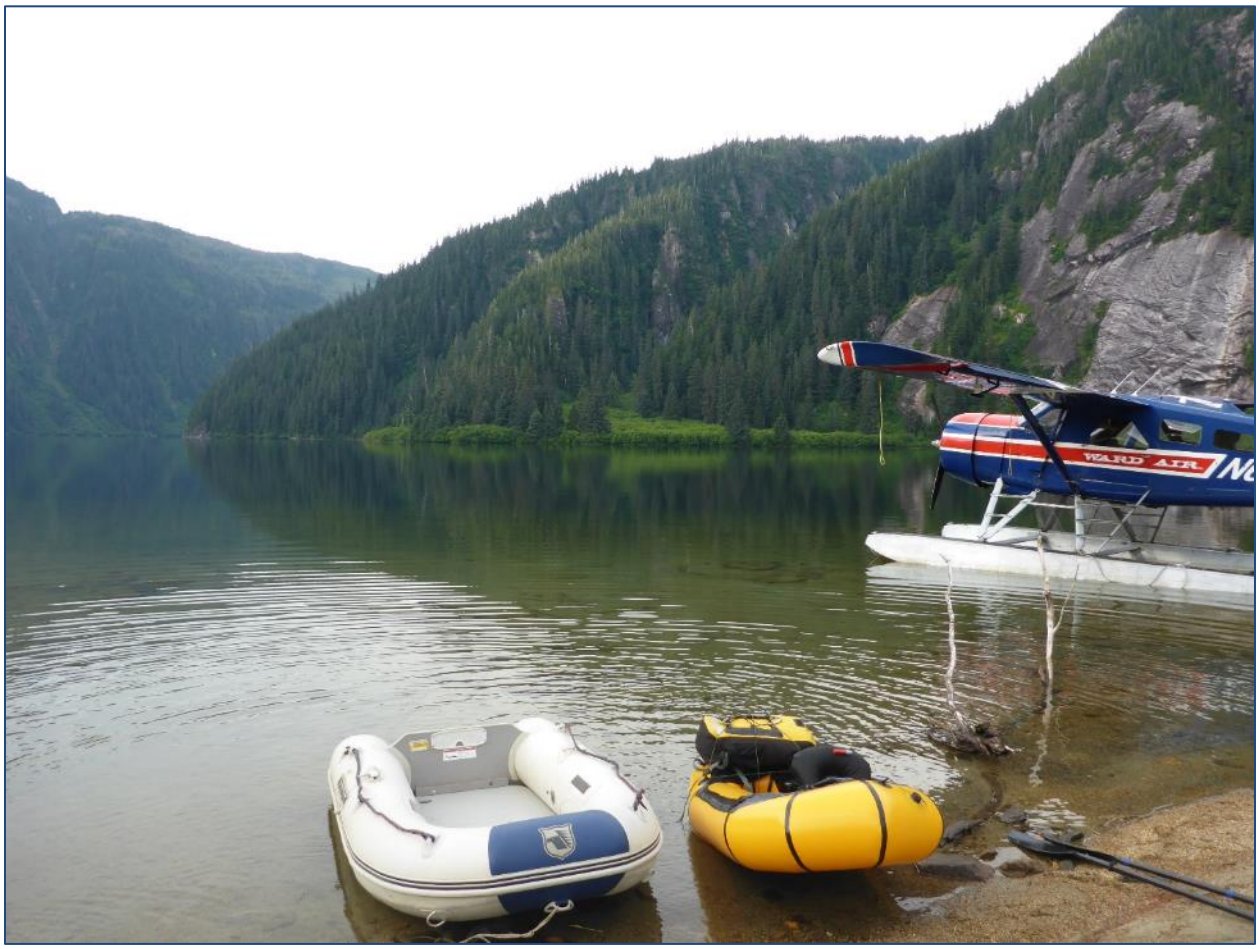
Field Report

Alaska Monitoring and Assessment Program (AKMAP)

