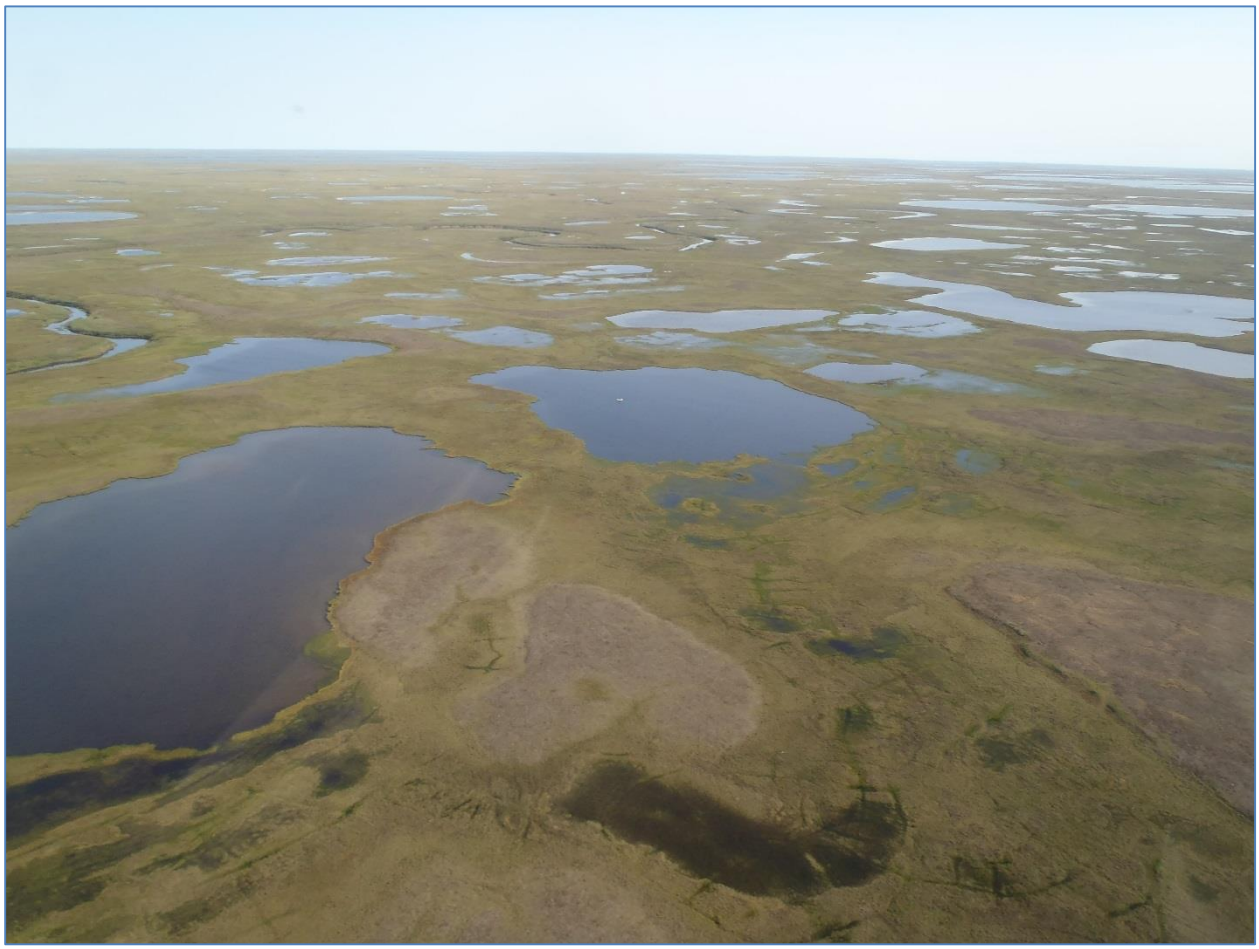
Field Report

Alaska Monitoring and Assessment Program (AKMAP)

