/22/2015
NRSA15-AK025	69.9458	-153.3597	7/23/2015
NRSA15-AK186	70.4381	-152.5344	7/23/2015
NRSA15-AK148	70.6844	-154.9189	7/24/2015
NRSA15-AK157	70.5533	-154.5175	7/24/2015
NRSA15-AK024	70.4247	-153.3260	7/25/2015
NRSA15-AK183	70.3087	-154.6343	7/25/2015
NRSA15-AK185	70.2759	-154.3860	7/25/2015

In July 2015 DEC staff with collaborators from AKNHP, sampled 26 randomly selected streams and rivers. The sampling team consisted of two crews of two scientists each. On arrival the stream was verified to having flowing water, be above the head of salt, and be more than 50% wadeable. If the stream or river did not meet these criteria then the site was dropped and we proceeded to an alternate site.

Crew 1 collected environmental DNA by pumping water for 1 hour through a filter which was later frozen. A Hach HQ40d water quality probe was used to collect pH, temperature, conductivity and dissolved oxygen. Water was collected for chlorophyll-a, nutrients, dissolved carbon, and water chemistry analyses.

After collecting water samples, crew 1 sampled fish assemblage using a Smith Root LR-24 electrofisher. Electrofishing was completed as time allowed, and the entire sampling reach was fished if possible. Up to 5 fish per species were collected for mercury and other fish tissue analyses, fish were dispatched via a strike to the head and stored frozen until delivery to the lab.

Crew 2 collected composite samples of benthic macroinvertebrates and periphyton at each of 11 transects within the sampling reach. Benthic macroinvertebrates were collected using a D-frame kick net and by sampling a 1 square foot quadrat for 30 seconds. Periphyton was collected using a 12-cm^2 area delimiter and by scrubbing the surface area with a brush or collecting surface sediment if no coarse sediment was available. Macroinvertebrates and periphyton were preserved using ethanol and Lugol's iodine, respectively.

Crew 2 characterized physical habitat by measuring a thalweg profile throughout the reach (if wadeable), collecting width and depth measurements at each transect, recording sediment types, classifying channel and riparian habitat, measuring bank angle and canopy cover, and measuring discharge. Human influences were recorded if present.

Using the above methods, data and samples were collected for the following:

- Water: temperature, dissolved oxygen, pH, conductivity, chlorophyll-a, dissolved organic carbon, calcium, magnesium, potassium, sodium, chloride, total nitrate/nitrite-N, ammonia-N, total Kjedahl nitrogen, total phosphorus, and total suspended solids
- Sediment: stable isotopes
- Biological: periphyton, macroinvertebrates, and fish assemblage, mercury in fish tissue
- Habitat Characterization: thalweg profile, channel and riparian cross sections, channel constraint, discharge, bank characteristics, canopy cover, riparian vegetation structure, instream fish cover, human influences

Samples are currently being analyzed at various laboratories, complete results are expected in 2016. Preliminary data is available in Table 2, more detailed data is available on request.

The success of this project is attributed to the following outstanding personnel

Scientific Crew
ADEC: Amber Bethe, Brian Stillie
AKNHP: Dan Bogan, Dustin Merrigan
NOAA Fisheries: Erika Ammann
EPA: Lillian Herger

Above: Dustin Merrigan and Dan Bogan collect physical habitat data; below from left to right Dan Bogan, Brian Stillie, Amber Bethe, Josiah Freeman and Dustin Merrigan.