2017 Southeast Lakes Survey

July 17 – August 14, 2017



Alaska Center for Conservation Science
University of Alaska Anchorage

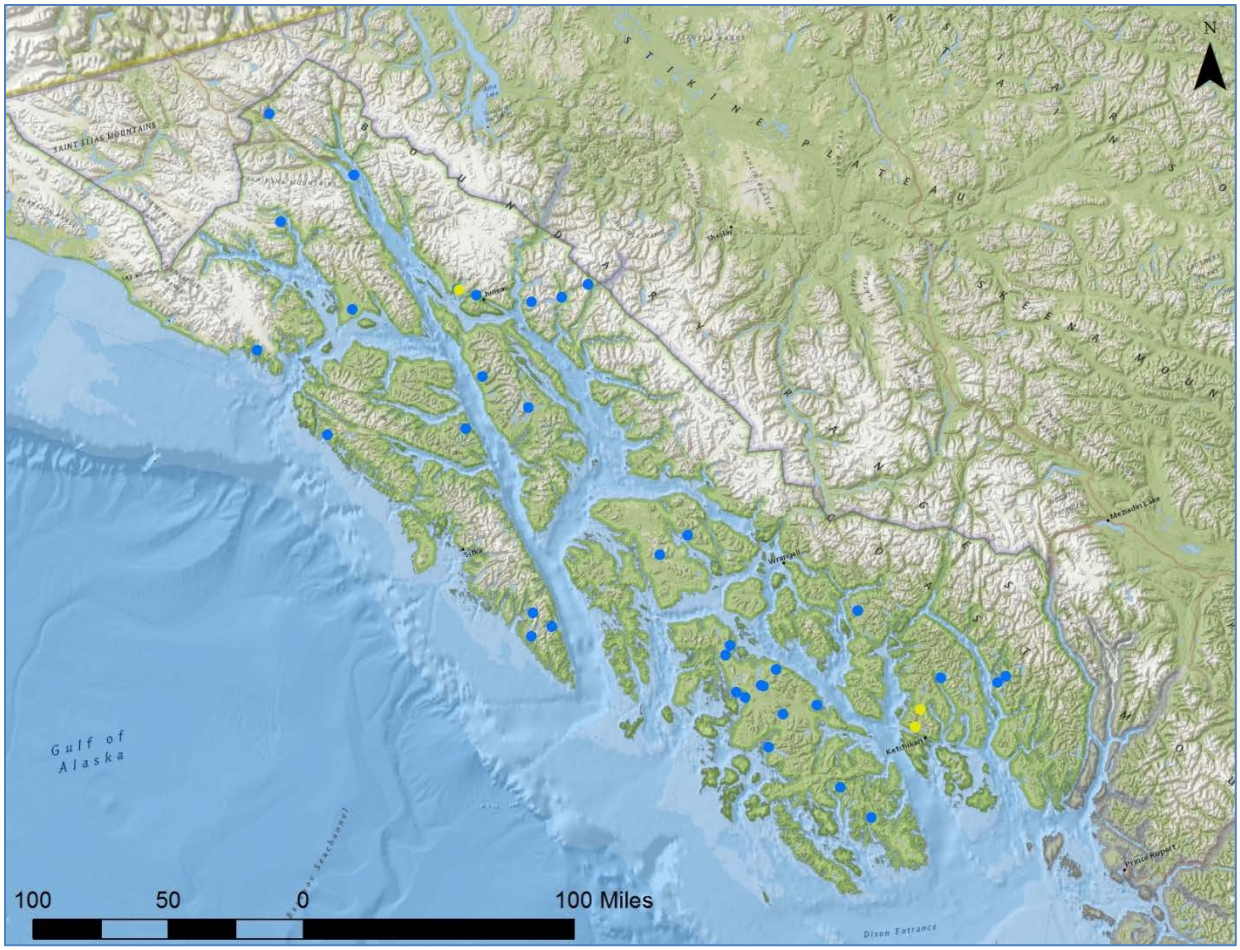


Figure 1 Sites surveyed during the 2017 Southeast Lakes survey, random sites are shown in blue and non-random sites in red.

Acknowledgements

This survey was funded in part through Environmental Protection Agency (EPA) Section 106 Clean Water Act grant I-0J03901-2. Work was completed in cooperation with University of Alaska's Alaska Center for Conservation Science (ACCS), DEC Environmental Health Lab, DEC Fish Tissue Monitoring Program, Alaska Department of Fish and Game, EPA, U.S. Forest Service (USFS), National Park Service, Ketchikan Indian Community, Organized Village of Kake, Klawock Cooperative Association, City of Thorne Bay, and the City and Borough of Haines.

