FALL 2014 SUBSISTENCE FISHERY MONITORING ON THE COLVILLE RIVER

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Cover: ABR biologist John Rose (front) helps Nuiqsut residents pull fish during a net harvest.

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FINAL REPORT

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We depend every year on the outstanding and welcoming support of the residents of Nuiqsut. They made our eighth year working out of the village a memorable one! We thank members of the *Qaaktaq* Panel who continue to provide valuable support to our sampling crew throughout the year. Thanks also to the Kuukpik Subsistence Oversight Panel, Inc. (KSOPI). We thank the Kuukpik Hotel staff for the comfortable accommodations and good food and the Nanuq Corporation and its employees for entertainment and insights as they prepared for the ice road season. We also are indebted to all the fishers who graciously offered their harvest data, advice and insights during the 2014 fall fishery.

INTRODUCTION

In 2014, ABR worked with key fishery stakeholders in Nuiqsut, Alaska, to continue long-term monitoring of the Colville River subsistence fishery, which is conducted each fall after freeze-up in the Niġliq Channel of the Colville River. The 2014 subsistence fishery monitoring program is a continuation of long-term studies that have taken place annually since 1985 (no data were collected in 1999). Monitoring has been conducted by several contractors over that time period (MJM Research [1985–2005], LGL Alaska Research Associates [2006]), and ABR [2007–2014]) on behalf of ConocoPhillips Alaska, Inc., (CPAI) and its predecessors (see Daigneault and Reiser 2007 and Moulton et al. 2006). The monitoring program has focused primarily on the fall harvest of Arctic Cisco (*Coregonus autumnalis*; *Qaaktaq*, in Iñupiaq), which are a staple in the diet of Nuiqsut residents and traded widely with other northern Alaska communities. The program also attempts to quantify harvest of other subsistence species captured in the *Qaaktaq* fishery. The primary impetus for the monitoring program is concern that oil and gas exploration and development in the nearshore marine environment and, more recently, on the Colville River delta (henceforth the Colville delta) could adversely affect these anadromous or amphidromous fish. Furthermore, in recent years this monitoring program has continued as mandated under stipulations defined by the CD-4 development permit issued by the North Slope Borough (NSB04-117, 2004). The main goal of the monitoring program has been to obtain estimates of the total fishing effort and catch.

ABR continues to implement the Arctic Cisco fall fishery monitoring program as conceived during a series of community meetings with fishery stakeholders in 2007 (Seigle et al. 2008). The result of those stakeholder meetings was that 1) ABR worked with the community of Nuiqsut to formulate a plan for continuing long-term fishery monitoring each fall, and 2) ABR made a commitment to continue working with the community via interactions with a *Qaaktaq Panel* of expert fishers to ensure that community concerns are continually incorporated into the monitoring plan. This process has been successful to date, and subsequently the monitoring program has been working closely with fishers and other stakeholders to keep all parties abreast of developments in the fishery. As an integral part of the monitoring program, ABR has conducted numerous meetings with community members and the *Qaaktaq* Panel (composed of expert participants in the fishery) before, during, and after the fishing season as dictated by the schedules of participants. ABR has also taken part in local community science fairs (including in November 2014) to present information on the fishery to children and adults alike. Furthermore, ABR has offered physical assistance to fishers with their harvests whenever seeking interviews. The objectives of the monitoring program in 2014 were to:

- Continue working with key stakeholders as per agreements made in 2007 (Appendix A),
- Monitor the harvest of Arctic Cisco throughout the fishing effort, using interviews of fishery participants,
- Record the number of nets fishing at any given time and net dimensions and locations during the season,
- Document the subsistence fishery harvest,
- Collect age, length, and weight information for a subsample of Arctic Cisco harvested,
- Measure water salinity and water and sediment quality (i.e., testing for metals and petroleum-based organic compounds) in primary fishing areas,
- Compare the 2014 results with those of previous years for this program and other historical data,
- Continue to raise awareness for, and maintain a high level of participation in, the *Qaaktaq* Panel meetings.

BACKGROUND

Very little was known of the basic life history of Arctic Cisco until fish monitoring studies were initiated by the oil industry in the nearshore environments of the Prudhoe Bay region in the

early 1980s (Gallaway et al. 1983). Those studies discovered that all Arctic Cisco in Alaska originate in the Mackenzie River system in Canada (Figure 1). Young-of-the-year drift down river into the Beaufort Sea in early summer, and prevailing easterly winds and ocean currents transport these young fish passively along the Beaufort Sea coast to the west. The number of young-of-the-year Arctic Cisco (i.e., recruitment strength) in Alaska and the Colville River region is correlated with the consistency and strength of easterly winds in the Beaufort Sea region during summer (Fechhelm and Fissell 1988). This wind- and ocean current-driven recruitment process largely determines the age structure of Arctic Cisco in Alaska (Gallaway and Fechhelm 2000), and the number of young-of-the-year Arctic Cisco at Prudhoe Bay (the site with the longest records on abundance of young-of-the-year Arctic Cisco) is highly correlated with harvest rates for the Colville fishery 5–7 years later (ABR et al. 2007). It was predicted that above-average harvest of Arctic Cisco would begin in 2011 and continue for the foreseeable future (Larry Moulton, 2008, personal communication). Indeed, catch per unit of effort in the Colville River during 2011 and 2012 were among the highest ever recorded (Seigle et al. 2011, Seigle and Gottschalk 2012).

Young Arctic Cisco in Alaskan Beaufort Sea waters spend their summers feeding in deltas and nearshore brackish waters before returning to deep pools of the Colville River for over-wintering (Craig 1984, Moulton et al. 1986). After achieving maturity (females at age 7–8, males at age 6–7), Arctic Cisco migrate during summer to their source rivers within the Mackenzie River system for fall spawning. These adult fish do not return to rearing streams in Alaska but rather stay in the Mackenzie system where they continue to spawn well into their teen-aged years (Craig and Halderson 1981, Gallaway et al. 1983, Bond and Erickson 1985, Bickham et al. 1989, Moulton 1989, Bond and Erickson 1997).

The subsistence fishery is conducted almost exclusively on the Niġliq Channel of the Colville River (Figure 1). A commercial Arctic Cisco fishery also was operated by the Helmericks family on the Main Channel of the Colville River for ~50 years starting in the early 1950s. In 1993, the year with the highest combined harvest from these 2 fisheries, ~78,254 fish (31,340 kg) were taken on the Colville delta (Moulton and Seavey 2004, Moulton et al. 2010). In contrast, only 5,859 fish (2,799 kg) were harvested in 2001, which was the lowest harvest on record. In 2003, the Minerals Management Service (MMS) convened a workshop in Nuiqsut to review the issue of variability in annual harvest of Arctic Cisco, from perspectives of both the subsistence community and scientists researching this species (MBC Applied Environmental Sciences 2004). Following the workshop, MMS commissioned a study to review and synthesize all available information from scientific studies and from subsistence users to assess the status of the Arctic Cisco population in Alaska and to evaluate the effects of anthropogenic disturbances on the fish (ABR et al. 2007). That study relied heavily on data collected since 1985 on the subsistence fishery in Nuiqsut (i.e., this long-term monitoring program).

METHODS

FISHERY EFFORT AND HARVEST

Four traditional fishing areas hosted the majority of concentrated fishing in the Colville delta in 2014 (Figure 2). Three traditionally used areas occur in the Niġliq Channel (in order of upstream to downstream) the Upper Niġliq area (adjacent to the town of Nuiqsut), the Nanuk area, and the Niġliq Delta area (includes nets between the Nanuk and Niġliq Delta areas). A fourth traditionally used area in the Kupigruak Channel on the eastern Colville delta (henceforth, the Main Channel fishing area) also was fished in 2014 (Figure 2).

The fishery monitoring team always included 2−3 scientists from ABR. The remaining team members were Nuiqsut residents Richard Tukle and Isaiah Nukapigak, with occasional assistance from former monitoring team member, Jerry Pausanna. ABR fishery monitors traveled each day by snow machine to the more intensively fished areas of the Colville River to conduct interviews for harvest assessment. When a member of the monitoring team observed a fisher on their way to or from a harvest, permission was asked to either assist in the harvest or to conduct an interview and to assess the recently completed harvest event. A harvest event occurs anytime a fisher checks his or

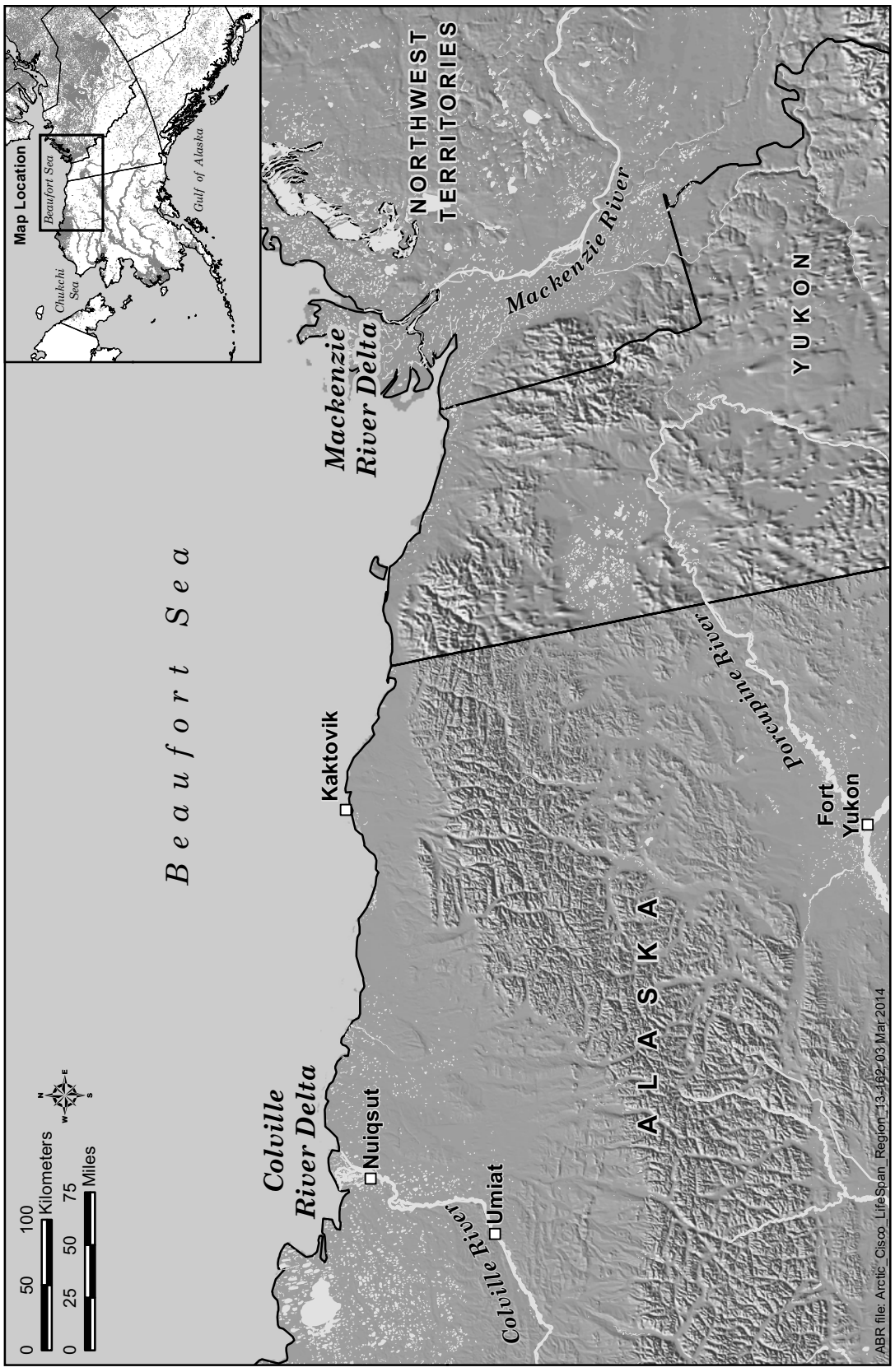

Figure 1. Waters important to the life history of Arctic Cisco in Canada (Mackenzie River drainages) and Alaska (Colville River delta) and the nearshore Beaufort Sea.

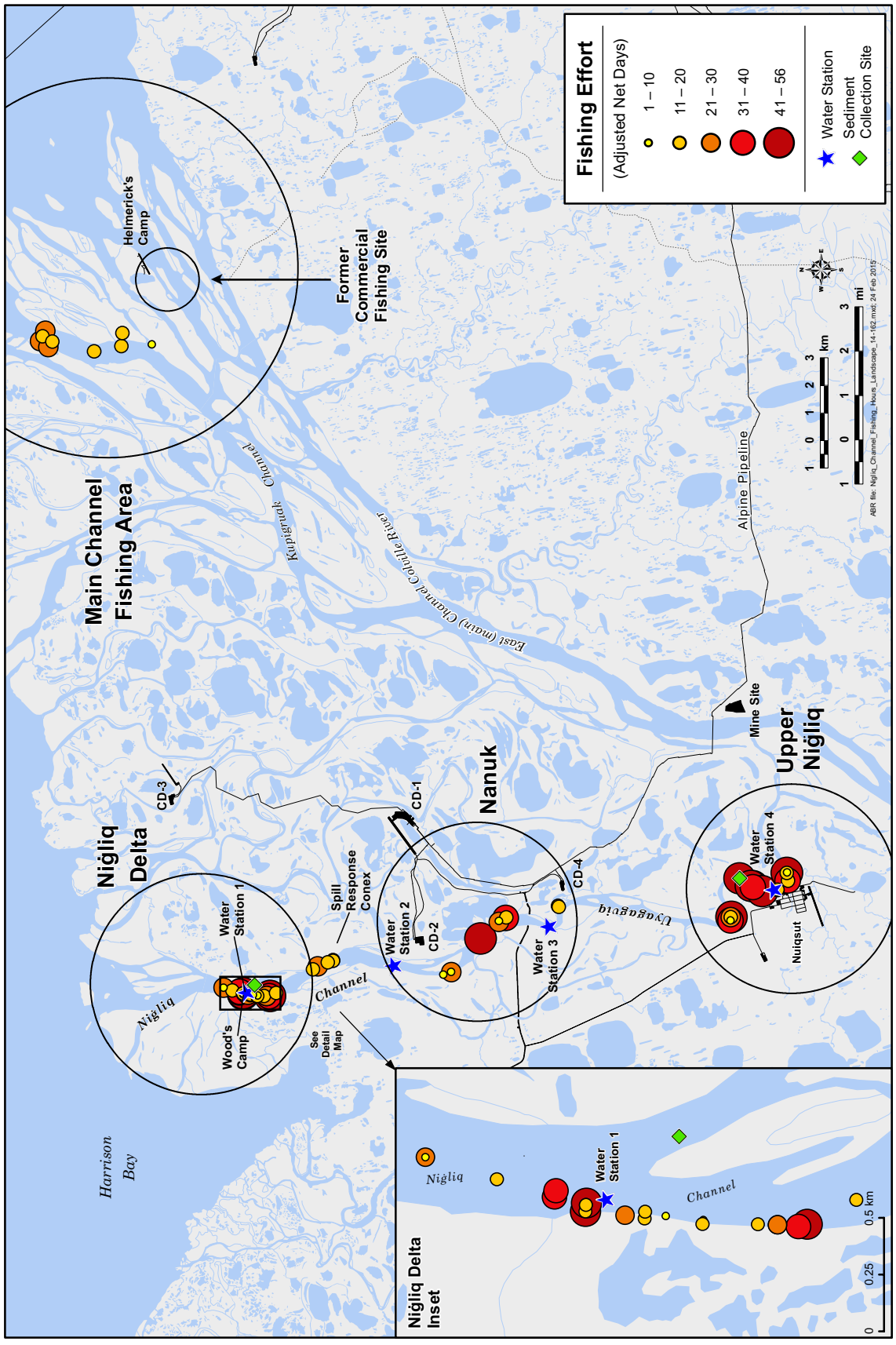

Figure 2. Water sampling stations and net sites in each of the 3 main subsistence fishing areas in the Niğliq Channel of the Colville River, Alaska, 2014. The amount of effort for each net set (adjusted net-days) is depicted by both color and the size of the net symbol.

her net, but it may be recorded by harvest monitors on location at the time of harvest or after the fact in Nuiqsut or at a later date via email or telephone. During interviews, we recorded net length, net mesh size, and start and end times for that particular harvest event. If a fisher expressed desire to work alone or to not participate in an interview the monitoring team respected those wishes and moved on to another net.

Fishers use a variety of net lengths and mesh sizes depending on individual preferences. For this reason, in calculating fishing effort (i.e., net-days), the net length and effort were adjusted to a standardized net length of 18 m (60 ft) and full-day (24-hour) set duration. For example, if an 80 ft net was used during a 24-hour period, fishing effort was calculated as 80 ft/60 ft × 1 day = 1.3 days of adjusted effort. Catch per unit effort (CPUE), expressed as catch per net-day, was calculated using these adjusted estimates of effort (Appendix B). Because nets of different mesh sizes capture different sizes of fish at different rates, we specify when data presentations are broken down by mesh size, when they include all mesh sizes, or when they are limited to the most frequently used mesh of 7.6 cm (3 inches). CPUE was calculated for all mesh sizes but is most commonly reported for nets with 7.6-cm mesh as this has historically been the most fished mesh size in the Arctic Cisco fall fishery.

In the event that the fishery monitoring team did not actually witness a harvest, interviews with fishers were conducted the next time the team crossed their path (usually within 24–48 hours). Variations of the following questions were asked:

- How many nets are you fishing?
- How long have your nets been actively fishing (helps define total season effort)?
- What are your net dimensions?
- How many *Qaaktaq* did you harvest in each net?
- How many fish of other species did you harvest?
- How often are you checking your nets (helps monitors determine when to meet fishers)?
- Do other people check your nets (helps monitors recognize when friends or relatives are assisting the net owner)?
- Where is your net and has it been moved recently (helps monitors determine location and end times for calculating effort in specific river sections)?

Catch data from these post-harvest interviews were included in the overall "observed" harvest assessment even if it was unclear which nets fish had been captured in (i.e., the fisher knew how many fish he/she caught in a day but could not say how many fish were caught in individual nets of varying mesh sizes and net lengths). Reported harvest numbers from these interviews were used in CPUE analysis only if the fisher also knew the number of days each net fished and the number of fish caught in nets of each mesh size. In 2014, as in previous years, ABR distributed a "North Slope Fisheries Logbook" to interested fishers (see Appendix B *in* Seigle et al. 2014). These books were distributed to fishers to assist them in tracking their personal harvests year-round. In 2014, one individual chose to share his daily harvest information (as recorded in his logbook) throughout the fall fishing season.

LENGTH, WEIGHT, AND AGE OF CATCH

After fish were removed from nets a total count was made for each net and a sub-sample was measured for fork length (to the nearest mm). The standard routine for sub-sampling from each net's catch was to lay out all fish of each species side-by-side on the ice in no particular order. Depending on the number of fish in the harvest and the amount of time available for the interview, monitors measured every fish or every second, third, or fourth fish from each net. The monitoring team endeavored to obtain a total count for each fish species captured. However, Arctic Cisco were measured first and other species, including Least Cisco (*Coregonus sardinella*), as time permitted, mainly because Arctic Cisco are the target species of fall fishing and monitoring efforts.

The total number of fish measured on a given day varied depending on several factors including a fisher's availability, the total number of fish caught in the net, and the number of fishers in the area. When several fishers were harvesting

simultaneously in the same area, monitors attempted to obtain a sub-sample of measurements from every fisher. When possible, ABR paid a participation honorarium to fishers who were willing to donate a sub-sample of fish from their harvest for age and length weight analysis (~10/day at $10/fish) or who otherwise provided detailed information about their fishing efforts and harvests outside of normal daily encounters with the monitoring team. Most samples were donated from 7.6-cm mesh nets as this is the predominate net used in the fishery, although fish from other known mesh sizes were accepted. The fish were kept frozen and transported to Anchorage where they were measured for fork length (mm) and weight (g) using a top-loading electronic scale.