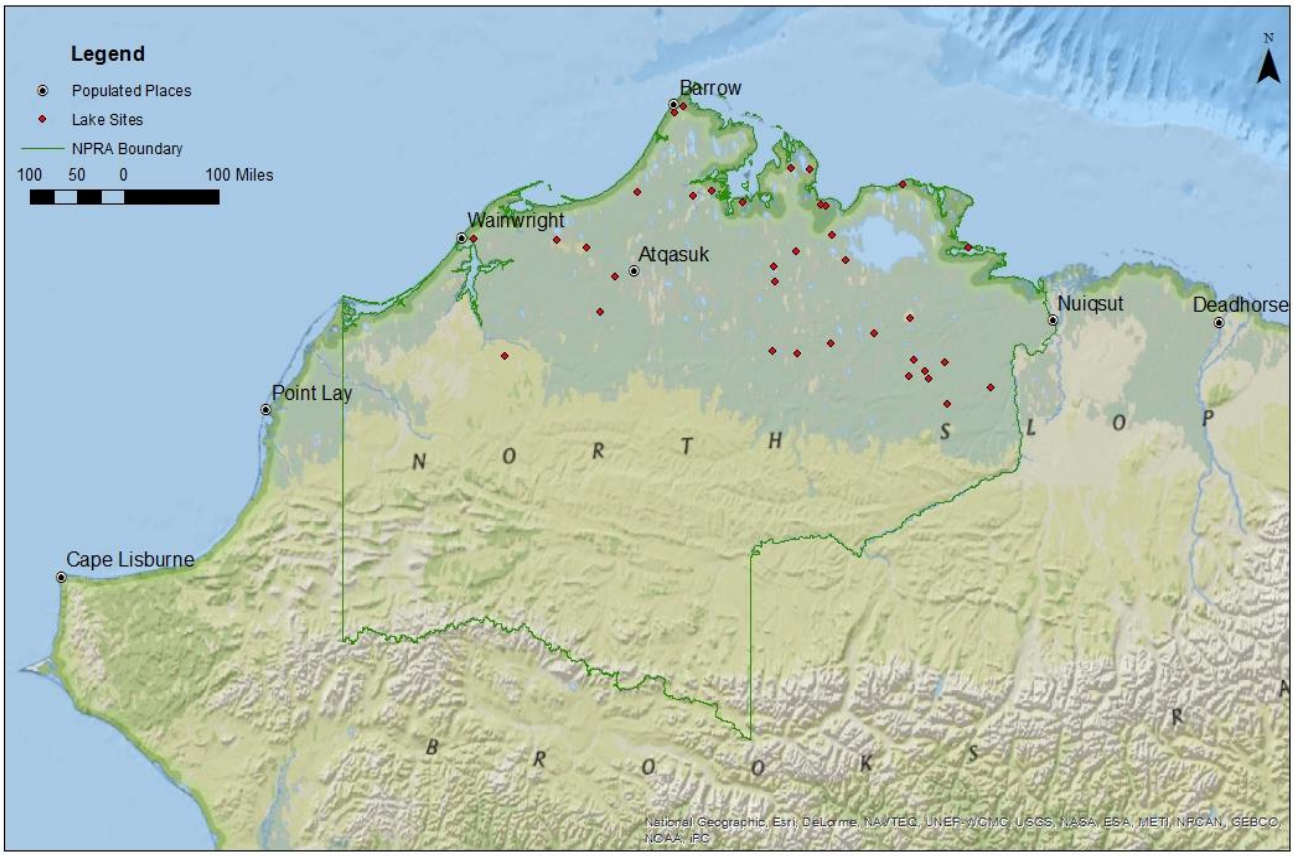
2013 Arctic Lakes Survey

July 17 – August 10, 2013



Alaska Natural Heritage Program
University of Alaska Anchorage

Alaska Monitoring and Assessment Program
2013 Arctic Lakes Survey Sites



Acknowledgements

This survey was funded in part through Environmental Protection Agency (EPA) Section 106 Clean Water Act grant I-00J63201 and I-00J63401. Work was completed in cooperation with University of Alaska's Alaska Natural Heritage Program (AKNHP), EPA, North Slope Borough, Bureau of Land Management, Wilderness Society, Ukpeagvik Inupiat Corporation, Olgoonik Corporation and the Barrow Arctic Science Consortium.

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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, the Environmental Protection Agency (EPA), and the University of Alaska Natural Heritage Program to complete the second of a five year series of aquatic resource surveys within the Arctic Coastal Plain of the National Petroleum Reserve – Alaska. This survey assessed freshwater lakes, other surveys that will be or have been completed include wetlands, rivers/streams and coastal.