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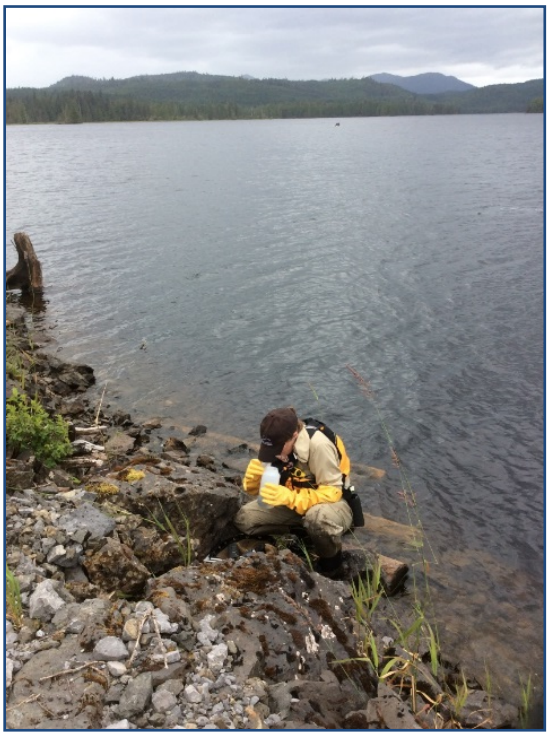
The Alaska Department of Environmental Conservation (DEC) established the Alaska Monitoring and Assessment Program (AKMAP) in 2004. It focuses on conducting applied environmental research that uses a statistical survey design to provide estimates of the spatial extent of water quality based on a variety 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, USFS and ACCS to complete the first of a series of 4 aquatic resource surveys in Southeast Alaska. This survey assessed lakes, future surveys will assess rivers, streams, and coastal areas.

EPA partners with states and Tribes to complete National Aquatic Resource Surveys to characterize the state of the nation's aquatic resources. These types of surveys are designed based on random selection and are 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. Random 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 lakes in Southeast Alaska that were greater than one hectare in surface area and with a minimum depth of at least one meter, and were accessible to the public. Accessible to the public, in general terms, meant that the lake could be easily accessed by ground transportation or by float plane.

Lakes were selected randomly using a Generalized Random Tessellation Stratified (GRTS) survey design for points with reverse hierarchical ordering. For random site selection, lakes were split into two stratum, small lakes with an area of 1 to 20 hectares and large lakes with an area greater than 20 hectares. One-thousand sixty lakes were selected randomly from the National Hydrography Dataset. Of these, 919 were reviewed using aerial imagery for target status as accessible to the public and of sufficient size. Many lakes were dropped during this review process because they were not easily accessible.



Alaska's limited infrastructure, small population base, and the remote nature of most of the state drives selection of sites in random surveys, typically only selecting sites in reference or near reference condition. In prior DEC surveys this proved to be problematic as a range of disturbance is needed to understand condition and develop metrics based on stress. To help ensure a range of disturbance in surveyed lakes, we added 3 targeted sites to our survey. These targeted sites were known or potentially impacted lakes within the sample area.

In July and August 2017 DEC and ACCS staff along with collaborators from the U.S. Forest Service, Alaska Department of Fish and Game, Ketchikan Indian Community, Klawock Cooperative Association, Organized Village of Kake, the City and Borough of Haines, and the City of Thorne Bay, sampled 35 of 40 randomly selected lakes for a sampling efficiency of 87.5%. Table 1 provides locations for each of the lakes surveyed.

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. Some sites were dropped because of weather, or as they became inaccessible when the crew moved from one region of Southeast Alaska to the next. For example, poor weather during the last two days scheduled in Ketchikan prevented the crew from reaching three sites.

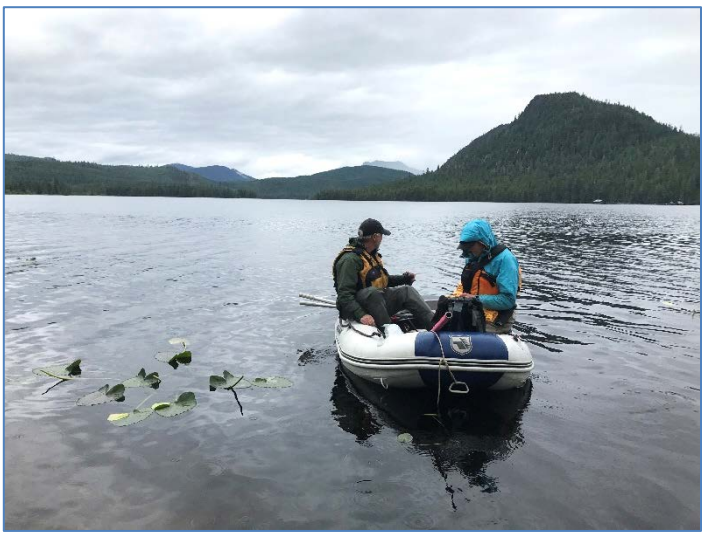
Crew one deployed a small raft to the index site, located at the deepest part of the lake or at a maximum depth of 40-50 meters depth. Because bathymetric data was not available, the index site was estimated using a hand held sonar device from the raft. Secchi depth was measured, and a multi-probe system was used 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 one 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, a 5 cm slice was collected from each of two cores, and samples collected for diatom identification, and metals and total organic carbon analysis.