Otoliths (sagittae) were extracted for ageing at a later date. Otoliths were cleaned with tap water and stored in 96-well pipette trays. The break-and-burn technique was used to prepare 1 otolith from each fish for ageing (Chilton and Beamish 1982). Otoliths were broken in half along the transverse axis using a sharp scalpel or by pressing the otolith between a fingernail and forefinger. The broken edge of one half of the otolith was held over an open flame for several seconds until it acquired an amber color. The otolith half was then placed broken edge up in putty and the surface was brushed with mineral oil to emphasize the growth rings under magnification. The otolith preparations were examined under a dissecting microscope at 25× magnification using reflected light. Alternating bands of dark and light on the otolith correspond to winter and summer growth, respectively, and together represent one year's growth. Following methodologies used in previous years, the central core region of the otolith, composed of a dark and light region, was recognized as the first summer and winter growth of an age 0 fish. All annuli outside this region were then counted to determine the age of the fish. Each fish was aged by 2 individuals and each otolith was read at least 3 times with additional readings as necessary to arrive at an agreement on the age of each fish.

WATER QUALITY

Water salinity was measured every other day between 24 October–17 November at 4 traditional water sampling stations that correspond to areas of intense fishing (Figure 2). Warm weather delayed ice formation on the Niġliq Channel during the first week of fishing, 16–23 October. At these stations, surface ice was removed and the sampling probe connected to a YSI Professional Plus meter was lowered into the water. Salinity was measured in parts per thousand (ppt) and was recorded at the surface and at 0.5-m increments of depth until the probe reached the river bottom. The monitoring team also measured ambient water chemistry at 3 m depth, including temperature (°C), pH, dissolved oxygen (% and mg/L), specific conductance (µS/cm), and conductivity (µS/cm) (Appendix C). At the end of each sampling event, a small piece of insulation was used to cover the hole in the ice. In this way, the sampling hole was only partially frozen upon return 48 hours later.

On 2 dates, 3 November and 18 November, ABR collected water samples for detailed chemical analyses by Test America America Laboratories, Inc. (Test America) of Portland, Oregon, Alaska. Water chemistry samples were collected at 3 sites in the Niġliq Channel: in the Niġliq Delta fishing area near Woods' Camp (downstream), near the Nanuk fishing area in a section of the channel known as Uyagagvik (mid-channel), and in the Upper Niġliq fishing area closest to Nuiqsut (upstream; Figure 2, Appendices D-1, D-2, and E). Water samples were collected at a depth of 3 m using a van Dorn 4.2 liter, Beta acrylic horizontal water column sampler. Water samples were poured directly from the sampler into glass and polypropylene bottles prepared and shipped to ABR by Arctic Fox Environmental, Inc., (Arctic Fox) in Prudhoe Bay. Samples were kept cool until shipment to Arctic Fox in Prudhoe Bay, where preservatives were added by Arctic Fox staff (if required) and shipped to Test America. Analyses included total metals (arsenic, barium, cadmium, chromium, lead, selenium, and silver (Method 6020), mercury (Method 7470A), total nitrogen (NO_3 + NO_2) (Method 353.2), and diesel-range and residual-range organics (Method AK102 & 103). The results of sample tests were compared to the United States Evironmental Protection Agency (USEPA) (2012) and Alaska Department of Environmental Conservation (ADEC) water quality standards. ADEC standards are the same as USEPA standards for most analytes tested.

However, ADEC water quality standards change for cadmium, lead, and silver depending on total water hardness for each sample tested. For these analytes, the water quality standards were based on calculations of sample-specific water hardness provided by ADEC (see Appendix D-2).

A severe weather event occurred in Nuiqsut on 18 November just as water chemistry samples were being collected. After collection, the water samples were placed on board a flight headed for Prudhoe Bay, Alaska, but due to the weather, the airplane was diverted to Barrow, Alaska. The samples remained in Barrow for several days before being delivered to Arctic Fox in Prudhoe Bay. The samples arrived at Arctic Fox beyond standard hold times for diesel-range organic and residual-range organics testing, but the results are nevertheless included in this report.

SEDIMENT ANALYSIS

On 18 November, benthic sediment samples were collected at downstream (Niġliq Delta) and upstream (Upper Niġliq near Nuiqsut) locations (Figure 2) for laboratory analysis of metals by ICPMS (Method SW6020A), polynuclear aromatic hydrocarbons hydrocarbons (8270 D SIMS PAH), and diesel-range and residual-range organics (Method AK102 & 103) (Appendices F and G). Sediment samples were collected with an Ekmann dredge from the river bed, immediately transferred to non-reactive plastic bottles, and kept cool until shipping. Samples were transferred to coolers and hand-delivered by ABR to SGS Laboratories Inc., in Anchorage, Alaska, for analysis.The results of sample tests were compared to ADEC's Alaska soil quality standards (Arctic Zone Direct Contact).

QAAKTAQ PANEL MEETING

A panel meeting was held on 27 May 2015 in Nuiqsut to discuss the 2014 fishery. The panel is composed of 9 local experts who meet with ABR scientists 1–2 times per year to talk about various issues related to the fishery. A summary of the 2015 meeting is found in Appendix H.

RESULTS

FISHERY EFFORT AND HARVEST

The ABR monitoring team arrived in Nuiqsut on 12 October 2014, prior to the onset of the Arctic Cisco fishery. Due to warm weather in early October, ice formation was slow to occur and nets were not deployed by Nuiqsut fishers until 16 October (Table 1). The average start date for the fishery over 29 years of harvest monitoring is 8 October. ABR fishery monitors observed 384 harvest events in 2014 (Table 2), up slightly from 376 in 2013 and well above the 262 observations in 2012. A total of 27 households (hereafter referred to as fishers and identified by Fisher Codes) deployed 58 nets (67 sets) during the fall fishery in 2014, down from 66 nets in 2013 (Table 2, Figure 3, Appendix C). The number of nets was slightly higher than the average (56) and median (55.5) numbers of nets deployed from 1985 to 2013. Of 67 total sets, 56 sets of 49 nets occurred in the Niġliq Channel in 2014 (Table 2). The remaining 11 sets of 11 different nets (Fisher 74 set 2 nets in the Niġliq Channel before moving those nets to the Main Channel) occurred in the Main Channel fishing area and were set by 6 families.

A total of 4 nets were deployed by 2 fishers in the Niġliq Channel on 16 October. The number of nets deployed rose steadily thereafter and the number of active nets peaked at 44 on 5 November (Niġliq Channel and Main Channel areas combined) (Figure 4). Of the 27 fishers, 7 pulled at least 1 net and redeployed it to another location at some point during the fishing season. Thirty or more nets were active in all parts of the river from 26 October through 18 November. Harvest activities in the Niġliq Channel began on 16 October and ended on 6 December. Harvest activities in the Main Channel area began on 1 November and ended on 22 November. After standardizing for net length, 1,499.8 adjusted net-days of fishing effort were calculated for the 2014 fall fishery (Table 2, Appendix B). This represents a 5% increase in total effort from the 2013 fishery (1,429 adjusted net-days). A total of 1,308 adjusted net-days of effort were calculated in the Niġliq Channel (versus 1,311 in 2013) and 192 adjusted net-days for the Main Channel area (versus 118 in 2013) (Table 2). In the Niġliq Channel, fishing effort was highest in the Niġliq Delta area at 47% of the total, followed by the Upper Niġliq area at 36%, and the Nanuk area at 17% (Figure 5). Fishing effort in the Upper Niġliq area (471 adjusted net-days) was more than twice that in 2013 (202 adjusted net-days) and was

Table 1. Estimated onset of the fall subsistence fishery for Arctic Cisco in the Niġliq Channel of the Colville River, Alaska, 1985–2014.

Year	Start Date
1985	2 October
1986	3 October
1987	8 October
1988	14 October
1989	22 October
1990	6 October
1991	12 October
1992	26 September
1993	3 October
1994	3 October
1995	16 October
1996	28 September
1997	13 October
1998	28 September
1999	--
2000	3 October
2001	6 October
2002	14 October
2003	16 October
2004	9 October
2005	7 October
2006	14 October
2007	4 October
2008	4 October
2009	6 October
2010	5 October
2011	13 October
2012	21 October
2013	9 October
2014	16-October
Average	8 October

greater there than at the Nanuk area for the first time since 2006 and for only the second time in the last 12 years.

Gill nets of 5 different mesh sizes were used in the fall fishery in 2014: 5 cm, 6.4 cm, 7.6 cm, 8.3 cm, 8.9 cm. Of these, 7.6-cm mesh nets made up 45 of the 58 total nets (78%) used in the fishery in 2014 (Table 2). In the Niġliq Channel, a total of 13,992 Arctic Cisco were documented during harvest monitoring in 7.6-cm mesh nets, the second highest observed harvest in the history of the fishery (Figure 6). This is more than double the historic average (5,438) of documented harvest for Arctic Cisco in 7.6 cm mesh nets over the previous 28 seasons. The total observed harvest of Arctic Cisco in 7.6-cm mesh nets increased over 2013 by 362% in the Upper Niġliq, 439% in the Nanuk, and 224% in the Niġliq Delta fishing areas (Table 3). An additional harvest of 579 Arctic Cisco was documented for 7.6-cm mesh nets in the Main Channel area, an increase over 2013 (438).

The 2014 observed CPUE in 7.6-cm mesh nets for Arctic Cisco in the Upper Niġliq (9.8 fish per adjusted net-day) area was its highest since 2006. Observed CPUE in the Nanuk area (26.2 fish per adjusted net-day) was up from 2013 (15 fish per adjusted net-day). The observed CPUE in the Niġliq Delta area (27.5) was nearly double that of 2013 (13.9) (Table 3). The total observed CPUE in 7.6-cm mesh nets for Arctic Cisco in the Niġliq Channel (23.6 fish/adjusted net-day, Table 3) was the eighth highest in the 29 years of the monitoring project (Figure 7). The CPUE in 7.6-cm mesh nets in the Main Channel area was 18.7 fish per adjusted net-day (Table 4a). The daily average CPUE in 7.6-cm mesh nets in 2014 in the Niġliq Channel was over 30 fish on 7 different occasions (17 and 27–30 October and 3–4 November), peaking on 28 October at 65 Arctic Cisco per adjusted net-day (Figure 8). There were 9 additional days with average daily CPUE values above 20 fish per adjusted net-day.

A total of 16,573 Arctic Cisco were documented by the monitoring team in nets of all mesh sizes for the Niġliq Channel in 2014. Documented harvest includes fish caught in nets of unknown size that are excluded from CPUE and CPUE-based estimates. This is an increase from 10,155 in 2013. An additional 1,766 fish were documented in the Main Channel area. The net

Table 2. Summary statistics for fall fishing effort in 3 Niġliq Channel fishing areas and in the Main Channel fishing area, Colville River, Alaska, 2014.

	Summary of 2014 Effort
Number of recorded harvest events	384
Number of Households	27
Number of 5.1 cm mesh nets	1(1)*
Number of 6.4 cm mesh nets	2(3)*
Number of 7.6 cm mesh nets	45(53)*
Number of 8.3 cm mesh nets	1(1)*
Number of 8.9 cm mesh nets	9(9)*
Number of Nets in Niġliq Channel	49
Total Number of Nets	58
Average Nets/Household	2.15
Net sets in Upper Niġliq	16
Net sets in Nanuk	12
Net sets in Niġliq Delta	28
Net sets in Main Channel	11
Total number of sets	67
Adjusted net days 5.1 cm mesh nets	35.00
Adjusted net days 6.4 cm mesh nets	63.99
Adjusted net days 7.6 cm mesh nets	1,187.20
Adjusted net days 8.3 cm mesh nets	10.67
Adjusted net days 8.9 cm mesh nets	202.98
Adjusted Net Days by Upper Niġliq	471.28
adjusted net days by Niġliq	611.60
adjusted net days by Nanuk	224.98
adjusted net days by main channel	191.98
Total Adjusted Net Days	1,499.8

*Values in parentheses represent the total number of sets for the nets of each mesh size class.

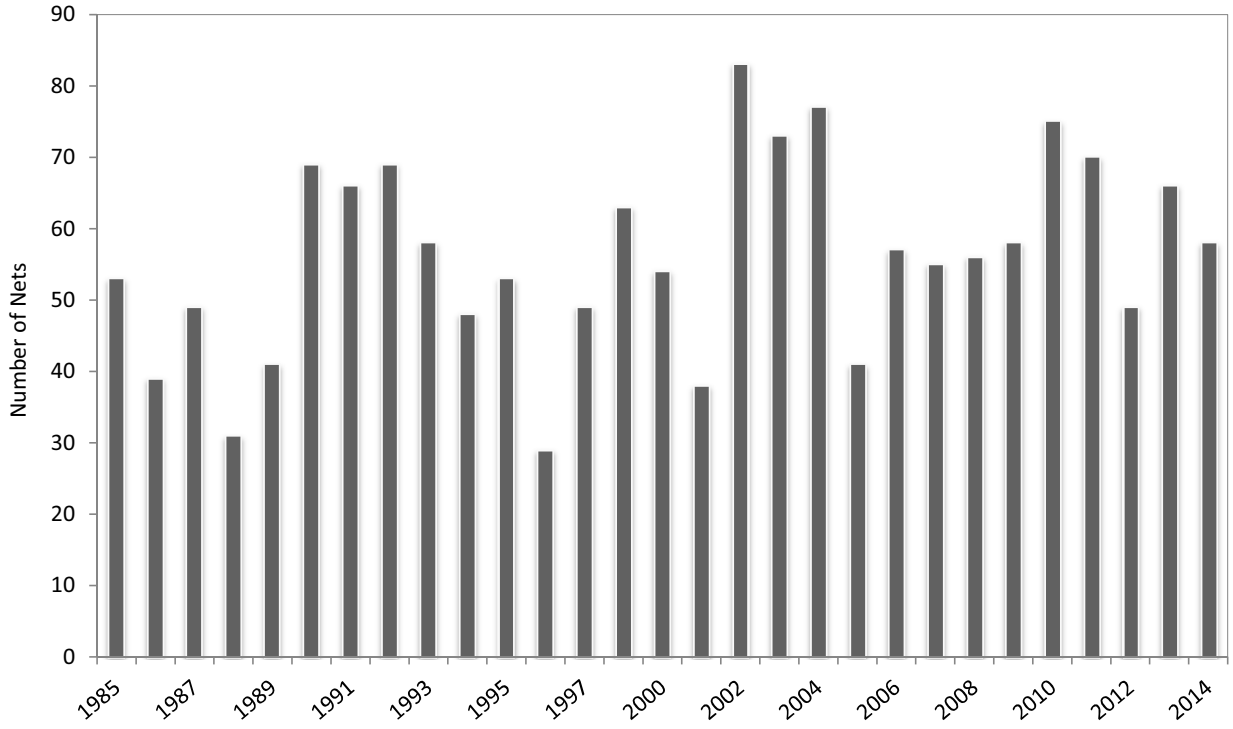

Figure 3. Number of nets deployed annually in the fall subsistence fishery for Arctic Cisco, Colville River, Alaska, 1985–2014.

length adjusted CPUE for each individual net mesh size from observed harvests in the Niġliq Channel ranged from 1.5 fish per adjusted net-day in 8.9-cm mesh nets in the Upper Niġliq area to 90 fish per adjusted net-day in 6.4-cm mesh nets in the Niġliq Delta area (Table 4a). Observed CPUE (adjusted for net length) multiplied by observed adjusted fishing effort (net-days) for each mesh size class yields a total harvest estimate of ~29,904 Arctic Cisco from the Niġliq Channel and ~3,336 from the Main Channel fishing area of the Colville River for an estimated total harvest of ~33,240 Arctic Cisco in 2014 (Table 4b). Arctic Cisco harvest from the Niġliq Channel and from the Main Channel area increased over 2013 harvest estimates (~20,670 in Niġliq Channel and ~1,570 in Main Channel).

A total of 9 species of fish were documented in the Colville River fall fishery harvest in 2014, including Fourhorn Sculpin (*Myoxocephalus quadricornis*) which are observed but not enumerated for this monitoring project (Table 5). A total of 19,217 fish (all species and mesh sizes) were counted during interviews, the fifth highest recorded number during the history of the monitoring project. Arctic Cisco (95.4%) comprised the vast majority of recorded harvests followed by Least Cisco (2.1%), Rainbow Smelt (1.3%), Humpback Whitefish (*C. pidschian*) (0.6%), Broad Whitefish (0.4%), and Saffron Cod (*Eleginus gracilis*) (0.2%) (Table 5). Burbot (*Lota lota*) (n = 3) and Arctic Grayling (*Thymallus arcticus*) were observed but comprised a negligible proportion of the harvest.

The CPUE for Least Cisco caught in 7.6-cm mesh nets was the lowest on record in the Niġliq Channel (0.4 fish per adjusted net-day) (Table 6). CPUE was highest in the Nanuk area (0.9 fish per adjusted net-day), followed by the Upper Niġliq (0.5 fish per adjusted net-day) and the Niġliq Delta (0.3 fish/net-day). This is the second consecutive year that CPUE in the Niġliq Channel was at an all-time low. The long-term average CPUE for Least Cisco harvest in the Niġliq Channel is 3.1 fish per adjusted net-day.

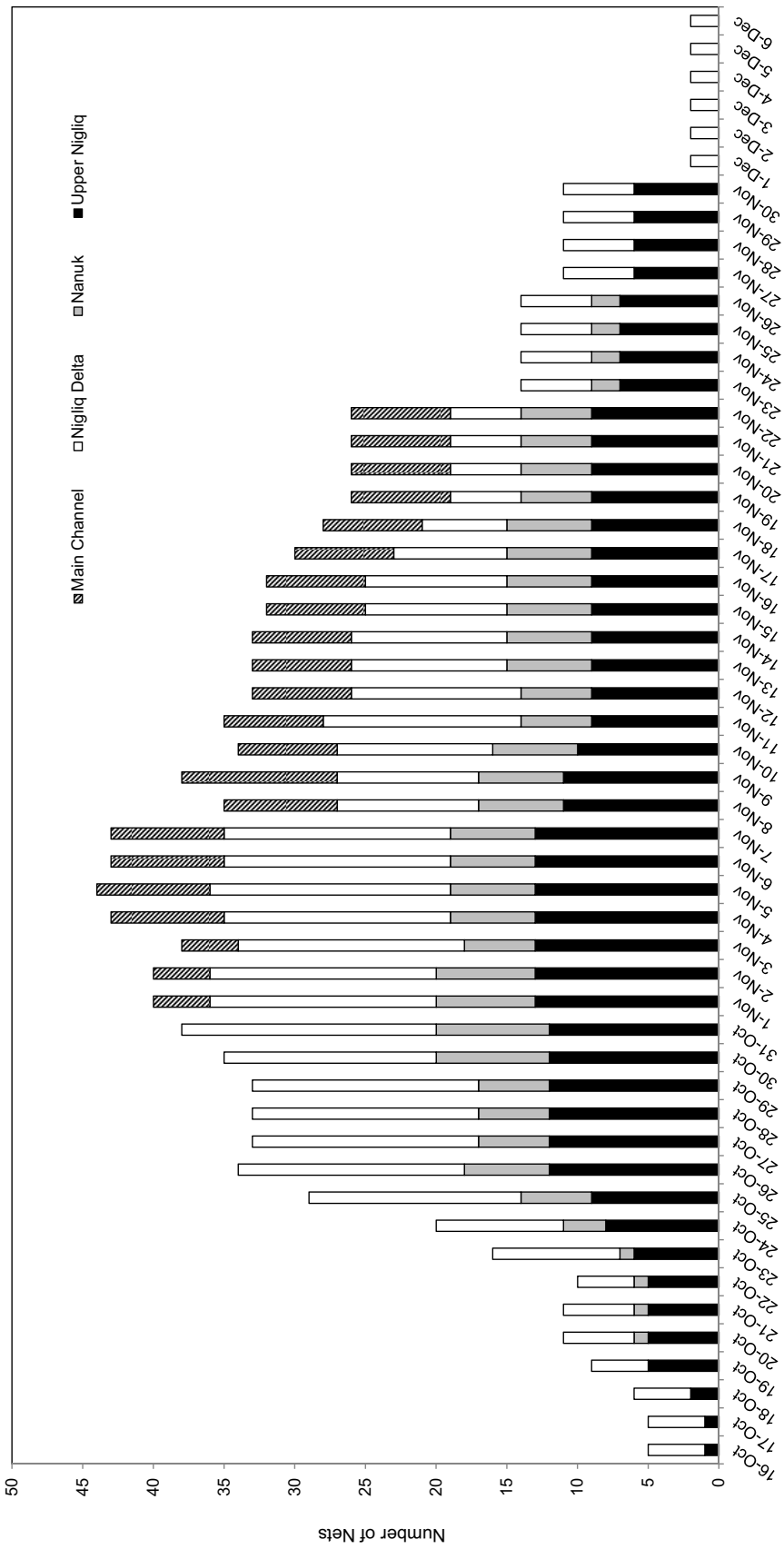

Figure 4. Number of nets fishing each day in each of 3 fishing areas in the Nigliq Channel and in the Main Channel fishing area, Colville River, Alaska, 16 October to 6 December 2014.