EPA partners with states and tribes to complete the National Lakes 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 sample population included freshwater lakes and ponds greater than one hectare in surface area and with a minimum depth of at least one meter. Approximately 35,000 lakes with a total surface area of 744,361 hectares (ha) were identified in the study area as potential candidates. To relieve concerns from local communities regarding helicopter interference with subsistence hunting, we created a buffer around high subsistence use areas and excluded sites within the buffer.

Coordinates produced for the 2011 Arctic Wetlands Survey using a Generalized Random Tessellation Stratified survey design were used to locate a subset of 30 random lakes to represent the sample population. Survey lakes were visually evaluated using imagery from the Statewide Digital Mapping Initiative's 2010 SPOT satellite orthophotos. Waterbodies that appeared to be directly connected to oceans or estuaries were excluded and replaced with the next closest candidate within the same hydrologic unit code. An additional 11 target lakes were selected for survey based on their proximity to target wetlands sampled during the 2011 Arctic Wetland Survey. Target wetlands were those with known or potential impacts, target lakes sites are assumed to have the similar impacts. A summary of lake sites surveyed is shown in Table 1.

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

Site ID	Stratum	Land owner	Date	Latitude	Longitude	Index Site Depth (m)	Area (ha)
NLA13-AK0001	Random	BLM	07/18/13	69.99849	-152.62914	1.6	40
NLA13-AK0002	Random	BLM	08/07/13	70.03165	-159.38530	2.9	15
NLA13-AK0003	Random	BLM	08/07/13	70.43883	-157.69014	1.1	2
NLA13-AK0004	Random	BLM	07/28/13	70.48553	-155.25554	4.4	60
NLA13-AK0005	Random	BLM	07/18/13	69.87219	-151.92065	1.2	10
NLA13-AK0006	Random	BLM	07/19/13	69.91393	-152.88249	2.8	62
NLA13-AK0007	Random	BLM	07/26/13	70.52222	-154.14491	2.2	38
NLA13-AK0008	Random	BLM	07/21/13	70.09750	-154.36850	2.0	24
NLA13-AK0010	Random	BLM	07/26/13	70.98017	-154.99397	1.0	12
NLA13-AK0014	Random	BLM	08/01/13	70.83981	-156.47990	3.8	15
NLA13-AK0016	Random	BLM	08/04/13	70.61922	-158.58478	1.1	23
NLA13-AK0019	Random	BLM	08/04/13	70.58076	-158.12752	1.1	5
NLA13-AK0020	Random	BLM	08/01/13	70.80839	-155.73602	0.9	20
NLA13-AK0021	Random	BLM	08/02/13	70.86228	-157.33638	1.1	2
NLA13-AK0027	Random	BLM	08/01/13	70.86295	-156.19334	2.1	7
NLA13-AK0028	Random	BLM	07/25/13	70.64337	-154.35774	2.5	4
NLA13-AK0030	Random	BLM	07/23/13	69.92488	-153.17307	3.8	44
NLA13-AK0032	Random	BLM	07/21/13	70.04831	-154.88457	1.5	7
NLA13-AK0033	Random	BLM	08/07/13	70.26069	-157.91049	1.4	10
NLA13-AK0034	Random	BLM	07/28/13	70.41310	-155.23990	2.2	11
NLA13-AK0035	Random	BLM	07/23/13	70.14790	-153.71086	2.8	4
NLA13-AK0036	Random	BLM	07/21/13	70.05882	-155.26863	2.4	114
NLA13-AK0037	Random	BLM	07/28/13	70.56502	-154.90329	1.5	4
NLA13-AK0038	Random	BLM	07/19/13	69.78346	-152.59473	1.8	4
NLA13-AK0041	Targeted	BLM	07/20/13	70.58317	-152.26645	1.1	65
NLA13-AK0044	Targeted	BLM	07/26/13	70.97063	-154.69830	0.5	292
NLA13-AK0045	Targeted	BLM	07/22/13	70.89959	-153.27155	0.8	4
NLA13-AK0047	Targeted	Ukpeagvik Inupiat Corp.	07/16/13	71.27882	-156.63235	1.6	9
NLA13-AK0048	Targeted	BLM	07/22/13	70.01026	-153.09512	1.9	304
NLA13-AK0050	Targeted	Olgoonik Corp.	08/07/13	70.62464	-159.85165	*	65
NLA13-AK0051	Targeted	BLM	07/23/13	69.95624	-152.93895	1.1	418
NLA13-AK0052	Targeted	BLM	07/27/13	70.79057	-154.45638	2.8	69
NLA13-AK0053	Targeted	BLM	07/27/13	70.79496	-154.52078	3.1	11
NLA13-AK0054	Targeted	Ukpeagvik Inupiat Corp.	07/16/13	71.25051	-156.77246	2.0	161
NLA13-AK0059	Targeted	BLM	07/20/13	70.22748	-153.15688	8.9	362