Crew two accessed shoreline sites either on foot or using a pack raft, and characterized physical habitat from ten 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.

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

- Water: temperature, pH, conductivity, Secchi depth, chlorophyll-a, dissolved organic carbon, calcium, magnesium, potassium, sodium, chloride, metals, mycrocystins, atrazine pesticide screen, nutrients
- Sediment: metals, stable isotopes and grain size
- Biological: zooplankton, diatoms, and macroinvertebrate identification
- Habitat: shoreline flooding, drawdown, fish habitat, riparian vegetation type and percent cover, aquatic macrophytes, and assessment of human influences if present



Samples are currently being analyzed at various laboratories, complete results are expected in 2018. Preliminary data is available in Table 2, more detailed data is available on request.

Table 1 - Lakes sampled during the 2017 Southeast Lakes Survey.

Monitoring Location ID	Monitoring Location Name	Date	Latitude	Longitude	Panel
NLA17-AK-10010	Ward Lake	07/26/2017	55.41281	-131.70004	Non-Random
NLA17-AK-10011	Auke Lake	08/11/2017	58.38557	-134.63133	Non-Random
NLA17-AK-10023		07/17/2017	55.87993	-132.94086	Random
NLA17-AK-10083		07/23/2017	55.50259	-130.73529	Random
NLA17-AK-10086		08/14/2017	59.56898	-136.01312	Random
NLA17-AK-10125		08/06/2017	58.44415	-135.73164	Random
NLA17-AK-10184		07/22/2017	55.55879	-133.07137	Random
NLA17-AK-10245		08/01/2017	56.72029	-133.49811	Random
NLA17-AK-10281		07/31/2017	56.77432	-133.17970	Random
NLA17-AK-10327		07/17/2017	55.88697	-132.95654	Random
NLA17-AK-10329		08/07/2017	58.33244	-134.47591	Random
NLA17-AK-10334	Rustabach Lake	08/13/2017	59.13110	-135.33904	Random
NLA17-AK-10383		07/20/2017	56.14211	-133.11578	Random
NLA17-AK-10391	Water Lake	07/19/2017	55.69212	-132.51247	Random
NLA17-AK-10395		07/20/2017	55.85264	-133.13200	Random
NLA17-AK-10422	Neck Lake	07/21/2017	56.10002	-133.18591	Random
NLA17-AK-10427	South Deception Lake	08/08/2017	58.37022	-136.78372	Random
NLA17-AK-10431	Lake Kathleen	08/02/2017	57.90805	-134.65862	Random
NLA17-AK-10432	Kook Lake	08/06/2017	57.66441	-134.96254	Random
NLA17-AK-10433	Boulder Lake	07/25/2017	56.10271	-131.85262	Random
NLA17-AK-10435	Crescent Lake	08/05/2017	58.20808	-133.35942	Random
NLA17-AK-10440	Deer Lake	08/03/2017	56.52417	-134.70871	Random
NLA17-AK-10446	Swan Lake	07/28/2017	55.61268	-131.31827	Random
NLA17-AK-10449	Luck Lake	07/18/2017	55.94348	-132.77057	Random
NLA17-AK-10453	Klakas Lake	07/24/2017	55.03099	-132.36569	Random
NLA17-AK-10455		08/08/2017	58.99820	-136.20628	Random
NLA17-AK-10456		08/04/2017	56.50189	-134.92288	Random
NLA17-AK-10462	Upper Checats Lake	07/27/2017	55.48745	-130.82486	Random
NLA17-AK-10464	McKinney Lake	08/02/2017	57.67763	-134.30115	Random
NLA17-AK-10465		07/19/2017	55.70520	-132.84164	Random
NLA17-AK-10472		08/04/2017	56.61921	-134.84222	Random
NLA17-AK-10473	Summit Lake	07/24/2017	55.23716	-132.54379	Random
NLA17-AK-10479	Lake Dorothy	08/10/2017	58.21307	-133.95949	Random
NLA17-AK-10495	Indian Lake	08/07/2017	58.18807	-133.65068	Random
NLA17-AK-10496	Lake Elfendahl	08/09/2017	57.83634	-136.31236	Random
NLA17-AK-10514	Harriet Hunt Lake	07/26/2017	55.48879	-131.59700	Non-Random
NLA17-AK-11111	Lily Lake	08/12/2017	58.39322	-134.64114	Random
NLA17-AK-11206		07/22/2017	55.89463	-133.20157	Random