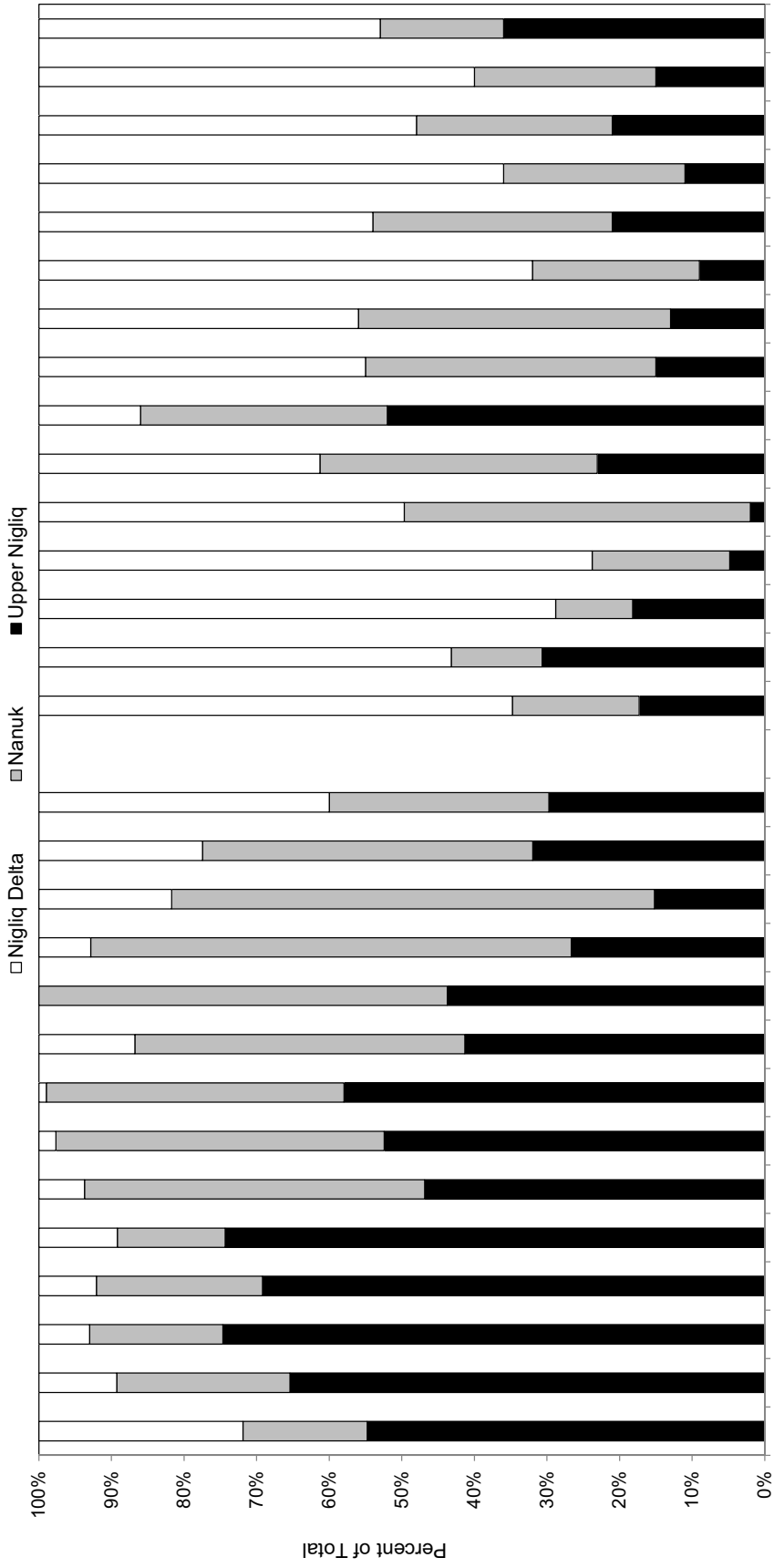

Figure 5. Percent of annual fishing effort in each of 3 Niġliq Channel fishing areas, Colville River, Alaska, 1985–2014. All nets are included regardless of length and mesh size.

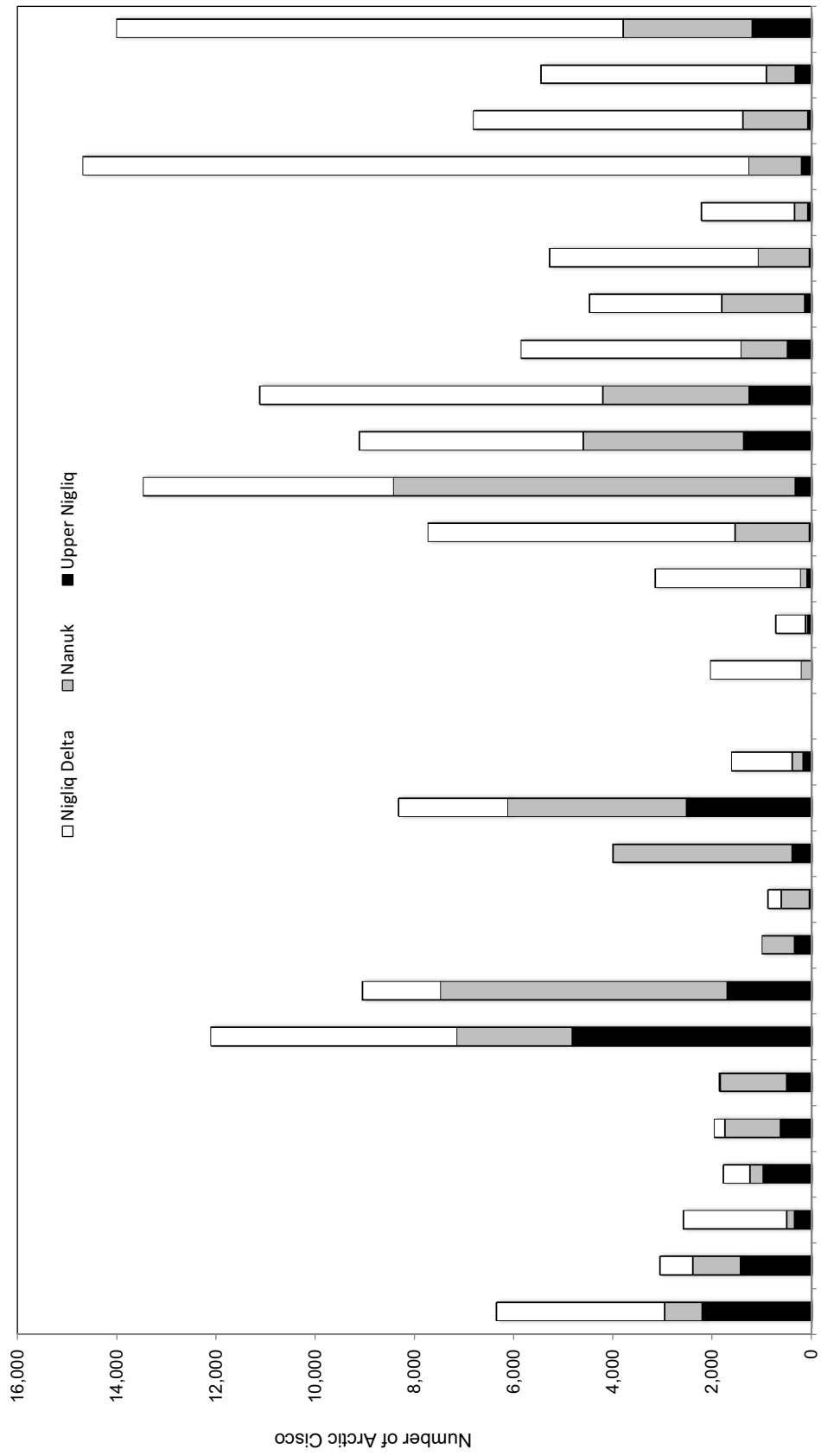

Figure 6. The observed number of Arctic Cisco harvested in 7.6-cm mesh nets in each of 3 Nigliq Channel fishing areas, 1986–2014. Data from 2005–2014 are not directly comparable to older data because the fishery was not monitored for the entire season during this period.

Table 3. Observed catch of Arctic Cisco (number of fish), effort (adjusted net-days), and catch per unit effort (CPUE; fish/net-day) in each of 3 fishing areas in the Niġliq Channel, Colville River, Alaska, 1986–2014. Catch and effort data are for 7.6-cm mesh nets standardized to 18 m length.

	Upper Niġliq Area			Nanuk Area			Niġliq Delta Area			Total Niġliq Channel		
Year	Observed Catch	Effort	CPUE	Observed Catch	Effort	CPUE	Observed Catch	Effort	CPUE	Observed Catch	Effort	CPUE
1986	2,218	115.7	19.2	752	25.1	29.9	3,379	51.3	65.8	6,349	192.2	33.0
1987	1,451	131.7	11.0	948	32.6	29.1	661	31.3	21.1	3,060	195.7	15.6
1988	366	56.9	6.4	146	18.0	8.1	2,078	37.3	55.7	2,590	112.3	23.1
1989	993	90.8	10.9	258	14.3	18.0	535	21.7	24.7	1,786	126.8	14.1
1990	650	147.1	4.4	1,114	148.5	7.5	202	27.6	7.3	1,966	323.1	6.1
1991	522	143.0	3.7	1,327	326.9	4.1	16	8.0	2.0	1,865	477.9	3.9
1992[a]	4,825	316.2	15.3	2,322	130.4	17.8	4,956	96.2	51.5	12,103	542.8	22.3
1993[a]	1,709	106.2	16.1	5,783	158.3	36.5	1,568	57.7	27.2	9,060	322.2	28.1
1994	366	99.0	3.7	642	190.2	3.4	0	0.0	--	1,008	289.2	3.5
1995[a]	56	50.3	1.1	568	178.3	3.2	267	12.0	22.3	891	240.7	3.7
1996	413	36.0	11.5	3,591	193.3	18.6	0	0.0	--	4,004	229.3	17.5
1997	2,539	119.0	21.3	3,586	128.8	27.8	2,207	53.3	41.4	8,332	301.2	27.7
1998	189	92.3	2.0	218	83.7	2.6	1,214	155.3	7.8	1,621	331.3	4.9
1999						No Data						
2000	8	8.0	1.0	217	62.0	3.5	1,826	190.4	9.6	2,051	260.4	7.9
2001	92	62.0	1.5	36	22.7	1.6	611	208.8	2.9	739	293.4	2.5
2002	103	115.7	0.9	137	36.7	3.7	2,925	460.9	6.3	3,165	613.2	5.2
2003	62	11.7	5.3	1,495	104.0	14.4	6,187	455.7	13.6	7,744	571.3	13.6
2004	338	22.0	15.4	8,102	270.9	29.9	5,021	199.7	25.1	13,461	492.6	27.3
2005	1,387	90.0	15.4	3,222	169.5	19.0	4,512	177.0	25.5	9,121	436.5	20.9
2006[a]	1,281	105.0	12.0	2,930	83.3	35.0	6,913	81.3	85.0	11,124	269.7	41.0
2007[a]	498	63.0	7.9	935	109.2	8.6	4,422	200.2	22.1	5,855	372.5	15.7

Table 3. Continued.

Year	Upper Niġliq Area			Nanuk Area			Niġliq Delta Area			Total Niġliq Channel		
	Observed Catch	Effort	CPUE	Observed Catch	Effort	CPUE	Observed Catch	Effort	CPUE	Observed Catch	Effort	CPUE
2008[a]	156	44.0	3.5	1,665	203.3	8.2	2,662	198.3	13.4	4,483	445.6	10.1
2009[a]	0	0.0	0.0	1,027	88.3	11.6	4,258	196.3	21.7	5,285	284.6	18.6
2010[a]	91	34.7	2.6	270	98.0	2.8	1,866	193.0	9.7	2,227	326.0	6.8
2011[a]	212	27.3	7.8	1,064	56.3	18.9	13,395	320.7	41.8	14,671	404.3	36.3
2012[a]	86	24	3.6	1,313	48.3	27.2	5,413	173.7	31.2	6,812	246.0	27.7
2013[a]	335	48.0	7.0	589	39.3	15.0	4,536	327.0	13.9	5,460	414.3	13.2
2014[a]	1,211	123.7	9.8	2,588	98.8	26.2	10,193	370.0	27.5	13,992	592.5	23.6
Total[b]	22,157	2,283.3	9.7	46,845	3,119.3	15.0	91,823	4,304.6	21.3	160,825	9,707.6	16.6

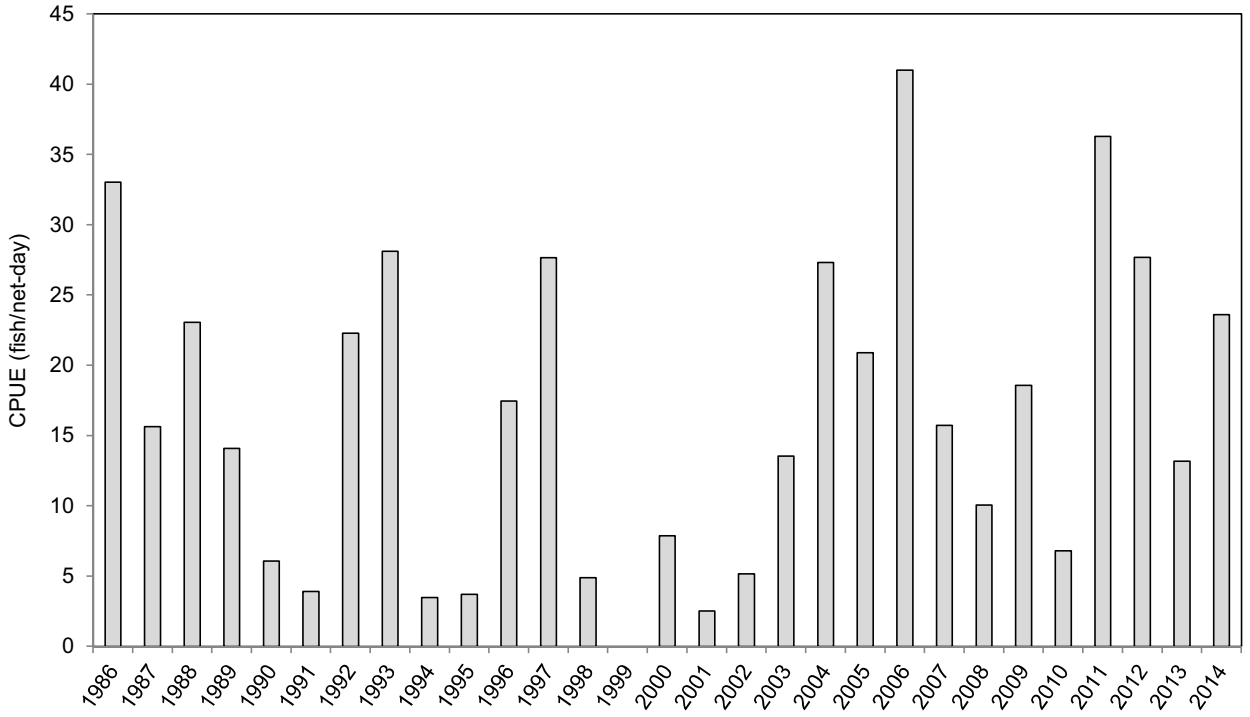

Figure 7. Catch per unit effort (CPUE; fish/net-day) of Arctic Cisco in 7.6-cm mesh gill nets, Niġliq Channel, Colville River, Alaska, 1986–2014. Effort is standardized to an 18 m net length.

LENGTH, WEIGHT, AND AGE OF CATCH

A sub-sample of fish was measured daily at net sites to determine the length distribution present in the fishery. ABR measured fork lengths of 1,500 Arctic Cisco in 2014. Arctic Cisco ranged in length from 202 mm to 433 mm (Figure 9). The middle 50% of fish ranged between 305 mm and 327 mm. The median fork length was 315 mm. As in 2013, 5 different mesh sizes were deployed in the Colville delta in 2014, though Arctic Cisco were only measured from 4 of these mesh sizes. Median fork lengths for measured nets were 252 mm in 5-cm mesh nets, 315 mm in 7.6-cm mesh nets, 344 mm in 8.3-cm mesh nets, and 346 mm in 8.9-cm mesh nets (Figure 10). The length distribution for Least Cisco appears to be bimodal (Figure 9). Least Cisco fork lengths ranged from 200 mm to 356 mm with a median of 305 mm. The middle 50% of measured Least Cisco ranged between 249 and 318 mm.

In 2014, ABR received donated fish samples (n = 195) from several fishers to be used for aging fish and for calculating length (mm) and weight (g) relationships. Length and weight were correlated ($r^2 = 0.52$) in Arctic Cisco in 7.6-cm mesh nets in 2014 (Figure 11). This was the lowest correlation between length and weight over the last 5 years (Figure 12). The strength of the correlation increases slightly ($r^2 = 0.58$) when Arctic Cisco harvested from other mesh-size nets are included in the analysis. A 5-year comparison of length-weight regressions for Arctic Cisco caught in 7.6-cm mesh nets show that the highest correlation occurred in 2011 ($r^2 = 0.73$).

Otolith analysis of donated fish found that those Arctic Cisco ranged in age from 4 to 7 years (all mesh sizes combined, n = 193) (Figure 13). Age composition across all mesh sizes from which fish were donated (7.6 cm, 8.1 cm, and 8.9 cm) was 54% age 5, 29.5% age 6, 15% age 4, and 1.5% age 7. Different mesh-size nets theoretically catch different age classes (i.e., sizes of fish) differentially. Because the vast majority of donated fish (n = 173) came from 7.6-cm mesh nets, age composition in 7.6-cm mesh nets was similar to that with all mesh sizes combined (54% age 5, 29%

Table 4a. Observed catch of Arctic Cisco (number of fish), effort (adjusted net-days), and catch per unit effort (CPUE; fish/net-day) for each fishing area in three Niġliq Channel fishing area and in the Main Channel fishing area by mesh size, Colville River, Alaska, 2014. Nets are standardized to 18 m length.