* Depth not measured due to adverse weather conditions.

In July and August 2013 DEC staff with collaborators from AKNHP, sampled 35 random and targeted lakes. The sampling team consisted of two crews of two scientists each. On arrival the lake was verified to be larger than one hectare and at least one meter deep. If the lake did not meet these criteria then the site was dropped and we proceeded to the nearest alternate site.

Crew 1 deployed a small raft to the index site, located at the deepest part of the lake. Because bathymetric data was not available, the index site was estimated using a hand held sonar device from the raft. A depth profile was completed, measuring Secchi depth, and using a YSI 556 multi-probe system to measure temperature, pH, conductivity and dissolved oxygen. An integrated water sampler was used to collect water for chlorophyll-a, phytoplankton, nutrients, dissolved carbon, stable isotope and water chemistry analyses.

Crew 1 collected zooplankton using 50 and 150 micron Wisconsin plankton nets and a cumulative vertical tow length of 5 meters. Samples were narcotized with carbon dioxide and preserved in 95% ethanol. A sediment core was collected using a gravity corer, 2 cm slices were collected from the top and bottom of the core for diatom identification, mercury and sediment dating analyses.

Crew 2 accessed shoreline sites either on foot or using a pack raft, and characterized physical habitat from 10 evenly spaced plots around the perimeter of the lake. Each plot was 15 meters wide and 25 meters deep to include riparian and littoral zones. Information and samples collected at these sites included physical habitat, human influence and benthic macroinvertebrates. At the last plot littoral water samples were collected for chlorophyll-a analysis and phytoplankton identification.

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

- Water: temperature, dissolved oxygen, pH, conductivity, Secchi depth, 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: mercury, dating, stable isotopes, and diatoms
- Biological: physical habitat characterization, phytoplankton, zooplankton, and macroinvertebrate identification

Samples are currently being analyzed at various laboratories, complete results are expected in 2014. 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:

<u>Scientific Crew</u>
Terri Lomax, DEC
Amber Bethe, DEC
Brian Stillie, DEC
Doug Kolwaite, DEC
Dan Bogan, AKNHP
Dustin Merrigan, AKNHP
Rebecca Schaftel, AKNHP
Lillian Herger, EPA
Jason Leppi, The Wilderness Society

Above: Dustin Merrigan and Rebecca Schaftel prepare to collect physical habitat data; below from left to right Dustin Merrigan, Terri Lomax, Doug Kolwaite and Dan Bogan