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

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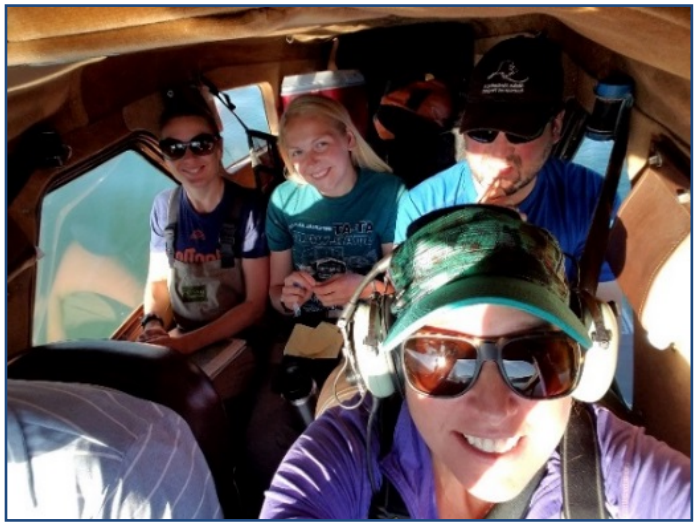

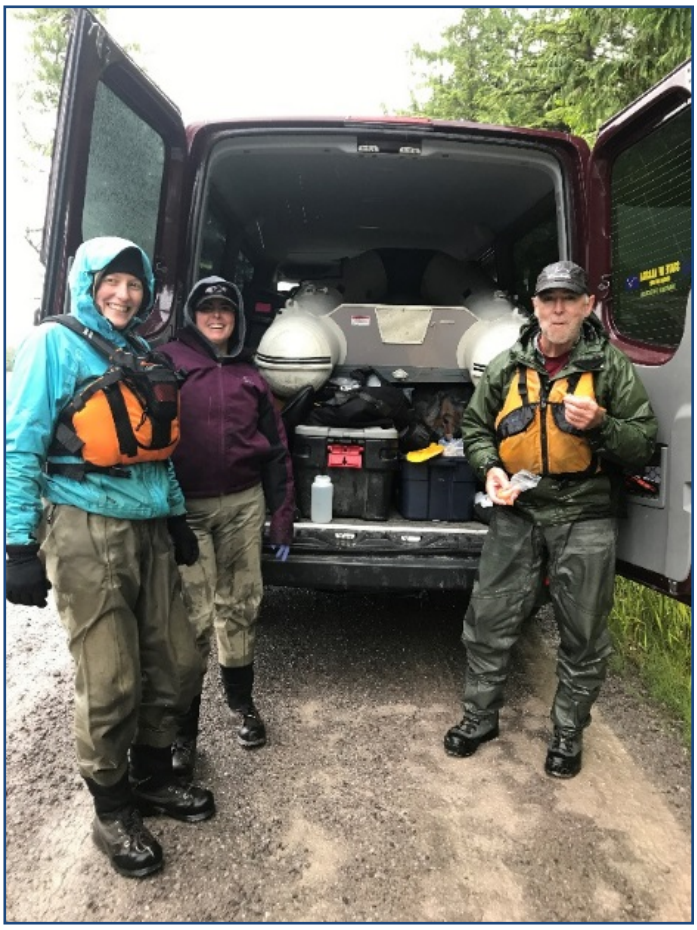

Table 2 – Preliminary Water Quality Sample Results

Monitoring Location ID	Chloride (mg/L)	Sulfate (mg/L)	Ammonia (mg/L)	Nitrate-Nitrite as N (mg/L)	Phosphorus (mg/L)	pH	Dissolved Organic Carbon (mg/L)	Total Nitrogen (mg/L)	Chlorophyll -a
NLA17-AK-10010	1.23	1.74	ND	0.0650	0.0265	6.6	4.50	ND	1.1
NLA17-AK-10011	1.8	1.8	0.24	ND	ND	6.9	7.3	0.2	0.25
NLA17-AK-10023	1.53	0.467	ND	ND	0.0288	6.4	10.6	ND	0.8
NLA17-AK-10083	0.303	ND	ND	0.0650	0.00830	5.7	3.99	ND	1.8
NLA17-AK-10086	ND	2.1	0.21	ND	ND	6.5	1.4	ND	0
NLA17-AK-10125	1.8	2.1	0.13	ND	ND	7.8	3.3	0.96	1.6
NLA17-AK-10184	2.40	0.755	ND	ND	0.0184	5.9	10.3	ND	1.5
NLA17-AK-10245	1.1	0.64	0.11	ND	ND	6.3	11	ND	0.85
NLA17-AK-10281	0.84	1.5	0.1	ND	ND	5.9	10	0.24	2.6
NLA17-AK-10327	1.30		ND	ND	0.00990	5.2	20.7	ND	0.2
NLA17-AK-10329	800	110	0.12	ND	ND	9.4	3.9	0.21	2.1
NLA17-AK-10334	3.6	4.7	0.26	ND	ND	7.7	4.8	0.28	1
NLA17-AK-10383	2.31	0.699	ND	0.0330	0.00710	7.8	6.74	ND	1
NLA17-AK-10391	2.52	0.372	ND	ND	0.00690	6.6	12.7	ND	0.75
NLA17-AK-10395	1.93	0.335	ND	ND	0.00760	7.2	12.1	ND	1.1
NLA17-AK-10422	2.00	1.16	ND	0.0420	0.0136	7.8	4.97	ND	0.53
NLA17-AK-10427	1.9	1.2	0.14	0.097	ND	7	1.8	0.67	0.6