	Mesh Size (cm)				
Location	5.1	6.4	7.6	8.3	8.9
Upper Niġliq Area					
Observed Catch (# of fish)	247	–	1,211	32	48
Effort (net-days)	21.7	–	123.7	5.3	31.3
CPUE (fish/net-day)	11.4	–	9.8	6	1.5
Nanuk Area					
Catch (# of fish)	–	–	2,588	–	72
Effort (net-days)	–	–	98.8	–	15.3
CPUE (fish/net-day)	–	–	26.2	–	4.7
Niġliq Delta Area					
Catch (# of fish)	–	450	10,193	–	228
Effort (net-days)	–	5	370	–	20
CPUE (fish/net-day)	–	90	27.5	–	11.4
Total Niġliq Channel					
Catch (# of fish)	247	450	13,992	32	348
Effort (net-days)	21.7	5	592.5	5.3	66.7
CPUE (fish/net-day)	11.4	90	23.6	6	5.2
Main Channel Area					
Catch (# of fish)	–	–	579	–	–
Effort (net-days)	–	–	31	–	–
CPUE (fish/net-day)	–	–	18.7	–	–
Total					
Catch (# of fish)	247	450	14,571	32	348
Effort (net-days)	21.7	5	623.5	5.3	66.7
CPUE (fish/net-day)	11.4	90	23.4	6	5.2

Table 4b. Estimate of total harvest of Arctic Cisco in the Niġliq Channel and Main Channel fishing areas is calculated based on calculated effort and estimated CPUE for each river section by mesh size, Colville River, Alaska, 2014.

Mesh Size (cm)	Niġliq Channel net-days	CPUE (fish/net day)	Estimated Niġliq Channel Harvest	Main Channel Area net-days	CPUE (fish/net day)	Estimated Main Channel Harvest	Total Estimated Harvest
5.1	35	11.4	399	--	--	--	
6.4	50.7	90	4,563	13.3	--	--	
7.6	1,008.6	23.61519	23,818.281	178.6	18.7	3,336	
8.3	10.7	6	64.2	--	--	--	
8.9	203	5.22	1,059.66	--	--	--	
		Total	29,904			3,336	33,240

age 6, 16% age 4, and 2% age 7) (Figure 13, Appendix H). Age 5 fish made up the majority of the harvest in 2014 for the third consecutive year.

Arctic Cisco generally recruit to the fishery at age 4, when they first reach lengths sufficient for capture in a range of mesh sizes from 6.4 to 7.6 cm. The fish continue to grow in subsequent years and are caught in higher proportions in these and larger nets. In 2014, the largest fish were typically the oldest fish (Figure 14). Median lengths of fish harvested in 7.6-cm mesh nets increased steadily with age. However, as in years past, there is wide variability in age at length, regardless of the mesh size in which fish are caught.

The age composition of Arctic Cisco in 2014 harvests (as percentage of catch) combined with the overall CPUE of 23.6 fish/net-day in the Niġliq Channel (Table 3, Appendix H), allowed estimation of the age-specific CPUE. The CPUE of Arctic Cisco in 7.6-cm mesh nets increased from age 4 (3.7 fish per adjusted net-day) to age 5 (12.7 fish per adjusted net-day), before decreasing at age 6 (6.8 fish per adjusted net-day) (Figure 15). The Arctic Cisco harvested in 2014 represent the 2007–2010 year classes. The 2006 year class appears to be either present in only small numbers or completely absent from the fishery in 2014 (Figure 15). Summing CPUE by age at capture for each year class across all years that the year class was present in the fishery provides an indicator of the relative contribution of each year class in the fishery (Figure 16). The cumulative total CPUE for the 2006 Arctic Cisco year class appears to have the lowest harvest rate (8.1 fish/adjusted net-day) of any year class since 2001 (Figure 16; Table 7). The average cumulative CPUE for year classes in 7.6-cm mesh nets between 1985 and 2005 is ~16 fish/adjusted net-day. The 2007 year class (age 7) has accounted for a CPUE of ~21 fish per adjusted net-day as of 2014 and is likely to be largely absent from the fishery in 2015. The 2008–2010 year classes (age 6, age 5, and age 4 fish) have so far contributed approximately 22, 15, and 4 fish per adjusted net-day respectively to the fishery. The 2007 year class (age 5), which was absent from the 2011 fishery (Figure 15), has subsequently contributed 19 fish/net-day to the cumulative CPUE (Figure 16).

SALINITY AND TEMPERATURE

Due to slow ice formation on the Niġliq Channel, ABR was unable to begin salinity sampling at pre-established stations until 24 October 2014. Salinity measurements continued every other day until 18 November (Figure 17). Salinity at the 2 downstream salinity stations (at 3 m depth) were above 15 parts per thousand (ppt) by 24 October and remained above 17 ppt from 28 October until the end of the monitoring season, peaking at 24.5 ppt in the Niġliq Delta area on 3 November (Figures 2 and 17). Salinity at Salinity Station 3 (Uyagagvik section of Niġliq Channel)

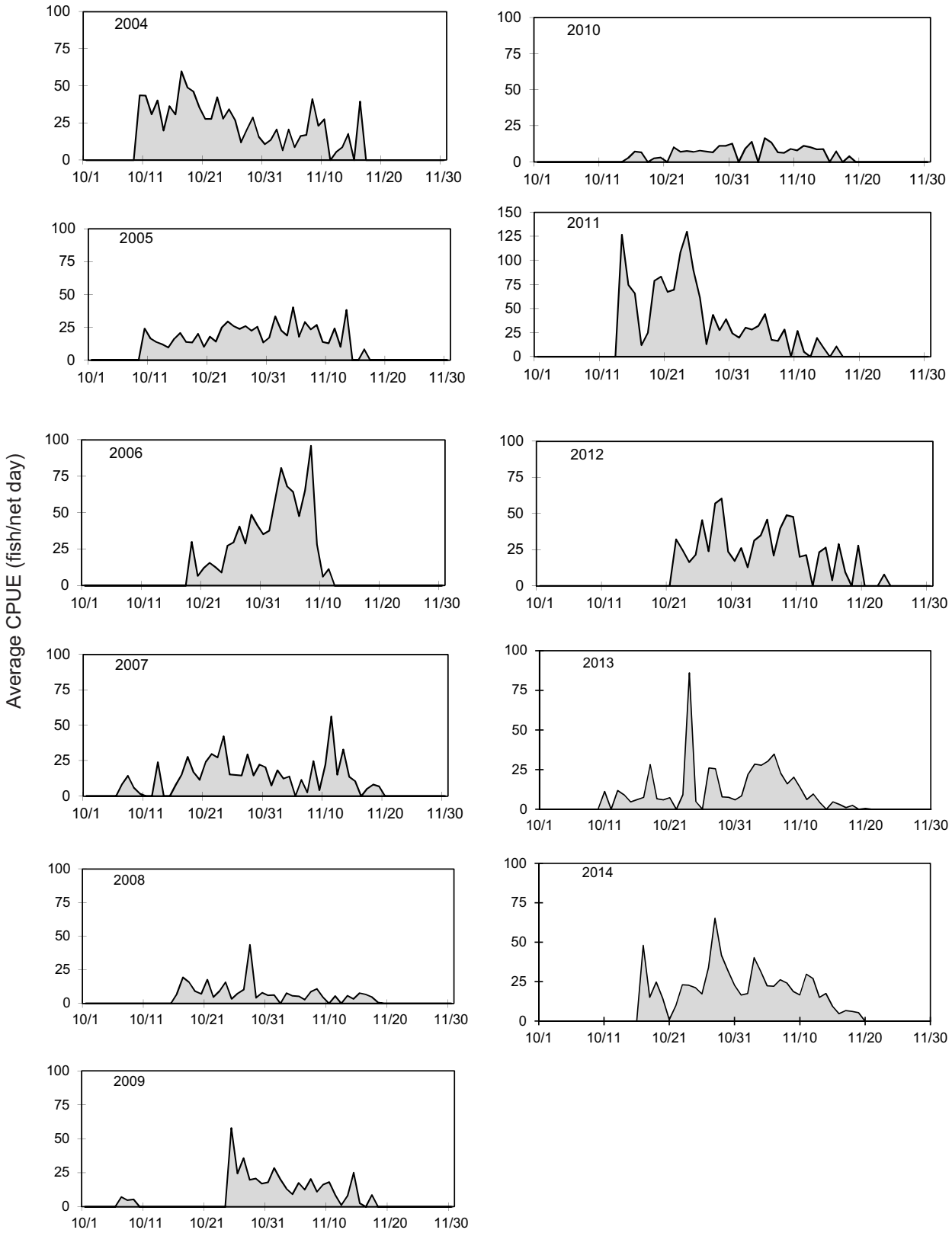

Figure 8. Average daily catch per unit effort (CPUE; fish/net-day) of Arctic Cisco in 7.6-cm gill nets, Niġliq Channel, 2004–2014. Effort is standardized to an 18 m net length.

Table 5. Species composition of the observed harvest from the fall subsistence fishery for Arctic Cisco expressed as a percent of the sampled catch, Colville River, Alaska, 1985–2014. Table includes all fish caught in every net, regardless of mesh size and location.

Year	Arctic Cisco	Bering Cisco	Least Cisco	Broad Whitefish	Humpback Whitefish	Arctic Grayling	Rainbow Smelt	Round Whitefish	Dolly Varden Char	Northern Pike	Saffron Cod	Burbot	Arctic Flounder	Fourhorn Sculpin	Total Observed
1985	69.5	(a)	14.8	15.1	0.5	0	0.2	0	0	0	0	0	0	(b)	2,705
1986	95.9	(a)	3.8	0.3	0.0	0	0.03	0.01	0	0	0	0	0	(b)	8,952
1987	71.8	(a)	18.7	5.5	3.8	0	0.01	0	0.03	0	0.03	0.06	0	(b)	6,826
1988	90.6	(a)	8.3	0.6	0.5	0	0	0	0	0	0	0.1	0	(b)	2,948
1989	66.2	(a)	23.7	7.0	3.1	0	0.03	0	0	0	0.03	0.03	0	(b)	2,946
1990	39.6	21.8	30.2	5.3	2.9	0	0.2	0	0.1	0	0.03	0.01	0	(b)	7,911
1991	62.8	1.2	30.0	1.0	3.8	0	1	0.03	0	0	0.04	0.09	0	(b)	7,576
1992	89.2	0.1	6.0	0.2	0.1	0	0	0	0	0	0	0	0	4.4	24,305
1993	85.4	0.02	11.1	0.3	0.4	0	0.04	0	0	0	0.01	0	0	2.7	17,155
1994	39.6	0.1	44.6	2.2	13.2	0	0.3	0	0	0	0	0	0	(b)	3,792
1995	34.7	0.2	35.0	7.6	22.3	0	0.2	0	0	0	0	0.1	0	(b)	7,155
1996	81.9	0	4.8	0.1	0.4	0	0.1	0	0	0	0.02	0.02	0.02	12.5	5,730
1997	74.8	0	22.9	1.3	0.9	0	0	0	0	0	0	0	0	(b)	19,758
1998	39.6	0	50.8	0.4	8.9	0	0	0.2	0	0	0	0	0	(b)	6,481
2000	79.4	0.1	14.0	0.2	6.0	0	0.3	0	0	0	0.03	0	0	(b)	3,871
2001	35.6	0.1	29.6	5.5	27.8	0	0.1	0	0	0	0	1.3	0	(b)	3,515
2002	49.8	0.1	30.6	1.6	17.5	0	0.2	0	0	0	0.1	0.2	0	(b)	8,445
2003	66.3	0.2	22.3	0.2	9.4	0	0.9	0	0	0	0.6	0.1	0	(b)	16,654
2004	74.7	0.06	24.2	0.0	0.9	0	0.08	0	0	0	0.04	0.03	0	(b)	20,705
2005	81.3	0	14.8	0.2	3.5	0	0.15	0	0	0	0.01	0	0	(b)	13,957
2006	86.6	0	12.0	0.4	0.9	0	0	0	0	0.1	0	0	0	(b)	17,344
2007	71.7	0	22.3	0.4	5.5	0	0	0	0	0	0.1	0	0	(b)	14,686
2008	84.1	0.2	14.7	0.0	0.1	0	0.7	0	0	0	0.1	0.01	0	(b)	9,199
2009	85.4	0.2	9.2	0.2	0.5	0	4.3	0	0	0	0.1	0.03	0	(b)	11,700

Table 5. Continued.

Year	Arctic Cisco	Bering Cisco	Least Cisco	Broad Whitefish	Humpback Whitefish	Arctic Grayling	Rainbow Smelt	Round Whitefish	Dolly Varden Char	Northern Pike	Saffron Cod	Burbot	Arctic Flounder	Fourhorn Sculpin	Total Observed
2010	60.7	0	34.4	0.4	3.0	0	1.3	0	0	0	0.2	0	0	(b)	18,505
2011	94.8	0	4.0	0.1	0.6	0	0.4	0	0	0	0.09	0	0	(b)	28,211
2012	77.8	0	19.8	0.6	0.9	0	0.4	0	0	1	0.5	0	0	(b)	17,172
2013	82.5	0	7.7	0.1	2.3	0	5.5	0	0	0	1.8	0	0	(b)	13,872
2014	95.4	0	2.1	0.4	0.6	<0.01	1.3	0	0	0	0.2	<0.01	0.0	(b)	19,217

(a) = included with Arctic Cisco prior to 1990
(b) = always present but not counted

Table 6. Observed catch of Least Cisco (number of fish), effort (net-days), and catch per unit effort (CPUE; fish/net-day) for each of 3 fishing areas in the Niġliq Channel, Colville River, Alaska, 1986–2014. Catch and effort data are for 7.6-cm mesh gill nets standardized to 18 m length.

	Upper Niġliq Area			Nanuk Area			Niġliq Delta Area			Total Niġliq Channel		
Year	Observed Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE
1986	146	115.7	1.0	16	25.1	1.0	24	51.3	0.0	186	192.2	1.0
1987	730	131.7	6.0	63	32.6	2.0	12	31.3	0.0	805	195.7	4.0
1988	93	56.9	2.0	12	18	1.0	105	37.3	3.0	210	112.3	2.0
1989	332	90.8	4.0	16	14.3	1.0	10	21.7	0.0	358	126.8	3.0
1990	711	147.1	5.0	416	148.5	3.0	179	27.6	6.0	1,306	323.1	4.0
1991	50	143	0.0	272	326.9	1.0	0	8	0.0	322	477.9	1.0
1992	261	316.2	1.0	88	130.4	1.0	151	96.2	2.0	500	542.8	1.0
1993	181	106.2	2.0	498	158.3	3.0	96	57.7	2.0	775	322.2	2.0
1994	330	99	3.0	711	190.2	4.0	0	0	--	1,041	289.2	4.0
1995	238	50.3	5.0	494	178.3	3.0	94	12	8.0	826	240.7	3.0
1996	14	36	0.0	195	193.3	1.0	0	0	--	209	229.3	1.0
1997	1,370	119	12.0	1,575	128.8	12.0	203	53.3	4.0	3,148	301.2	10.0
1998	544	92.3	6.0	577	83.7	7.0	935	155.3	6.0	2,056	331.3	6.0
1999						No Data						
2000	11	8	1.0	97	62	2.0	330	190.4	2.0	438	260.4	2.0
2001	129	62	2.0	222	22.7	10.0	491	208.8	2.0	842	293.4	3.0
2002	176	115.7	2.0	165	36.7	5.0	1,033	460.9	2.0	1,374	613.2	2.0
2003	25	11.7	2.0	459	104	4.0	1,038	455.7	2.0	1,522	571.3	3.0
2004	167	22	8.0	2,493	270.9	9.0	1,483	199.7	7.0	4,143	492.6	8.0
2005	405	90	5.0	710	140.3	5.0	700	177	4.0	1,815	407.3	4.0
2006	274	92.7	3.0	261	67.3	4.0	414	65.0	6.0	949	225.0	4.0
2007	939	63.0	15.0	559	109.4	5.0	1085	188.7	6.0	2583	361.2	7.0
2008	78	44.0	1.8	529	188.0	2.8	460	233.2	2.0	1067	465.2	2.3
2009	6	1.7	3.6	321	88.3	3.6	265	181.3	1.5	592	271.3	2.2
2010	139	34.7	4.0	235	92	2.6	225	193.3	1.2	599	320	1.9
2011	8	27.3	0.3	90	56.3	1.6	550	292.0	1.9	648	375.7	1.7

Table 6. Continued.

	Upper Niġliq Area			Nanuk Area			Niġliq Delta Area			Total Niġliq Channel		
Year	Observed Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE
2012	92	24.0	3.8	585	48.3	12.1	319	173.7	1.8	996	246.0	4.0
2013	74	48.0	1.5	21	23.3	0.9	93	322.0	0.3	188	393.3	0.5
2014	61	123.7	0.5	76	82.8	0.9	93	322.0	0.3	230	528.5	0.4
Total	7,584	2,273	3.3	11,756	3,021	3.9	10,388	4,215	2.5	29,728	9,509	3.1

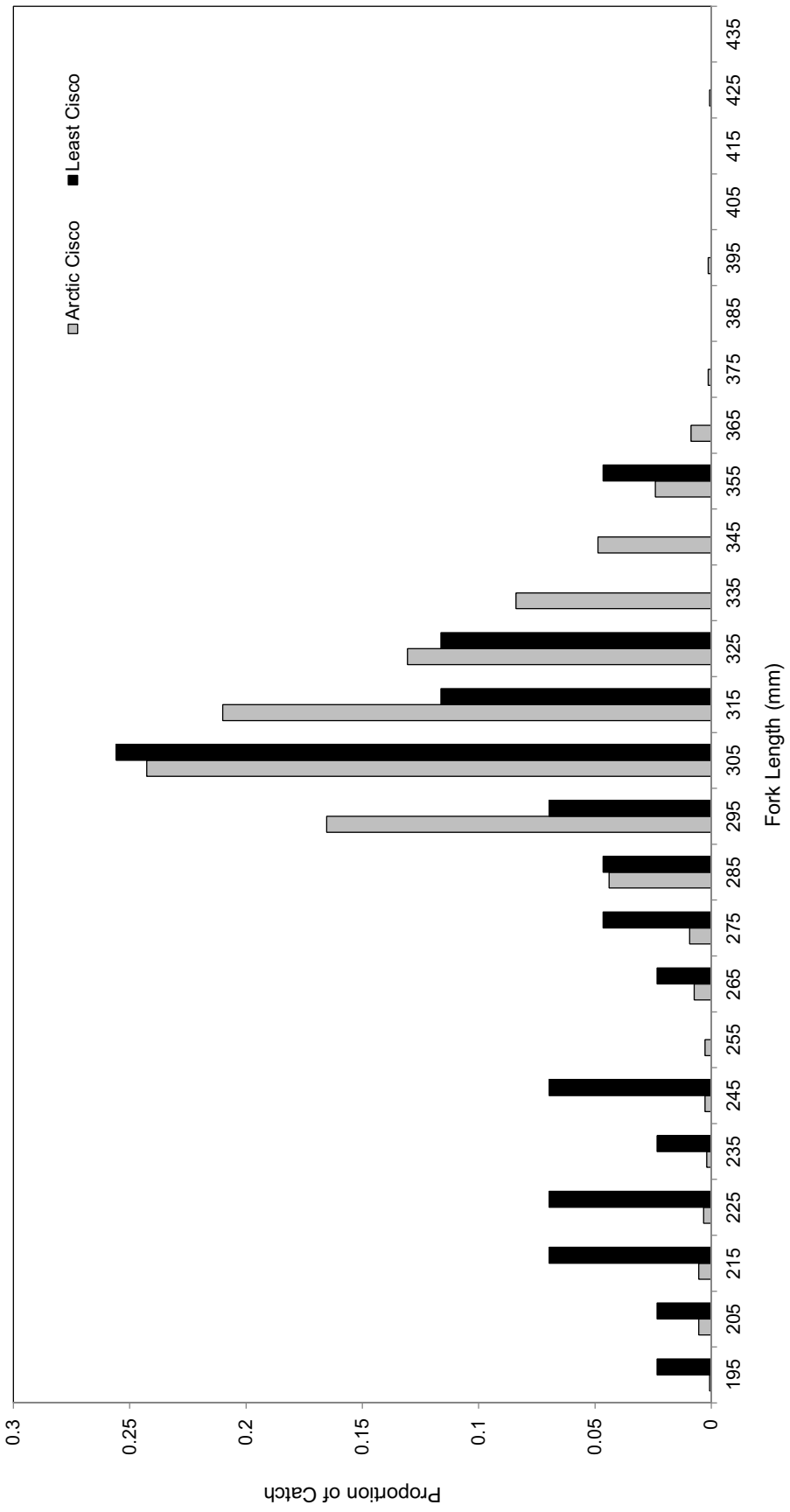

Figure 9. Length frequency (10 mm increments) of Arctic Cisco and Least Cisco captured in all mesh sizes in the fall subsistence fishery, Nigliq Channel, Colville River, Alaska, 2014.