Table 2 – Water Quality Sample Results

Site ID	Temp (°C)	Conductivity (umhos/cm)	Total Suspended Solids (mg/L)	Dissolved Organic Carbon (mg/L)	Calcium (ug/L)	Magnesium (ug/L)	Potassium (ug/L)	Sodium (ug/L)	Chloride (mg/L)	Total Phosphorus (mg/L)	Total Nitrate/ Nitrite -N (mg/L)	Ammonia-N (mg/L)	T Kjedahl Nitrogen (mg/L)
NLA13-AK0001	17.1	159	ND	4	1800	3060	ND	6170	12	ND	ND	ND	ND
NLA13-AK0002	11.6	89	2.0	9	10400	3110	ND	2550	6	ND	ND	ND	ND
NLA13-AK0003	10.8	57	4.8	15	2580	1450	ND	5750	14	0.0160	ND	ND	ND
NLA13-AK0004	12.1	149	0.7	5	15900	3580	837	6700	13	0.0280	ND	ND	ND
NLA13-AK0005	16.7	50	1.1	*	5560	1310	ND	2250	4	0.0103	ND	ND	ND
NLA13-AK0006	15.7	95	0.8	5	14500	1700	ND	1870	2	0.0165	ND	ND	ND
NLA13-AK0007	10.3	148	1.3	5	15500	3040	731	7820	15	0.0271	ND	ND	ND
NLA13-AK0008	17.3	113	0.8	4	16000	2040	ND	2660	4	0.0103	ND	ND	ND
NLA13-AK0010	12.6	226	11.3	13	4270	5020	1350	27800	60	0.0558	ND	ND	ND
NLA13-AK0014	12.1	109	0.8	4	5820	3260	767	8740	19	0.0125	ND	ND	ND
NLA13-AK0016	11.7	78	5.5	42	5830	1980	ND	5400	14	0.0231	ND	ND	ND
NLA13-AK0019	12.3	54	3.0	12	3510	1340	ND	4310	11	0.0205	ND	ND	ND
NLA13-AK0020	11.9	110	4.0	12	4790	2870	809	11600	19	0.0349	ND	ND	ND
NLA13-AK0021	13.3	104	3.8	17	3300	2750	522	10500	26	0.0179	ND	0.218	1.05
NLA13-AK0027	11.9	193	0.7	5	9030	6720	736	14800	33	0.0230	ND	ND	ND
NLA13-AK0028	9.9	230	1.4	9	24800	6030	957	7200	16	0.0241	ND	ND	ND
NLA13-AK0030	15.7	100	0.5	5	14700	1540	ND	1970	3	ND	ND	ND	ND
NLA13-AK0032	18.5	48	0.5	6	5050	1160	ND	2130	3	0.0180	ND	ND	ND
NLA13-AK0033	10.7	62	2.1	10	5930	1660	ND	2970	9	ND	ND	ND	3.01
NLA13-AK0034	12.7	79	1.1	330	8190	2040	609	3640	7	0.0199	ND	ND	ND
NLA13-AK0035	16.1	96	1.3	10	11800	2090	ND	3550	6	ND	ND	ND	ND
NLA13-AK0036	17.1	44	1.1	4	4390	860	ND	1910	3	0.0101	ND	ND	ND

Site ID	Temp (°C)	Conductivity (umhos/cm)	Total Suspended Solids (mg/L)	Dissolved Organic Carbon (mg/L)	Calcium (ug/L)	Magnesium (ug/L)	Potassium (ug/L)	Sodium (ug/L)	Chloride (mg/L)	Total Phosphorus (mg/L)	Total Nitrate/ Nitrite -N (mg/L)	Ammonia-N (mg/L)	T Kjedahl Nitrogen (mg/L)
NLA13-AK0037	12.9	292	0.8	9	25600	14500	1150	8460	17	0.0113	ND	ND	ND
NLA13-AK0038	16.6	55	2.4	10	6940	1550	ND	1740	2	0.0217	0.779	ND	ND
NLA13-AK0041	13.7	855	9.7	7	47300	18000	3000	91800	218	0.0292	ND	ND	ND
NLA13-AK0044	8.9	316	390.0**	12	18600	12100	4440	30900	54	0.798	ND	ND	2.63
NLA13-AK0045	14.8	514	1.6	27	16900	15000	3610	60800	112	0.0233	ND	ND	1.75
NLA13-AK0047	10.6	134	4.3	11	4350	3530	878	15700	30	0.0443	ND	ND	ND
NLA13-AK0048	16.2	129	0.8	4	19000	1870	996	3550	5	ND	ND	ND	ND
NLA13-AK0051	14.5	162	3.4	3	22600	2120	ND	2440	4	ND	ND	ND	ND
NLA13-AK0052	10.9	1480	2.5	4	37400	26000	7490	223000	392	0.0316	ND	ND	ND
NLA13-AK0053	10.3	4170	0.8	7	75600	71900	14500	739000	1360	0.0195	ND	ND	ND
NLA13-AK0054	11.8	79	6.5	4	3800	2020	ND	7510	18	0.0340	ND	ND	1.15
NLA13-AK0059	16.0	195	0.5	9	24500	2940	594	7770	16	ND	ND	ND	ND

*No sample collected

**Suspect measurement