NLA17-AK-10431	0.96	11	0.31	0.069	ND	7.7	1.7	0.49	1.3
NLA17-AK-10432	1.6	2.6	0.13	0.16	ND	7.3	3	0.16	0.34
NLA17-AK-10433	0.440	ND	ND	0.0772	ND	6.1	5.02	ND	0.61
NLA17-AK-10435	0.63	2.1	0.18	ND	ND	6.9	0.98	ND	0.8
NLA17-AK-10440	1.9	1.5	0.17	0.066	ND	6.7	1.6	0.26	0.34
NLA17-AK-10446	0.503	1.78	ND	0.0640	ND	7.1	1.98	ND	0.64

Monitoring Location ID	Chloride (mg/L)	Sulfate (mg/L)	Ammonia (mg/L)	Nitrate-Nitrite as N (mg/L)	Phosphorus (mg/L)	pH	Dissolved Organic Carbon (mg/L)	Total Nitrogen (mg/L)	Chlorophyll -a
NLA17-AK-10449	1.19	1.85	ND	0.104	0.00790	7.5	5.30	0.104	1.9
NLA17-AK-10453	1.86	0.603	ND	0.0694	ND	7.0	3.86	ND	0.4
NLA17-AK-10455	0.89	8.5	0.14	ND	ND	7.6	1	0.18	0.34
NLA17-AK-10456	2.2	1.6	0.16	0.09	ND	6.4	2.1	0.41	0.11
NLA17-AK-10462	0.580	0.756	ND	0.0864	0.0127	6.7	2.62	ND	0.79
NLA17-AK-10464	1	2.6	0.14	0.08	ND	6.9	4.6	0.55	0.68
NLA17-AK-10465	1.30	1.32	ND	0.085	0.00760	7.1	9.59	ND	0.75
NLA17-AK-10472	1.6	1.4	0.11	1.5	ND	7.3	1.8	2.1	0.1
NLA17-AK-10473	1.43	1.23	ND	0.075	0.04560	7.5	1.59	ND	0.43
NLA17-AK-10479	0.16	1.4	0.23	ND	ND	6.9	1	ND	0.11
NLA17-AK-10495	0.79	2.4	0.28	0.077	ND	6.2	1.4	ND	0.8
NLA17-AK-10496	2.7	1.1	0.14	ND	ND	4.3	1.9	0.82	0.1
NLA17-AK-10514	1.01	0.529	ND	0.0658	0.0311	6.5	4.10	ND	1
NLA17-AK-11111	2.9	15	0.23	ND	ND	7.4	6.8	0.21	6
NLA17-AK-11206	3.08	6.67	ND	ND	0.0110	8.0	6.32	ND	0.8

ND= Not Detected or below minimum detection limit