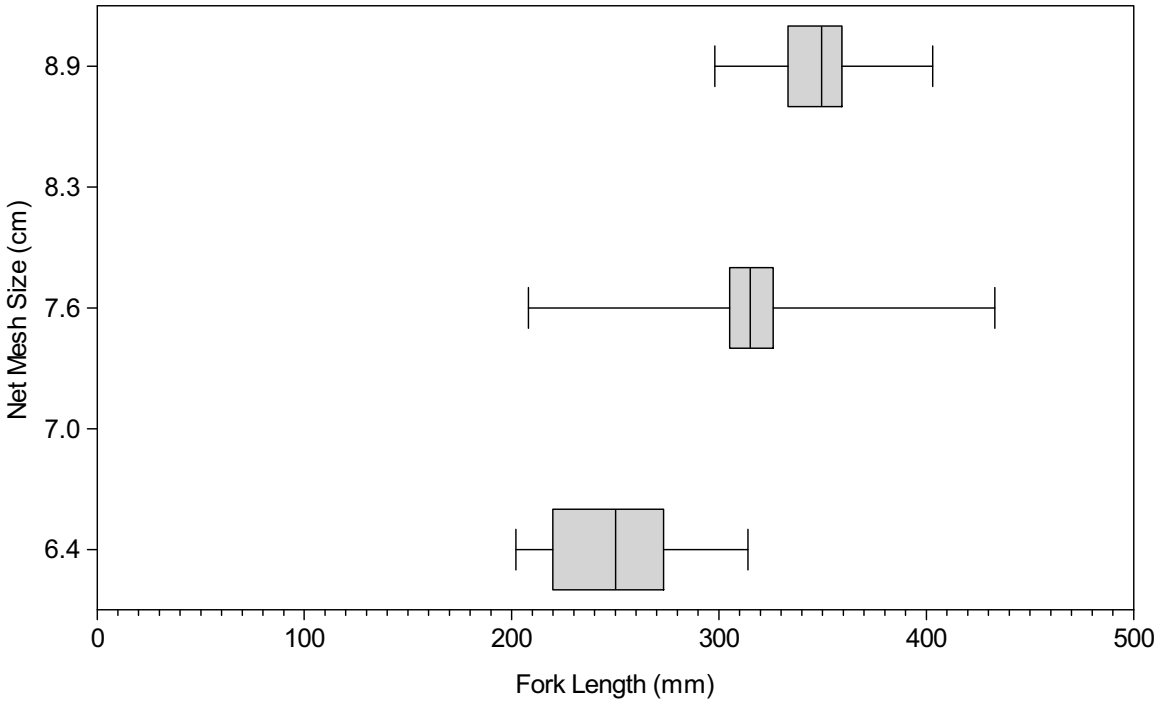

Figure 10. Length frequencies of Arctic Cisco in the fall subsistence fishery by gillnet mesh size, Niġliq Channel, Colville River, 2014.

rose above 15 ppt on 30 October and remained there until the end of monitoring, peaking at 19.1 ppt on the last day of monitoring. Salinity upstream Salinity Station 4 in the Upper Niġliq area, was negligible until 28 October when it reached 6.9 ppt. The salinity at this station rose gradually to 13.5 on the last day of monitoring. Peak fishing effort typically occurs during the first week of November (Figure 4) and early November salinity levels during this period were in line with past measurements over the history of the fishery (Figure 18). Temperature was measured at the same time as salinity at 3 m depth at all 4 salinity stations. The temperature trends were opposite of the salinity trends at all 4 stations for most of the sampling season (Figure 17). Temperatures were coldest at the downstream location (-1.1–0.3 °C) and warmest at the upstream station (0.4–0.8 °C) (Appendix C).

WATER CHEMISTRY

ABR collected water at upstream, mid-channel, and downstream water chemistry collection sites on 3 and 18 November for analysis of total metals, total nitrogen, diesel-range organics, and residual-range organics (Figure 2, Appendix D-1 and D-2). Total nitrogen was either undetected or was detected at levels well below the Alaska Department of Environmental Conservation (ADEC) water quality standards at all collection sites. Diesel-range and residual-range organics were not detected at any of the collection sites. Arsenic and barium were detected at each collection site at levels well below ADEC water quality standards. Mercury was detected during both sampling events at the downstream water chemistry collection site. Mercury concentrations (0.26 µg/L on 3 November and 0.57 µg/L on 18 November) were well below USEPA drinking water standards and USEPA Aquatic Life Standards, but were higher than ADEC water quality standards. Full laboratory reports are found in Appendix E.

SEDIMENT ANALYSIS

ABR collected sediment samples at the upstream and downstream sediment collection sites on 18 November (Figure 2). Metal analytes tested

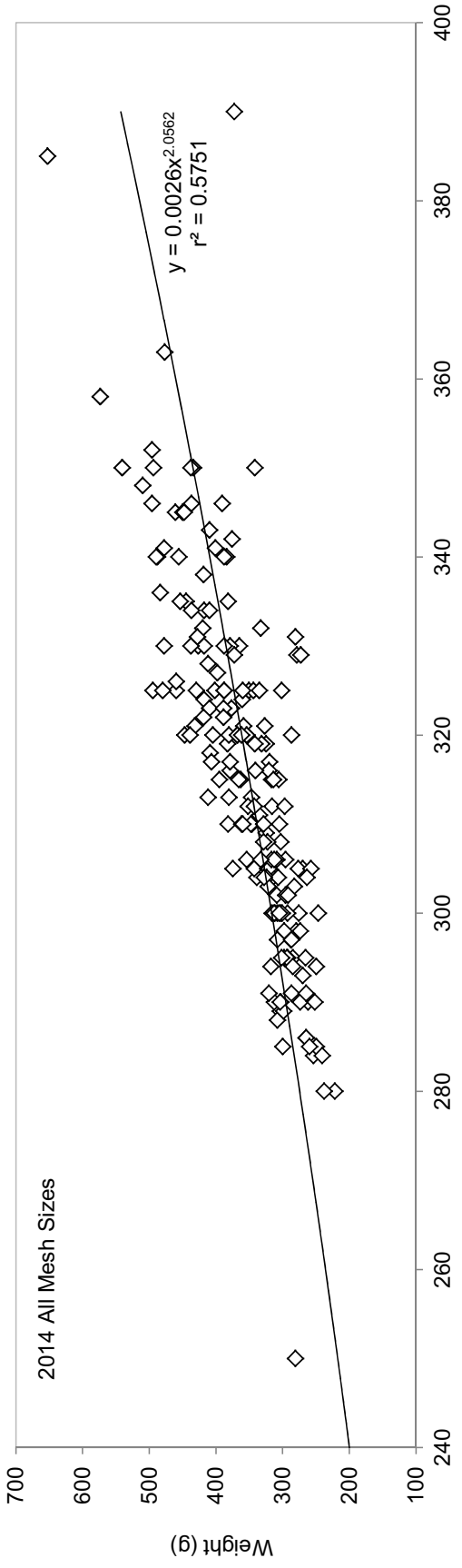

Figure 11. Length-weight relationship of Arctic Cisco captured in the fall subsistence fishery, Nigliq Channel, Colville River, 2014. Includes fish captured in all mesh sizes and all net lengths (n = 194).

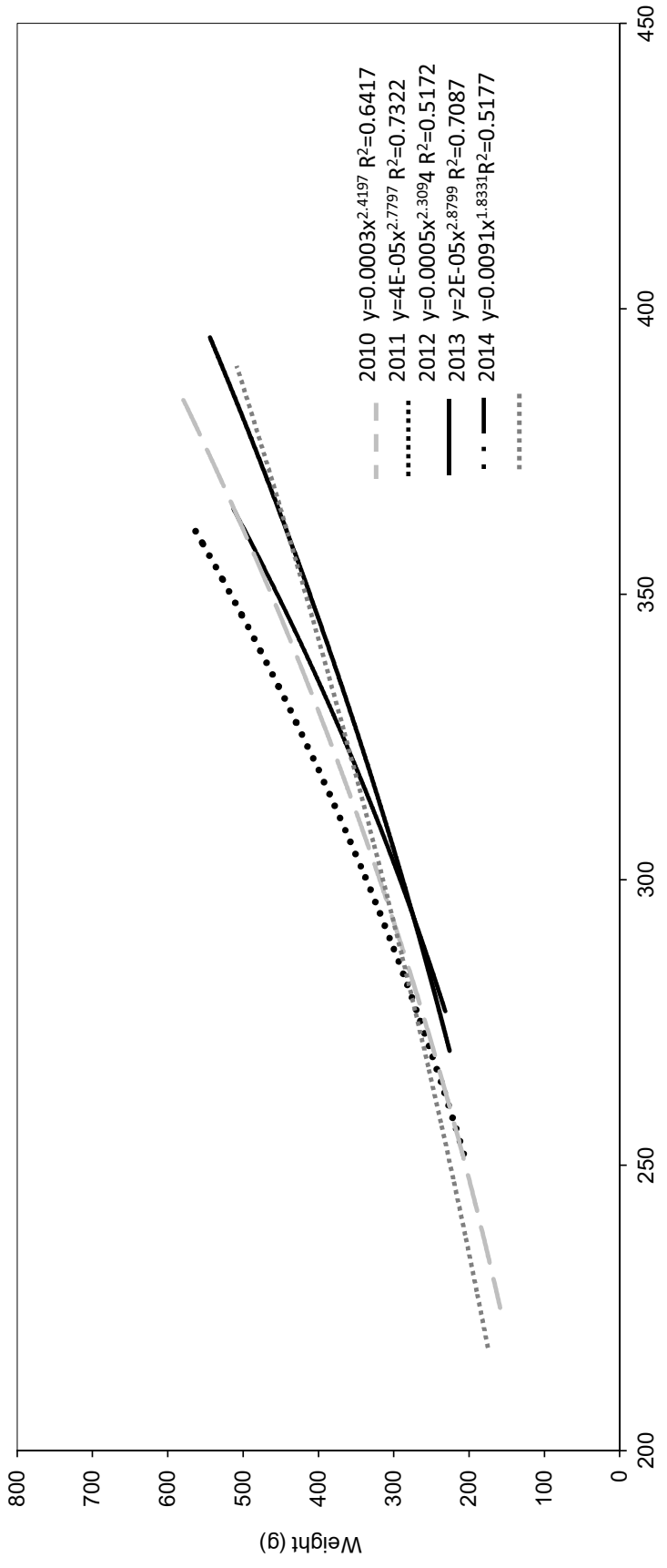

Figure 12. A 5-year (2010–2014) comparison of length-weight regression lines for Arctic Cisco captured in 7.6-cm mesh nets in the fall subsistence fishery, Nigliq Channel, Colville River, Alaska.

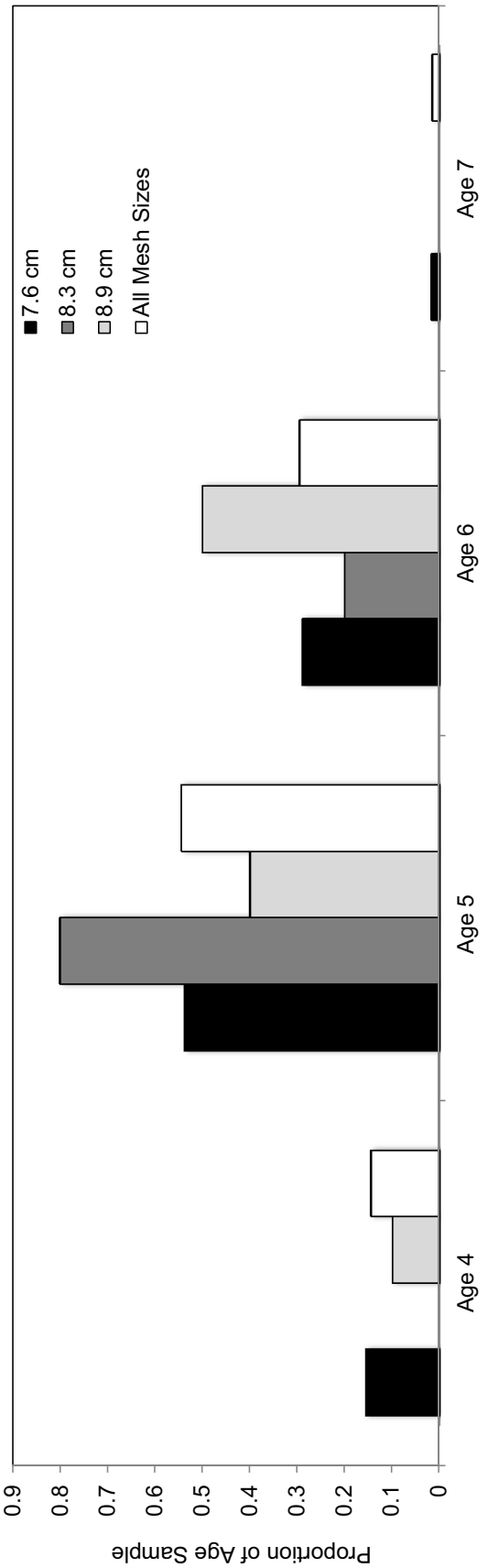

Figure 13. Age composition of Arctic Cisco harvested in 7.6-cm mesh nets (n = 176), 8.3-cm mesh nets (n = 10), 8.9-cm mesh nets (n = 10), and all mesh sizes combined (n = 194), Nigliq Channel, Colville River, Alaska, 2014.

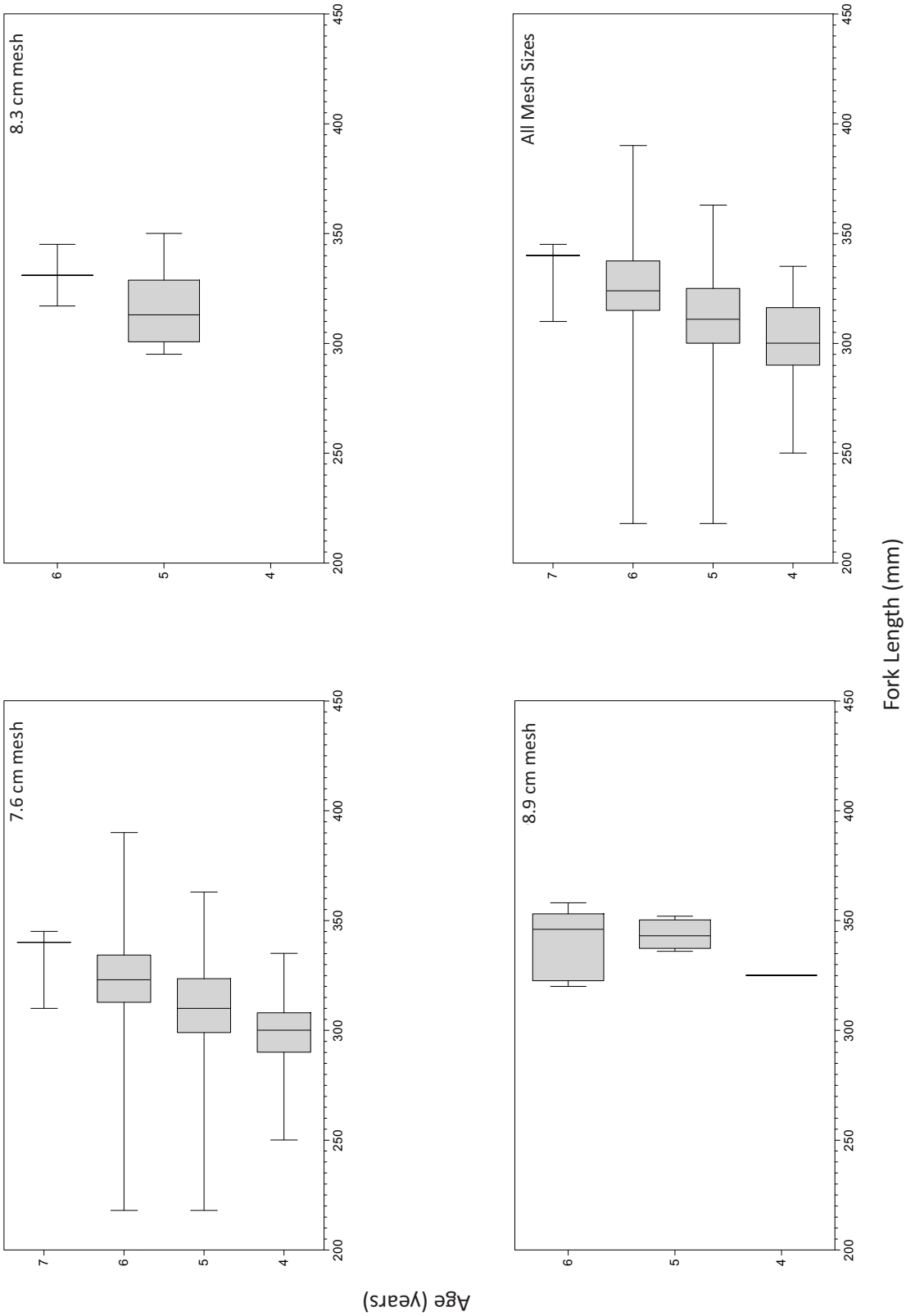

Figure 14. Age-specific length distribution by gill net mesh size of Arctic Cisco harvested in the fall subsistence fishery, Niġliq Channel, Colville River, Alaska, 2014.

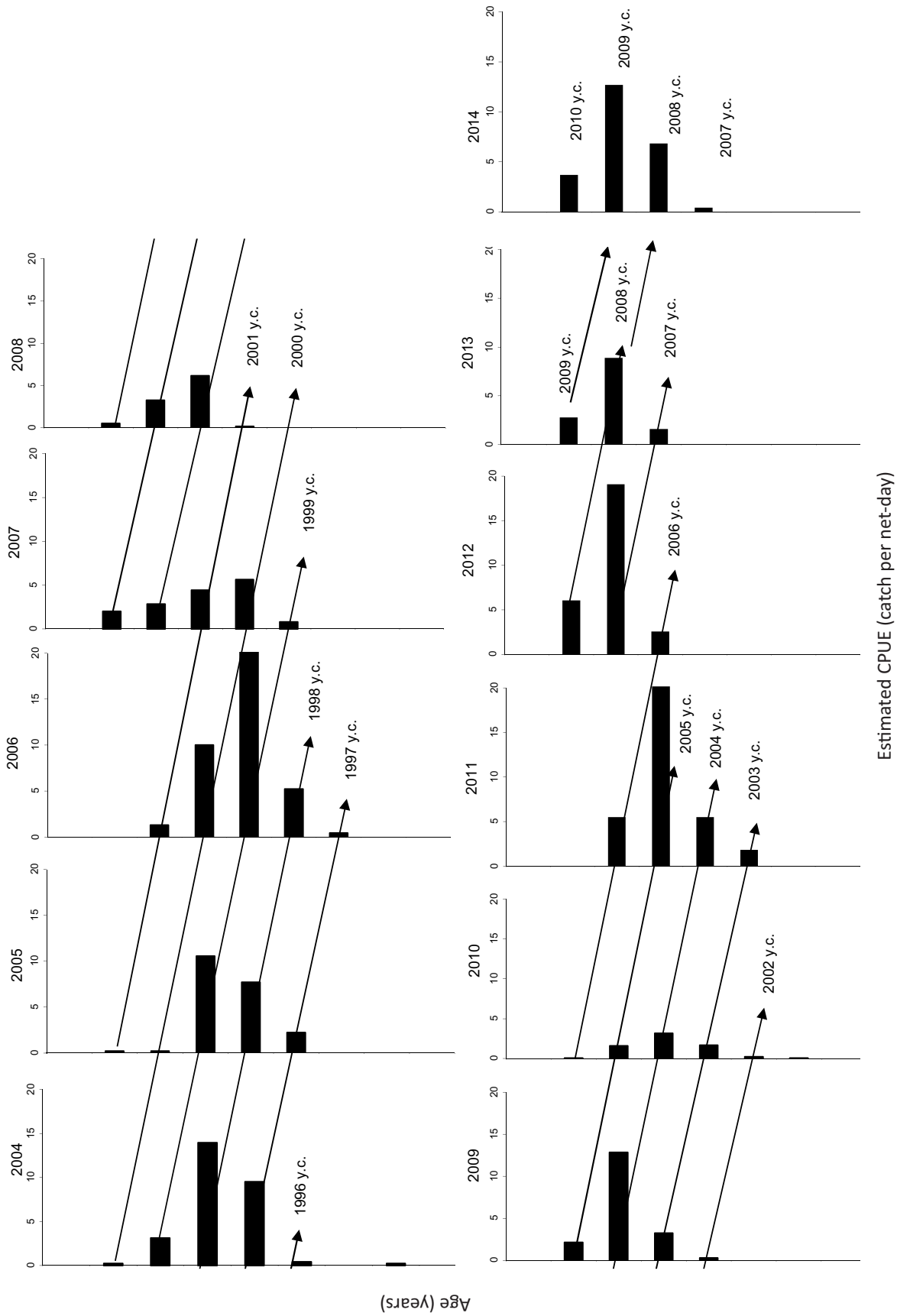

Figure 15. Catch per unit effort (CPUE) of Arctic Cisco by age class in the fall subsistence fishery, Niġliq Channel, 2004–2014. Arrows demonstrate the progression of select year classes through the fishery. Only fish harvested in 7.6-cm mesh gill nets are included and counts are standardized to 18 m net length, as described in text.