Table 2 – Water Quality Sample Results

Site ID	DO (mg/L)	Temp (°C)	pH	Cond (us/cm)	Calcium (ug/L)	Magnesium (ug/L)	Potassium (ug/L)	Sodium (ug/L)	Chloride (mg/L)	Conductivity (umhos/cm)	Total Nitrate/Nitrite -N (mg/L)	Total Organic Carbon, Dissolved (mg/L)	Total Phosphorus (mg/L)	Total Suspended Solids (mg/L)	Ammonia-N (mg/L)	T Kjedahl Nitrogen (mg/L)
NRSA15-AK001	10.5	13.0	7.93	236.0	30400	7490	539	4870	10.9	235	ND	11.9	ND	ND	ND	ND
NRSA15-AK002	11.7	9.9	7.58	100.5	14900	2660	ND	3090	6.24	113	ND	7.01	ND	ND	ND	ND
NRSA15-AK008	10.9	11.1	7.41	94.6	11100	2300	ND	3980	8.33	97.9	ND	7.38	0.0123	1.20	ND	ND
NRSA15-AK015	11.7	11.0	7.56	813.0	10200	2090	ND	3580	7.56	91.1	ND	6.96	0.0114	ND	ND	ND
NRSA15-AK024	10.6	15.2	8.40	269.4	40900	5790	566	7170	14.3	270	ND	7.37	0.0130	0.963	2.39	ND
NRSA15-AK025	10.8	11.8	7.64	125.0	21100	1910	ND	1840	2.77	129	ND	5.77	0.0127	ND	0.874	ND
NRSA15-AK048	9.9	11.4	7.55	92.7	11800	3780	ND	2740	2.73	95.2	ND	12.0	0.0319	ND	ND	1.18
NRSA15-AK056	10.7	12.9	6.15	216.1	19500	5890	644	14400	29.2	219	0.125	8.56	0.0107	1.79	ND	1.61
NRSA15-AK057	11.0	10.2	7.30	55.3	3910	1590	ND	3790	10.2	56.7	ND	7.40	0.0202	0.870	ND	ND
NRSA15-AK059	11.0	11.0	7.94	58.8	4230	1660	ND	4380	11.6	60.0	ND	6.28	0.0184	ND	ND	ND
NRSA15-AK147	6.8	11.8	6.20	136.2	11900	4340	ND	7810	21.8	141	ND	11.4	0.0131	3.48	ND	ND
NRSA15-AK148	12.2	10.8	8.76	173.3	25200	4510	525	3260	7.10	178	ND	6.58	0.104	0.978	0.116	ND
NRSA15-AK155	9.9	12.6	6.74	159.5	10600	4700	891	10300	34.4	167	ND	11.3	0.0250	2.35	ND	1.47
NRSA15-AK157	11.7	9.6	7.64	240.6	35200	6670	640	4350	8.33	243	ND	7.26	0.0324	0.549	0.124	ND
NRSA15-AK167	11.8	9.3	5.98	588.0	19400	14400	689	69100	146	591	ND	16.4	0.0575	6.00	ND	1.65
NRSA15-AK175	8.4	14.7	7.55	190.8	33300	2610	ND	2190	3.29	191	0.371	4.24	0.0152	2.00	0.303	ND
NRSA15-AK183	11.1	9.2	7.55	170.8	27200	3510	ND	4090	7.05	174	ND	6.17	0.0114	1.15	0.121	ND
NRSA15-AK185	11.6	10.5	8.01	134.2	21000	2660	ND	3320	5.78	138	ND	5.74	0.0183	ND	0.476	ND
NRSA15-AK186	12.5	6.7	7.99	155.3	20200	3080	610	7790	16.4	161	ND	5.29	0.0225	1.41	0.270	ND
NRSA15-AK194	10.7	11.6	7.39	65.7	9100	1430	ND	2390	4.14	68.2	ND	5.19	0.0137	ND	0.120	ND
NRSA15-AK208	*	*	*	*	6380	2160	ND	2350	5.05	60.0	ND	13.4	0.0360	4.00	ND	1.01
NRSA15-AK210	10.1	11.1	6.88	131.8	16400	4570	ND	3240	14.0	138	ND	14.6	0.0239	1.77	ND	ND

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NRSA15-AK220	*	11.5	7.21	62.4	6130	2190	ND	2820	6.90	64.0	ND	13.8	0.0168	6.25	ND	1.26
NRSA15-AK222	11.4	10.1	6.09	246.0	7430	4970	798	18400	34.7	177	ND	9.12	0.0153	1.25	ND	ND
NRSA15-AK223	10.8	11.8	6.43	93.5	9390	3350	ND	4000	12.4	98.0	ND	10.4	0.0193	1.22	ND	ND
NRSA15-AK238	10.0	10.7	7.51	104.0	13200	4030	678	3400	6.23	107	ND	16.2	0.0352	4.55	ND	ND

*No sample collected