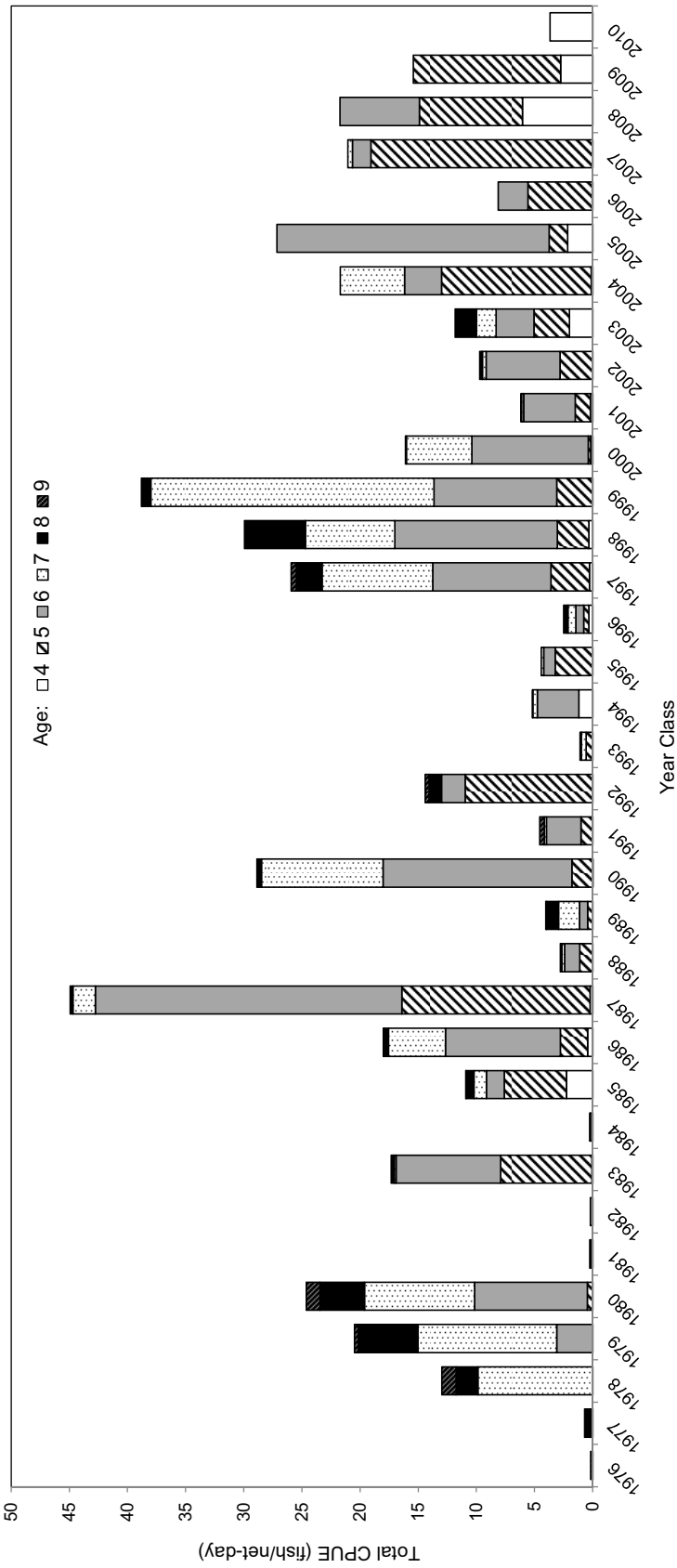

Figure 16. Cumulative catch per unit effort (catch per net-day) of Arctic Cisco by year class (year of hatch) in the fall subsistence fishery, Nigliq Channel, Colville River, 1976–2010 (capture dates 1985–2014). Catch per unit effort was estimated only for fish captured in 7.6-cm mesh nets.

Table 7. Cumulative catch per unit effort (CPUE) of Arctic Cisco in 7.6-cm mesh gill nets by year class in the fall subsistence fishery, Niġliq Channel, Colville River (1981–present).

Year Class	CPUE
1981	0.4
1982	0.2
1983	17.3
1984	0.3
1985	10.9
1986	18.0
1987	44.9
1988	2.8
1989	4.3
1990	29.2
1991	4.7
1992	14.4
1993	1.1
1994	5.4
1995	4.4
1996	2.5
1997	25.9
1998	29.9
1999	38.8
2000	16.1
2001	6.2
2002	9.7
2003	11.8
2004	21.7
2005	27.2
2006	8.1
2007[a]	21.1
2008[a]	21.7
2009[a]	15.4
2010[a]	3.7

[a] Calculation assumes that the 2007–2010 year classes are still contributing to cumulative CPUE.

were all well below the ADEC soil quality standards with the exception of arsenic (Appendices F and G). The arsenic levels were 7.49 mg/kg and 8.79 mg/kg for the upstream and downstream collection sites respectively, while the ADEC standard is 6.1 mg/kg or less. Arsenic levels were also slightly higher than ADEC standards in 2013 (Seigle et al. 2014).

DISCUSSION

Warm weather conditions delayed freeze-up on the Colville delta in early October 2014. The fall fishery for Arctic Cisco began on 16 October, a week later than 2013 and 8 days later than the average start date for the fall fishery since 1985 (Table 1). Two net owners and a third fisher set nets on 16 October. However, ice conditions were still sub-standard for travel in certain sections of the river and all 3 fishers penetrated through the ice with their snow machines after setting nets (*note*: nobody was seriously injured). As such, ABR's on-ice monitoring did not begin until the following week when it was confirmed that ice formation had reached consistently safe levels for snow machine travel. Despite the slow start to the season, ABR was able to record 384 harvest events from the Niġliq Channel and the Main Channel fishing areas.

ABR continued monitoring of the fishery in Nuiqsut until 24 November, though most fishing effort had ceased by the end of the third week of November when regular net-tending (i.e., every day or every other day) of still active nets had diminished considerably due to a series of severe storms in the region. ABR continued monitoring of the fishery until early December via telephone and email contact with a few of the remaining fishers still active on the river. However, local weather conditions impacted the start and end of the harvest efforts, effectively shortening the fall fishing season. Despite the late start to the fishing season, the observed fishing effort of ~1,500 adjusted net-days (Table 2) was higher than in 2013 (1,429), 2012 (847), and 2011 (1,232). The increased 2014 effort can be attributed to consistently good ice conditions on the Niġliq Channel, which were safe for travel and net deployment once the season did begin, and up until the severe weather events nearly 5 weeks later.

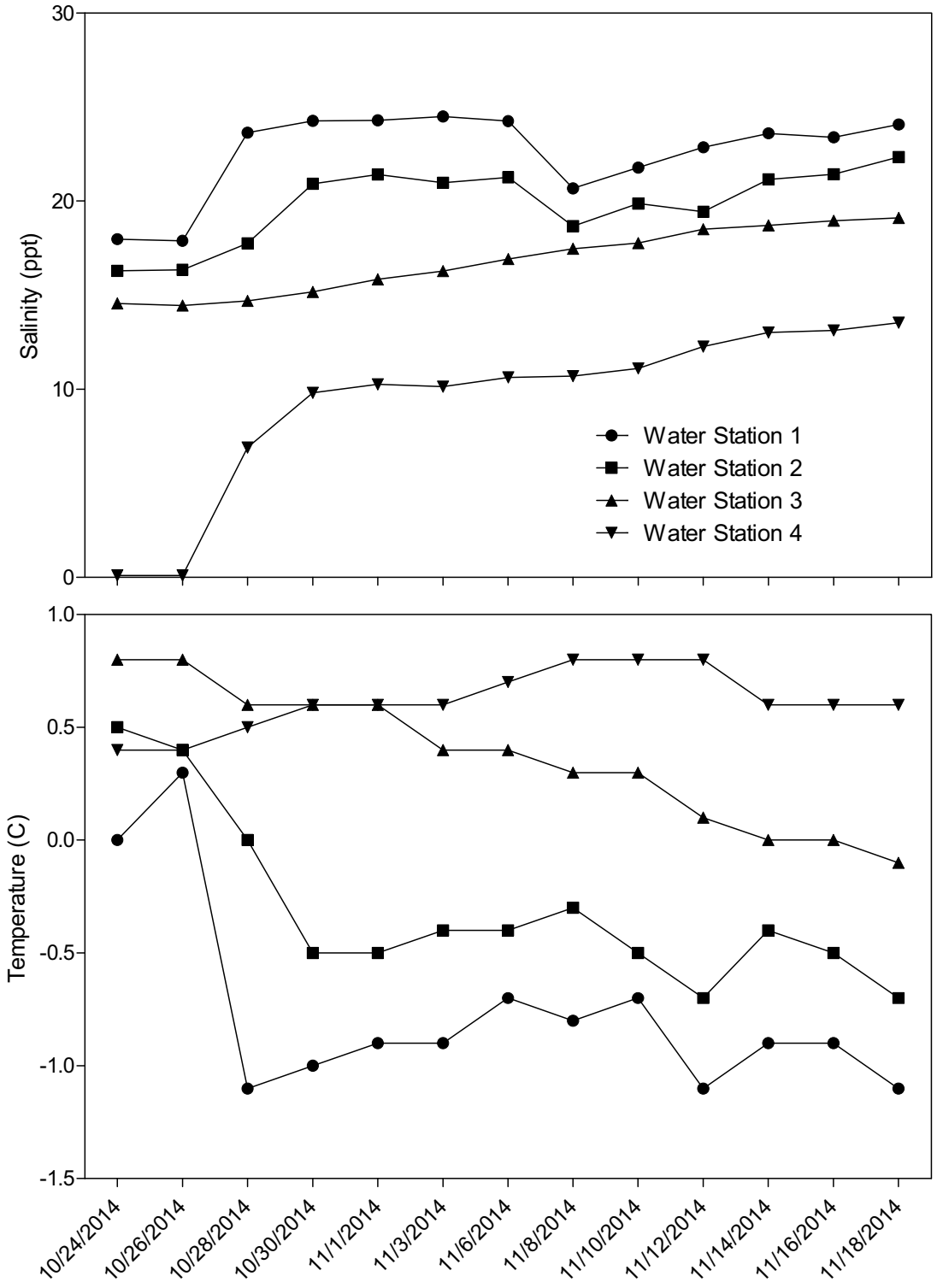

Figure 17. Salinity (parts per thousand) and temperature (°C) measured at 3.0 m depth from 4 water stations on the Niġliq Channel, Colville River, Alaska, 24 October to 18 November 2014.

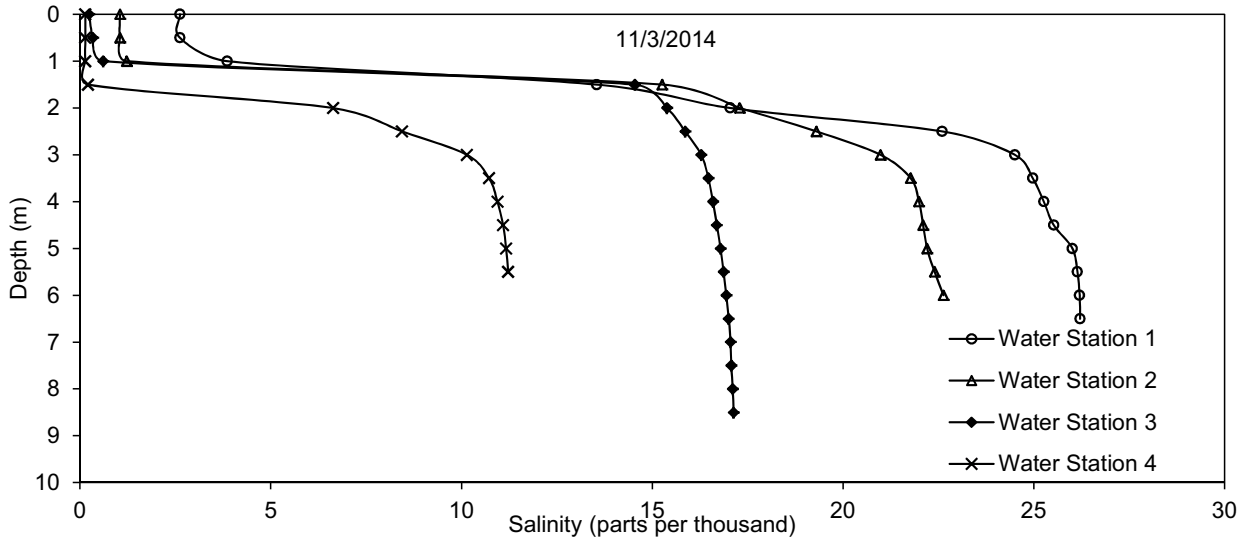

Figure 18. Water salinity depth profiles in Niġliq Channel fishing areas, Colville River, Alaska, early November 2014.

Even though the fishing season was abbreviated, the total of 58 nets deployed in the Niġliq Channel and in the Main Channel fishing area was actually slightly higher than the average number of nets (56) deployed in the previous 28 years (Figure 3). Furthermore, the number of nets deployed at any one time during the 2014 season remained consistently high during the traditional period of peak fishing which typically occurs from the middle of October until the middle of November (Figure 4). In fact, there was a 3-week period from 26 October through 17 November 2014 where 30 or more nets were active each day and the peak of 44 active nets on 5 November was a slight increase over peak net deployment in 2013 (42). The peak net fishing effort in 2013 occurred on 16 October, the same day that fishing *began* in 2014 (see Figure 4 *in* Seigle et al. 2014). In 2014, daily active nets remained above 25 until after the normal stop-date for monitoring by ABR (~20 November). It is likely that the late start to the fishery, combined with a relatively high daily catch rate of greater than 25 fish per adjusted net-day (Figure 8) for much of the season, led to a high level of fishing effort into the latter portion of the fishing season, as compared to years past.

Beginning in 1998, and with few exceptions since then, the majority of fishing effort on the Niġliq Channel has occurred in the Niġliq Delta fishing area, followed by the Nanuk area, and then the farthest upstream Upper Niġliq area (Figure 5). While the Niġliq Delta area was still the preferred fishing area in 2014, the Upper Niġliq fishing area surpassed the Nanuk area for the first time since 2006 and for only the second time since 1998. Over the past 8 years, our experience with the fishery has indicated that the typical increase in fishing effort from upstream to downstream among the 3 Niġliq Channel fishing areas resulted from the perception among fishers that returns relative to effort were greater with distance downstream. This perception is supported by the fact that CPUE in the Niġliq Delta area has indeed been higher than in the Nanuk and Upper Niġliq fishing areas in 13 of the last 16 years. Additionally, CPUE in the Upper Niġliq area has been notably lower than in the other 2 fishing areas in nearly every year, and average CPUE increases from upstream to the farthest downstream area (9.7, 15.0, and 21.3; Table 3).

While the pattern of increasing CPUE with distance downstream continued in 2014, fishers in the Upper Niġliq area experienced the highest CPUE since 2006 (~10 fish per adjusted net-day), and CPUE in the Nanuk area (26.2 fish per adjusted net-day) was more than double that in the

Upper Niġliq area, and nearly as high as in the Niġliq Delta area (Table 3). Furthermore, CPUE of Arctic Cisco in the Nanuk area has increased annually over the last 4 years. The relatively high CPUE for Arctic Cisco in 7.6-cm mesh nets in these 2 upstream fishing areas allowed many fishers to enjoy adequately high harvest rates without burning as much snow machine fuel in 2014 as compared to 2013 (Table 3). Fishers who did travel all the way to the Niġliq Delta fishing area were rewarded with a CPUE of 27.5 Arctic Cisco per adjusted net-day in 7.6-cm mesh nets that was nearly double the 2013 rate of 13.9 and reversed a downward trend in catch rates in that area in recent years (Table 3). The CPUE in the Niġliq Delta area in 2014 was the eighth highest in 29 years of monitoring.

It should be noted that the results of fishing effort in the Main Channel fishing area on the eastern Colville delta not as well documented 2014 relative to the previous 2 years. Although considerable fishing effort was documented there for the fourth consecutive year, communication with those fishers was limited. This is due in part to the fact that ABR monitors generally focus on the much greater fishing effort that occurs in the Niġliq Channel and typically rely on local hires to provide all of the information about harvests on the Main Channel fishing area. Traditionally, the Main Channel area has been fished by overnight campers because of the distance from Nuiqsut precludes nets from being checked reliably on a daily or semi-daily basis. This did not appear to be the case in 2014 and there was considerable uncertainty over the schedule of net-checking compared to previous seasons. Based on limited harvest reports, fishing appeared to be good in the Main Channel area with observed CPUE of nearly 19 fish per adjusted net-day in 7.6-cm mesh nets. Still, due to the lack of reliable reporting by fishers of most of their harvest events, particularly for nets other than 7.6-cm mesh, it is possible that we underestimated harvest in the Main Channel in 2014.

Increased overall fishing effort (~5% over 2013) combined with increased CPUE in all areas of the river made for an above average harvest season as observed by ABR fishery monitors (Figure 6). The estimated harvest of ~35,000 Arctic Cisco in the Niġliq Channel in 2014 (Table 4) was well above the average catch of ~25,900 fish during the previous 5 years. We reported previously that upward trends in harvest of Arctic Cisco were predicted in 2011 and the years to follow based on estimates of young-of-the-year Arctic Cisco captured in nearshore Beaufort Sea fyke net surveys near Prudhoe Bay (Craig Reiser, LGL, 2009 and 2010, personal communications; see Figure 17 *in* Seigle and Parrett 2008). These predictions appeared to be confirmed in 2011 (~39,000 fish harvested), but then harvest estimates dipped in 2012 (~23,000 fish) and 2013 (~20,000 fish). The increase in harvest in 2014 illustrates the effects of year class recruitment and strength on fishing success.

Indeed, large fluctuations in harvest levels of Arctic Cisco from various year classes on a year to year basis remain evident in the fishery. For example, the 2007 year class was barely represented in the 2011 fishery but then appeared in large numbers as 5-year-olds in 2012 (Figures 15 and 16). The year class contributed to a rather small percentage of the harvests in 2013 and 2014 as 6 and 7-year-olds. However, the 2008 year class (6-year-olds in 2014) continues to represent a considerable portion of harvests in the Niġliq Channel (Figures 15 and 16, Appendix H). The 2006 year class has likely returned to the McKenzie River system to spawn. The 2009 year class (5-year-olds in 2014) was a major contributor to 2013 and 2014 harvests and will likely continue to be so in 2015.

The increase in CPUE for Arctic Cisco in the fishery in 2014 was perhaps influenced by the presence of a more diverse age structure than in recent years. For the first time since 2011, we saw a range of age classes in the fishery from 4 to 7 years (Figures 13–15). In the previous 2 years we observed mostly 5 and 6-year-olds with a small percentage of 4-year-old fish. It is possible that the 2005 and 2006 year classes (age 9 and age 8 in 2014), which were present in lower numbers as 7-year-olds in the fishery in recent years, were simply not as successful as the subsequent 2007–2009 year classes (ages 7, 6, and 5 in 2014). It is also possible that these Arctic Cisco were overwintering in other parts of the Colville River (e.g., Main Channel) or that they matured faster and left the Colville River earlier for the spawning grounds on the Mackenzie River system.

The wide range of lengths of Arctic Cisco observed in each mesh size net along with wide variability in age at length suggests that there may be many environmental factors affecting the successful recruitment of any given age class fish to the fishery (Figures 10 and 14). Size differences among age classes could be caused by differences among years in the nutrient availability in offshore waters during summer months, or differences in overwintering conditions between different parts of the river which might make different metabolic demands on overwintering fish. This is supported further by the large variability in weight at length for Arctic Cisco over the past 5 years (Figure 12). Nonetheless, median size and age of Arctic Cisco did increase overall with increasing mesh size of the nets in which those fish were caught in 2014, indicating relatively good fish health (Figures 10 and 14).

Another factor that may have contributed to high CPUE for Arctic Cisco in 2014 was the persistence of favored salinity levels during the fishing season (Moulton and Field 1988, Moulton 1994). In fact, salinity levels in the Niġliq Delta and Nanuk fishing areas were optimal for overwintering Arctic Cisco from the onset of water sampling on 24 October (15–25 ppt, Figure 17). These salinity levels also may have influenced the overall harvest percentages of other species. Salinity in the Niġliq Channel is often a good predictor for Arctic Cisco location and harvest numbers and also tends to predict Least Cisco presence and abundance as well (Moulton and Seavey 2004). Least Cisco prefer salinities slightly lower than Arctic Cisco in the Niġliq Channel and generally reside in waters with salinity <15 ppt (Moulton and Field 1988). Higher salinities in the Niġliq Delta and Nanuk areas throughout the monitoring season likely influenced the low numbers of Least Cisco observed during the 2014 season in those areas (Table 6). Salinity at the upstream sampling location (Salinity Station 4) in the Upper Niġliq area was above 10 ppt by the end of October and rose steadily to the upper salinity range of Least Cisco thereafter (Figures 17 and 18). It is therefore likely that high salinities pushed Least Cisco upstream of traditional fishing areas in 2014. Temperature may also influence the movement of some fish upstream in the Niġliq Channel as warmer waters tend to occur upstream of the Niġliq Delta fishing area (Figure 17).

Laboratory analysis of water sample chemistry indicates that for most analytes tested, Niġliq Channel water meets agency standards for USEPA drinking water and aquatic life as well as ADEC water quality standards. The exception was mercury, which was detected above ADEC standards at the downstream location. However, it should be noted that mercury is found in naturally high concentrations throughout wetlands and waterbodies of the high Arctic environments (Douglas and Strum 2004, Loseto et al. 2004, Rember and Trefry 2004). Furthermore, one must consider that the results for all analytes tested represent a snap-shot of water quality at one location during a low-flow period of the year and may not be representative of year-round water quality conditions. Similarly, only arsenic levels registered above ADEC soil standards, though it must be noted that those standards are for soils that are not inundated by flowing waters year-round. Additionally, localized areas of elevated arsenic are not uncommon in the state due both to atmospheric deposition and local geology (Crecelius et al. 1991, Stenhaur and Boehm 1992, ADEC 2009).

In summary, the 2014 fall fishery was perceived by fishers to be a good harvest year. This perception was supported by harvest CPUE's in the Niġliq Channel that ranked eighth overall in the 29 years of harvest monitoring. ABR will continue to work with members of the Qaaktaq Panel in the spring of 2015 to discuss the results of 2014 harvest monitoring. We also will continue to work with various stakeholders to assist in facilitating the exchange of information related to what continues to be a successful subsistence fishery.

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Appendix A. Stakeholder engagement and monitoring plan for the fall subsistence fishery monitoring on the Colville River.

John Seigle (ABR) traveled to Nuiqsut on 27 May for a 1:30 pm meeting with the *Qaaktaq* Panel. The KSOPI executive director, Elizabeth Ipalook, was present and assisted John in reminding panel members about the meeting. Unfortunately, several members of the panel left town during 26–27 May and were unable to attend the meeting. Ultimately, 2 members of the panel attended (Lydia Sovalik and Thomas Napageak Jr.).

John presented results from analysis of the 2014 fishery. There were 2 comments made by those present. First, Lydia noted that fish appeared smaller in 2014. John responded that this likely true on average, but that one must also consider the age of fish predominant in the harvests. Arctic Cisco will remain in the Colville Delta until approximately age-8, and older fish are more likely to be larger than younger fish. Of the fish that were sub-sampled for age, 59% were age-5 and another 30% were age-6. With so few fish present from age-7 and age-8 age classes, it is reasonable to expect that fish might have been slightly smaller on average. There is some evidence that Arctic Cisco in 2014 weighed slightly less at length than in the previous 4 years, particularly with the longest fish (see Figure 12).

Thomas Napageak Jr agreed with John that it is likely that ABR has underestimated the harvest of fish in the main channel in 2014. We estimated a harvest of ~3,336 fish in 3 inch mesh nets from a small number of interviews. However, Thomas suggests that he alone caught nearly 3,000 fish in that region of the Delta. We discussed some of the problems that ABR had in 2014 with regard to collecting harvest data from the Main Channel. In particular, ABR relies on local hire to collect data from the Main Channel, but those hires experienced difficulties in visiting that section of the river delta in 2014. Thomas and John discussed communicating directly more frequently in 2015. Thomas said that he would assist the fish monitors to increase the accuracy of their harvest projections for the Main Channel by participating in more harvest interviews.

John noted that the overall 2014 harvest appeared to be one of the best in the nearly 30 years of monitoring of the fishery. Thomas agreed that it was a better than average year and that he was pleased with his harvest results. The meeting closed with an agreement to reconvene the panel in the fall of 2015 during the fall fishery to revisit these and other related topics.

Appendix B. Total fishing effort (adjusted net-days) recorded for the fall subsistence fishery for Arctic Cisco in 3 Niġliq Channel fishing areas and in the Main Channel fishing area, Colville River, Alaska, 2014.

Fisher Code	Fishing Area	Net	Net Code	Length (m)	Stretched Mesh (cm)	Start Date	End Date	Net-days	Adjusted Net-days
6	Nanuq	A	146A1	24.384	7.62	10/30/14	11/10/14	11	14.67
7	Upper Nigliq	A	147A1	24.384	7.62	10/21/14	11/26/14	36	47.99
7	Nanuq	B	147B1	15.24	7.62	10/25/14	11/26/14	32	26.66
7	Nanuq	C	147C1	24.384	7.62	10/25/14	10/26/14	1	1.33
7	Nanuq	C	147C2	24.384	7.62	10/26/14	11/26/14	31	41.33
16	Upper Nigliq	A	1416A1	18.288	8.89	10/23/14	11/30/14	38	38.00
16	Upper Nigliq	B	1416B1	24.384	7.62	10/23/14	11/30/14	38	50.66
16	Upper Nigliq	C	1416C1	24.384	8.89	10/26/14	11/30/14	35	46.66
16	Upper Nigliq	D	1416D1	24.384	8.89	10/26/14	11/30/14	35	46.66
21	Upper Nigliq	A	1421A1	30.48	7.62	10/19/14	10/26/14	7	11.67
25	Nanuq	A	1425A1	30.48	7.62	10/30/14	11/22/14	23	38.33
25	Nanuq	B	1425B1	24.384	8.89	11/4/14	11/22/14	18	24.00
25	Nanuq	C	1425C1	18.288	8.89	11/13/14	11/22/14	9	9.00
27	Upper Nigliq	A	1427A1	12.192	8.255	10/25/14	11/10/14	16	10.67
27	Upper Nigliq	B	1427B1	18.288	7.62	10/26/14	11/10/14	15	15.00
28	Main Colville	A	1428A1	24.384	7.62	11/9/14	11/22/14	13	17.33
32	Nanuq	A	1432A1	24.384	7.62	10/24/14	11/2/14	9	12.00
32	Nanuq	B	1432B1	24.384	7.62	10/24/14	11/2/14	9	12.00
41	Nanuq	A	1441A1	24.384	7.62	10/30/14	10/31/14	1	1.33
41	Nigliq Delta	A	1441A2	24.384	7.62	10/31/14	12/6/14	36	47.99
42	Upper Nigliq	A	1442A1	30.48	7.62	10/27/14	11/22/14	26	43.33
49	Main Colville	A	1449A1	30.48	7.62	11/1/14	11/9/14	8	13.33
55	Nigliq Delta	A	1455A1	24.384	7.62	10/23/14	11/5/14	13	17.33
55	Nigliq Delta	B	1455B1	30.48	7.62	10/25/14	11/30/14	36	59.99
55	Nigliq Delta	A	1455A2	24.384	7.62	11/5/14	11/30/14	25	33.33
55	Nigliq Delta	C	1455C1	24.384	7.62	11/11/14	11/30/14	19	25.33
56	Nigliq Delta	A	1456A1	24.384	7.62	10/25/14	11/14/14	20	26.66
63	Nigliq Delta	A	1463A1	30.48	7.62	11/11/14	12/6/14	25	41.66
69	Nigliq Delta	A	1469A1	30.48	7.62	10/23/14	10/29/14	6	10.00
70	Nigliq Delta	A	1470A1	30.48	7.62	10/16/14	10/25/14	9	15.00
70	Nigliq Delta	B	1470B1	24.384	7.62	10/16/14	10/29/14	13	17.33
70	Nigliq Delta	C	1470C1	18.288	7.62	10/23/14	11/12/14	20	20.00
70	Nigliq Delta	A	1470A2	30.48	7.62	10/25/14	11/17/14	23	38.33
70	Nigliq Delta	D	1470D1	30.48	7.62	10/25/14	11/17/14	23	38.33
72	Main Colville	A	1472A1	24.384	7.62	11/4/14	11/22/14	18	24.00
72	Main Colville	B	1472B1	24.384	7.62	11/4/14	11/22/14	18	24.00
72	Main Colville	C	1472C1	24.384	7.62	11/9/14	11/22/14	13	17.33

Appendix B. Continued.

Fisher Code	Fishing Area	Net	Net Code	Length (m)	Stretched Mesh (cm)	Start Date	End Date	Net-days	Adjusted Net-days
74	Nigliq Delta	A	1474A1	24.384	8.89	10/16/14	10/21/14	5	6.67
74	Nigliq Delta	B	1474B1	24.384	8.89	10/16/14	10/20/14	4	5.33
74	Nigliq Delta	C	1474C1	30.48	7.62	10/20/14	10/31/14	11	18.33
74	Nigliq Delta	D	1474D1	30.48	6.35	10/21/14	10/31/14	10	16.66
74	Main Colville	C	1474C2	30.48	7.62	11/1/14	11/9/14	8	13.33
74	Main Colville	D	1474D2	30.48	6.35	11/1/14	11/9/14	8	13.33
77	Upper Nigliq	A	1477A1	13.716	7.62	10/18/14	11/7/14	20	15.00
77	Upper Nigliq	B	1477B1	18.288	6.35	10/19/14	11/22/14	34	34.00
79	Upper Nigliq	A	1479A1	30.48	7.62	10/24/14	11/7/14	14	23.33
79	Nigliq Delta	B	1479B1	24.384	7.62	10/26/14	11/7/14	12	16.00
82	Nigliq Delta	A	1482A1	24.384	7.62	10/26/14	11/11/14	16	21.33
82	Nigliq Delta	B	1482B1	24.384	7.62	10/30/14	11/11/14	12	16.00
86	Main Colville	A	14A1	9.144	7.62	11/1/14	11/9/14	8	4.00
87	Main Colville	A	1487A1	24.384	7.62	11/4/14	11/22/14	18	24.00
87	Main Colville	B	1487B1	24.384	7.62	11/9/14	11/22/14	13	17.33
87	Main Colville	C	1487C1	24.384	7.62	11/4/14	11/22/14	18	24.00
88	Upper Nigliq	A	1488A1	24.384	7.62	10/24/14	11/30/14	37	49.33
88	Upper Nigliq	B	1488B1	24.384	7.62	11/1/14	11/9/14	8	10.67
88	Upper Nigliq	B	1488B2	24.384	7.62	11/11/14	11/30/14	19	25.33
88	Nigliq Delta	C	1488C1	24.384	7.62	11/11/14	11/18/14	7	9.33
89	Upper Nigliq	A	1489A1	18.288	7.62	10/19/14	10/22/14	3	3.00
89	Nigliq Delta	A	1489A2	18.288	7.62	10/23/14	11/7/14	15	15.00
89	Nigliq Delta	B	1489B1	24.384	7.62	10/23/14	11/7/14	15	20.00
89	Nigliq Delta	C	1489C1	24.384	7.62	10/25/14	11/7/14	13	17.33
89	Nigliq Delta	D	1489D1	24.384	8.89	10/25/14	11/7/14	13	17.33
89	Nigliq Delta	E	1489E1	24.384	7.62	10/31/14	11/16/14	16	21.33
89	Nigliq Delta	B	1489B2	24.384	7.62	11/10/14	11/16/14	6	8.00
100	Nanuq	A	14100A1	30.48	5.08	10/20/14	11/10/14	21	35.00
100	Nanuq	B	14100B1	24.384	8.89	11/11/14	11/18/14	7	9.33
101	Nigliq Delta	A	14101A1	30.48	7.62	10/31/14	11/7/14	7	11.67
Total									1,499.8

Appendix C. Ambient water chemistry at 3 m depth at 4 water stations on the Niġliq Channel, Colville River, Alaska, 24 October to 18 November 2014.

Date	Salinity Station	Salinity (ppt)	Water Temperature (°C)	Percent Oxygen	Oxygen Concentration (mg/L)	Specific Conductance (mS/cm)	pH
24 Oct	1	18.0	0.0	86.8	11.1	30.2	7.43
24 Oct	2	16.3	0.5	85	10.9	27.6	7.22
24 Oct	3	14.6	0.8	94.8	11.5	24.8	7.37
24 Oct	4	0.1	0.4	101.3	14.6	0.2	6.84
26 Oct	1	17.9	0.3	75.5	9.6	30.0	7.67
26 Oct	2	16.4	0.4	87	11.2	27.6	7.65
26 Oct	3	14.5	0.8	87.6	11.4	24.6	7.31
26 Oct	4	0.1	0.4	95.5	13.8	0.2	8.22
28 Oct	1	23.6	–1.1	93	11.9	39.2	7.75
28 Oct	2	17.8	0	87.5	11.4	29.9	7.63
28 Oct	3	14.7	0.6	93.3	12.1	25.0	7.44
28 Oct	4	6.9	0.5	94.6	13.0	12.4	7.62
30 Oct	1	24.3	–1.0	85.7	10.8	40.1	7.74
30 Oct	2	20.9	–0.5	88.3	11.3	34.8	7.63
30 Oct	3	15.2	0.6	87.4	11.3	25.8	7.59
30 Oct	4	9.8	0.6	91	12.2	17.0	7.12
1 Nov	1	24.3	–0.9	98	12.3	40.1	7.79
1 Nov	2	21.4	–0.5	93.9	12.0	35.6	7.63
1 Nov	3	15.8	0.6	98.5	12.6	26.8	7.63
1 Nov	4	10.3	0.6	98.4	13.4	17.9	7.19
3 Nov	1	24.5	–0.9	96.4	12.0	40.6	7.76
3 Nov	2	21.0	–0.4	96.8	12.3	34.9	7.7
3 Nov	3	16.3	0.4	97.5	12.5	27.5	7.57
3 Nov	4	10.1	0.6	100	13.4	17.7	7.5
6 Nov	1	24.3	–0.7	92.4	11.5	40.1	7.7
6 Nov	2	21.3	–0.4	91.9	11.5	35.4	7.56
6 Nov	3	16.9	0.4	94.9	11.9	28.5	7.38
6 Nov	4	10.6	0.7	96.9	12.8	18.5	7.67
8 Nov	1	20.7	–0.8	87.6	10.6	35.2	7.72
8 Nov	2	18.7	–0.3	90.6	11.7	31.2	7.72
8 Nov	3	17.5	0.3	91.6	11.7	29.4	7.62
8 Nov	4	10.7	0.8	98.4	13.1	18.8	7.25
10 Nov	1	21.8	–0.7	94.4	12.1	36.7	7.67
10 Nov	2	19.9	0.5	92.2	11.9	33.1	7.67

Appendix C. Continued.

Date	Water Station	Salinity (ppt)	Water Temperature (°C)	Percent Oxygen	Oxygen Concentration (mg/L)	Specific Conductance (mS/cm)	pH
10 Nov	3	17.8	0.3	93	11.8	29.9	7.51
10 Nov	4	11.1	0.8	98.1	12.5	19.4	7.38
12 Nov	1	22.9	–1.1	98.4	12.6	38.1	7.74
12 Nov	2	19.4	–0.7	91.6	11.8	32.6	7.73
12 Nov	3	18.5	0.1	93.2	11.9	31.1	7.65
12 Nov	4	12.3	0.8	96.3	12.5	21.2	7.44
14 Nov	1	23.6	–0.9	92.1	11.5	39.1	7.59
14 Nov	2	21.2	–0.4	87.5	11.2	35.2	7.68
14 Nov	3	18.7	0	87.2	11.2	31.4	7.65
14 Nov	4	13.0	0.6	90.8	11.9	22.4	7.63
16 Nov	1	23.4	–0.9	93.6	11.9	38.7	7.62
16 Nov	2	21.4	–0.5	88.3	11.2	35.8	7.62
16 Nov	3	19.0	0	87.6	11.2	31.8	7.64
16 Nov	4	13.1	0.6	86.1	11.3	22.5	7.31
18 Nov	1	24.1	–1.1	99.1	12.4	39.7	7.51
18 Nov	2	22.3	–0.7	89.1	11.3	37.1	7.6
18 Nov	3	19.1	–0.1	88.8	11.4	32.0	7.61
18 Nov	4	13.5	0.6	91.2	11.9	23.3	7.6

Appendix D-1. Water chemistry results from 3 sampling locations on 2 dates, November 3 (11/3) and November 18 (11/18), during the fall subsistence harvest of Arctic Cisco in the Niġliq Channel, Colville River, Alaska, 2014.

Analyte (µg/L)	Analytical Method	Reporting Limit	USEPA Drinking Water Standard (MCL[a])	USEPA Aquatic Life Standard (CCC[b])	ADEC Alaska Water Quality Standards	Downstream Water Chemistry Collection Site		Mid-Channel Water Chemistry Collection Site		Upstream Water Chemistry Collection Site	
						11/3	11/18	11/3	11/18	11/3	11/18
Arsenic	6020 - Metals (ICP/MS)	1.0	10	150	10	1.1	2.1	ND	1.4	ND	1.0
Barium	6020 - Metals (ICP/MS)	1.0	2,000	NEL	2,000	58	81	100	100	120	130
Cadmium	6020 - Metals (ICP/MS)	1.0	5	0	calculated[c]	ND	ND	ND	ND	ND	ND
Calcium	200.7 Rev 4.4 - Metals	0.001	NEL	NEL	NEL	0.290	0.290	0.200	0.250	0.150	0.180
Chromium	6020 - Metals (ICP/MS)	2.0	100	74	100	ND	ND	ND	ND	ND	ND
Lead	6020 - Metals (ICP/MS)	1.0	15	3	calculated[c]	ND	ND	ND	ND	ND	ND
Magnesium	200.7 Rev 4.4 - Metals	0.001	NEL	NEL	NEL	0.890	0.880	0.560	0.720	0.380	0.480
Mercury	7470A	0.0005	2.00	0.77	0.05	0.26	0.57	ND	ND	ND	ND
Selenium	6020 - Metals (ICP/MS)	1.0	50	5	5	2.7	4.3	ND	ND	ND	ND
Silver	6020 - Metals (ICP/MS)	1.0	NEL	NEL	calculated[c]	ND	ND	ND	ND	ND	ND
Nitrate Nitrite as Total Nitrogen	EPA 353.2	10	10,000	NEL	10,000	ND	ND	33	ND	24	ND
Diesel Range Organics	AK102 & AK 103	100	NEL	NEL	NEL	ND	ND[d]	ND	ND[d]	ND	ND[d]
Residual Range Organics	AK102 & AK 103	520	NEL	NEL	NEL	ND	ND[d]	ND	ND[d]	ND	ND[d]
Total water hardness	SM 2430B Hardness	0.0002	NEL	NEL	NEL	4.40	4.30	2.80	3.60	1.90	2.40

[a] Maximum Contaminent Level
[b] Criterion Continuous Concentration
[c] See Appendix D-2 for calculated values of the ADEC water quality standards for each sample collected. Refer to the "Methods" section of this report for a description of how these standards were calculated.
[d] Diesel range and residual range organics were processed past their hold times
NEL= No Established Limit
ND = Not detected at the reporting limit

Appendix D-2. Calculated Alaska water quality standards for total water hardness-dependent metals from 3 sampling locations on 2 dates, November 3 (11/3) and November 18 (11/18), during the fall subsistence harvest of Arctic Cisco in the Niġliq Channel, Colville River, Alaska, 2014.

			ADEC Alaska Water Quality Standardsa					
	USEPA Drinking Water Standard	USEPA Aquatic Life Standard	Downstream Water Chemistry Collection Site		Mid-Channel Water Chemistry Collection Site		Upstream Water Chemistry Collection Site	
Analyte (µg/L)	MCL[b]	CCC[c]	11/3	11/18	11/3	11/18	11/3	11/18
Total Water Hardness	—	—	4.40	4.30	2.80	3.60	1.90	2.40
Cadmium	5	0.25	4.47	4.39	3.20	3.85	2.40	2.85
Lead	15.0	2.5	50.0	50.0	50.0	50.0	50.0	50.0
Silver	NEL	NEL	2,539	2,441	1,167	1,798	599	895

[a] See “Methods” for description of ADEC Alaska Water Quality Standards calculation
[b] Maximum Contaminent Level
[c] Criterion Continuous Concentration
NEL= No Established Limit

Appendix E. Raw laboratory water chemistry results from Arctic Fox Laboratories, Inc., for samples collected from 4 locations during the fall subsistence harvest of Arctic Cisco, Niġliq Channel, Colville River, Alaska, November 2014.

Arctic Fox Environmental, Inc.
Pouch 340043 / Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146
arcticfox@astacalaska.com / www.arcticfoxenv.com

Analytical Services Order and Chain of Custody Form

85525

1114-1844

Client Name and Address:
ABR, INC.
P.O. BOX 24068
ANCHORASE, AK 99524

Contact Person:

Phone Number: (907) 344-6777 Fax Number: 907-770-1443

E-mail: JSEIGLE@ABRINC.COM

Project Name:

Data Deliverables:
Level I ☐ Level II ☐ Level III ☐ EDD/Format:

Requested Turnaround Time and Special Instructions:

Account Number:

P.O. or Contract Number: 14-162

Authorization Number:

Sampled By: JRR

PWS Number:

Send Results to ADEC: ☐ YES ☒ No

Client Sample ID	Date Sampled	Time Sampled	Matrix	AF Sample ID	Number of Containers	DRO / RRO	TOTAL METALS	TOTAL NITROGEN NO_3 NO_2	CA/mg Hardness 2/3/15				Preservative / Remarks
						NONE	NONE	NONE					←
Hydro 1-1	3 Nov 14	12:00		AF52840	1	X							1000 mL Glass
Hydro 1-2	3 Nov 14	12:00		AF52841	1		X		X				500 mL poly
Hydro 1-3		12:00		AF54842	1			X					500 mL poly
Hydro 3-1		12:40		AF54843	1	X							1000mL Glass
Hydro 3-2		12:40		AF54844	1		X		X				500 mL poly
Hydro 3-3		12:40		AF54845	1			X					500 mL poly
Hydro 4-1		15:20		AF54846	1	X							1000 mL Glass
Hydro 4-2		15:20		AF54847	1		X		X				500mL poly
Hydro 4-3		15:20		AF54848	1			X					500 mL poly

	Date	Time	Received By	Date	Time
Relinquished By (1): JOHN ROSE John Rose	4 Nov 14		Received By: 11/5/14	0930	
Relinquished By (2):	Date:	Time:	Received By:		
Relinquished By (3):	Date:	Time:	Received for lab by:		

TO BE COMPLETED BY LABORATORY

Location Received/ Temp on Arrival: ANC ☐ ____ °C FBK ☐ ____ °C PB ~~4.6~~ 5 °C 8178

Chain of Custody Seal ☐ INTACT ☐ BROKEN ☐ ABSENT

Shipping Bill Number: _____

Arctic Fox Environmental, Inc.
Pouch 340043 - Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146 / arcticfox@astacalaska.com

ABR Inc. environmental Research & Services
PO BOX 24068
Anchorage, Alaska 99524

Report Date: 12/26/2015
Date Arrived: 11/4/2014
Date Sampled: 11/3/2014
Time Sampled: see below
Collected By: JRR

Attn: Not Documented
Phone: (907) 223-2536
Fax: (907) 770-1443
Email: jseigle@abrinc.com

Arctic Fox Lab# AF52840-52848
Client Sample ID: See below
Location/Project: Not Documented
COC#: 85525
Sample Matrix: Water

Comments: Attached are the results for analysis of your samples.
These samples were analyzed by Test America in Beaverton, OR.
Tracking information is as follows:

ABR Sample ID: Hydro 1-1
Analysis Requested: DRO/RRO
Time Sampled: 1200
Arctic Fox ID: AF52840
Test America ID:250-22607-1

ABR Sample ID: Hydro 1-2
Analysis Requested: Total Metals, Ca/Mg Hardness
Time Sampled: 1200
Arctic Fox ID: AF52841
Test America ID:250-22607-2

ABR Sample ID: Hydro 1-3
Analysis Requested: Total Nitrogen
Time Sampled: 1200
Arctic Fox ID: AF52842
Test America ID:250-22607-3

ABR Sample ID: Hydro 3-1
Analysis Requested: DRO/RRO, Ca/Mg Hardness
Time Sampled: 1240
Arctic Fox ID: AF52843
Test America ID:250-22607-4

ABR Sample ID: Hydro 3-2
Analysis Requested: Total Metals
Time Sampled: 1240
Arctic Fox ID: AF52844
Test America ID:250-22607-5

ABR Sample ID: Hydro 3-3
Analysis Requested: Total Nitrogen
Time Sampled:1240
Arctic Fox ID: AF52845
Test America ID:250-22607-6

ABR Sample ID: Hydro 4-1
Analysis Requested: DRO/RRO
Time Sampled: 1520
Arctic Fox ID: AF52846
Test America ID:250-22607-7

ABR Sample ID: Hydro 4-2
Analysis Requested: Total Metals, Ca/Mg Hardness
Time Sampled: 1520
Arctic Fox ID: AF52847
Test America ID:250-22607-8

ABR Sample ID: Hydro 4-3
Analysis Requested: Total Nitrogen
Time Sampled: 1520
Arctic Fox ID: AF52848
Test America ID:250-22607-9

Reported By: Ralph E. Allphin/Michael J. Hawley/John M. Fot
Arctic Fox Environmental, Inc.

Arctic Fox Environmental, Inc.
Pouch 340043 / Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146
arcticfox@astacalaska.com / www.arcticfoxenv.com

Analytical Services Order and Chain of Custody Form

85525

1114-1844

Client Name and Address:
ABR, INC.
P.O. BOX 24068
ANCHORASE, AK 99524

Contact Person:

Phone Number: (907) 344-6777 Fax Number: 907-770-1443

E-mail: JSEIGLE@ABRINC.com

Project Name:

Data Deliverables:
Level I ☐ Level II ☐ Level III ☐ EDD/Format:

Requested Turnaround Time and Special Instructions:

Account Number:

P.O. or Contract Number: 14-162

Authorization Number:

Sampled By: JRR

PWS Number:

Send Results to ADEC:
☐ YES ☒ No

Client Sample ID	Date Sampled	Time Sampled	Matrix	AF Sample ID	Number of Containers	NONE DRO / RRO	NONE TOTAL METALS	NONE TOTAL NITROGEN NO_3 NO_2					Preservative / Remarks
Hydro 1-1	3 Nov 14	12:00		AF52840	1	X							1000 mL Glass
Hydro 1-2	3 Nov 14	12:00		AF52841	1		X						500 mL poly
Hydro 1-3		12:00		AF54842	1			X					500 mL Poly
Hydro 3-1		12:40		AF54843	1	X							1000mL Glass
Hydro 3-2		12:40		AF54844	1		X						500 mL poly
Hydro 3-3		12:40		AF54845	1			X					500 mL poly
Hydro 4-1		15:20		AF54846	1	X							1000 mL Glass
Hydro 4-2		15:20		AF54847	1		X						500mL Poly
Hydro 4-3		15:20		AF54848	1			X					500 mL poly

Relinquished By (1): John Rose	Date: 4 Nov 14	Time:	Received By: 11/5/14 0930
Relinquished By (2):	Date:	Time:	Received By:
Relinquished By (3):	Date:	Time:	Received for lab by:

TO BE COMPLETED BY LABORATORY

Location Received/ Temp on Arrival: ANC ☐ _____ °C FBK ☐ _____ °C PB ☐ 16.5 °C 8178

Chain of Custody Seal ☐ INTACT ☐ BROKEN ☐ ABSENT

Shipping Bill Number: _____

Page _____ of _____

Arctic Fox Environmental, Inc.
Pouch 340043 - Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146 / arcticfox@astacalaska.com

ABR Inc. environmental Research & Services
PO BOX 24068
Anchorage, Alaska 99524

Report Date: 11/20/2014
Date Arrived: 11/4/2014
Date Sampled: 11/3/2014
Time Sampled: see below
Collected By: JRR

Attn: Not Documented
Phone: (907) 223-2536
Fax: (907) 770-1443
Email: jseigle@abrinc.com

Arctic Fox Lab# AF52840-52848
Client Sample ID: See below
Location/Project: Not Documented
COC#: 85525
Sample Matrix: Water

Comments: Attached are the results for analysis of your samples.
These samples were analyzed by Test America in Beaverton, OR.
Tracking information is as follows:

ABR Sample ID: Hydro 1-1
Analysis Requested: DRO/RRO
Time Sampled: 1200
Arctic Fox ID: AF52840
Test America ID:250-22607-1

ABR Sample ID: Hydro 1-2
Analysis Requested: Total Metals
Time Sampled: 1200
Arctic Fox ID: AF52841
Test America ID:250-22607-2

ABR Sample ID: Hydro 1-3
Analysis Requested: Total Nitrogen
Time Sampled: 1200
Arctic Fox ID: AF52842
Test America ID:250-22607-3

ABR Sample ID: Hydro 3-1
Analysis Requested: DRO/RRO
Time Sampled: 1240
Arctic Fox ID: AF52843
Test America ID:250-22607-4

ABR Sample ID: Hydro 3-2
Analysis Requested: Total Metals
Time Sampled: 1240
Arctic Fox ID: AF52844
Test America ID:250-22607-5

ABR Sample ID: Hydro 3-3
Analysis Requested: Total Nitrogen
Time Sampled:1240
Arctic Fox ID: AF52845
Test America ID:250-22607-6

ABR Sample ID: Hydro 4-1
Analysis Requested: DRO/RRO
Time Sampled: 1520
Arctic Fox ID: AF52846
Test America ID:250-22607-7

ABR Sample ID: Hydro 4-2
Analysis Requested: Total Metals
Time Sampled: 1520
Arctic Fox ID: AF52847
Test America ID:250-22607-8

ABR Sample ID: Hydro 4-3
Analysis Requested: Total Nitrogen
Time Sampled: 1520
Arctic Fox ID: AF52848
Test America ID:250-22607-9

Reported By: Ralph E. Allphin/Michael J. Hawley/John M. Fot
Arctic Fox Environmental, Inc.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Tel: (503)906-9200

TestAmerica Job ID: 250-22607-1
Client Project/Site: 1114-1844/Coleville Fish Study

For:
Arctic Fox Environmental, Inc
Pouch 340043
Prudhoe Bay, Alaska 99734

Attn: Ralph Allphin

Vanessa Berry

Authorized for release by:
11/14/2014 4:12:26 PM

Vanessa Berry, Project Manager II
(503)906-9233
vanessa.berry@testamericainc.com

Table of Contents

Sample Summary

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
250-22607-1	AF52840 Hydro 1-1	Water	11/03/14 12:00	11/07/14 08:55
250-22607-2	AF52841 Hydro 1-2	Water	11/03/14 12:00	11/07/14 08:55
250-22607-3	AF52842 Hydro 1-3	Water	11/03/14 12:00	11/07/14 08:55
250-22607-4	AF52843 Hydro 3-1	Water	11/03/14 12:40	11/07/14 08:55
250-22607-5	AF52844 Hydro 3-2	Water	11/03/14 12:40	11/07/14 08:55
250-22607-6	AF52845 Hydro 3-3	Water	11/03/14 12:40	11/07/14 08:55
250-22607-7	AF52846 Hydro 4-1	Water	11/03/14 15:20	11/07/14 08:55
250-22607-8	AF52847 Hydro 4-2	Water	11/03/14 15:20	11/07/14 08:55
250-22607-9	AF52848 Hydro 4-3	Water	11/03/14 15:20	11/07/14 08:55

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-1

Job ID: 250-22607-1

Laboratory: TestAmerica Portland

Narrative

Job Narrative
250-22607-1

Comments
No additional comments.

Receipt
The samples were received on 11/7/2014 8:55 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.8º C.

Except:

The following samples were received unpreserved and were preserved upon receipt to the laboratory: AF52841 Hydro 1-2 (250-22607-2), AF52844 Hydro 3-2 (250-22607-5), AF52847 Hydro 4-2 (250-22607-8). Regulatory documents require a 24-hour waiting period from the time of the addition of the acid preservative to the time of digestion. PSS 11/7/14@1015 M039

GC Semi VOA
Method(s) AK102 & 103: 250-32172 MB, LCS/LSCD surrogate recoveries were outside of acceptance limits for Triacontane. Samples in the batch had passing surrogate recoveries. Target analyte recoveries in LCS/LCSD were within lab control limits. The low Triacontane recovery in batch QC samples had limited negative impact on sample results. (LCS 250-32172/2-A), (LCSD 250-32172/3-A), (MB 250-32172/1-A), AF52840 Hydro 1-1 (250-22607-1), AF52843 Hydro 3-1 (250-22607-4), AF52846 Hydro 4-1 (250-22607-7). There was insufficient sample to perform a re-extraction; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client Sample ID: AF52840 Hydro 1-1

Lab Sample ID: 250-22607-1

Date Collected: 11/03/14 12:00

Matrix: Water

Date Received: 11/07/14 08:55

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (C10-C25)	ND		0.12		mg/L		11/12/14 09:12	11/12/14 16:27	1
RRO (nC25-nC36)	ND		0.61		mg/L		11/12/14 09:12	11/12/14 16:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triacontane	*67*		*50 - 150*	*11/12/14 09:12*	*11/12/14 16:27*	*1*
1-Chlorooctadecane	*99*		*50 - 150*	*11/12/14 09:12*	*11/12/14 16:27*	*1*

Client Sample ID: AF52841 Hydro 1-2

Lab Sample ID: 250-22607-2

Date Collected: 11/03/14 12:00

Matrix: Water

Date Received: 11/07/14 08:55

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.0011**		0.0010		mg/L		11/08/14 15:10	11/09/14 21:47	1
Barium	**0.058**		0.0010		mg/L		11/08/14 15:10	11/09/14 21:47	1
Chromium	ND		0.0020		mg/L		11/08/14 15:10	11/09/14 21:47	1
Lead	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 21:47	1
Silver	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 21:47	1
Selenium	**0.0027**		0.0010		mg/L		11/08/14 15:10	11/09/14 21:47	1
Cadmium	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 21:47	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.00026**		0.00020		mg/L		11/11/14 14:33	11/11/14 23:46	1

Client Sample ID: AF52842 Hydro 1-3

Lab Sample ID: 250-22607-3

Date Collected: 11/03/14 12:00

Matrix: Water

Date Received: 11/07/14 08:55

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	ND		0.010		mg/L			11/12/14 17:40	1

Client Sample ID: AF52843 Hydro 3-1

Lab Sample ID: 250-22607-4

Date Collected: 11/03/14 12:40

Matrix: Water

Date Received: 11/07/14 08:55

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (C10-C25)	ND		0.10		mg/L		11/12/14 09:12	11/12/14 16:46	1
RRO (nC25-nC36)	ND		0.52		mg/L		11/12/14 09:12	11/12/14 16:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triacontane	*104*		*50 - 150*	*11/12/14 09:12*	*11/12/14 16:46*	*1*
1-Chlorooctadecane	*89*		*50 - 150*	*11/12/14 09:12*	*11/12/14 16:46*	*1*

Client Sample ID: AF52844 Hydro 3-2

Lab Sample ID: 250-22607-5

Date Collected: 11/03/14 12:40

Matrix: Water

Date Received: 11/07/14 08:55

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:01	1
Barium	**0.10**		0.0010		mg/L		11/08/14 15:10	11/09/14 22:01	1
Chromium	ND		0.0020		mg/L		11/08/14 15:10	11/09/14 22:01	1
Lead	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:01	1
Silver	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:01	1
Selenium	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:01	1
Cadmium	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:01	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020		mg/L		11/11/14 14:33	11/11/14 23:38	1

Client Sample ID: AF52845 Hydro 3-3

Lab Sample ID: 250-22607-6

Date Collected: 11/03/14 12:40

Matrix: Water

Date Received: 11/07/14 08:55

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	**0.033**		0.010		mg/L			11/12/14 17:45	1

Client Sample ID: AF52846 Hydro 4-1

Lab Sample ID: 250-22607-7

Date Collected: 11/03/14 15:20

Matrix: Water

Date Received: 11/07/14 08:55

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (C10-C25)	ND		0.10		mg/L		11/12/14 09:12	11/12/14 17:04	1
RRO (nC25-nC36)	ND		0.50		mg/L		11/12/14 09:12	11/12/14 17:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triacontane	*53*		*50 - 150*	*11/12/14 09:12*	*11/12/14 17:04*	*1*
1-Chlorooctadecane	*84*		*50 - 150*	*11/12/14 09:12*	*11/12/14 17:04*	*1*

Client Sample ID: AF52847 Hydro 4-2

Lab Sample ID: 250-22607-8

Date Collected: 11/03/14 15:20

Matrix: Water

Date Received: 11/07/14 08:55

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:33	1
Barium	**0.12**		0.0010		mg/L		11/08/14 15:10	11/09/14 22:33	1
Chromium	ND		0.0020		mg/L		11/08/14 15:10	11/09/14 22:33	1
Lead	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:33	1
Silver	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:33	1
Selenium	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:33	1
Cadmium	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 22:33	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020		mg/L		11/11/14 14:33	11/11/14 23:36	1

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-1

Client Sample ID: AF52848 Hydro 4-3
Date Collected: 11/03/14 15:20
Date Received: 11/07/14 08:55

Lab Sample ID: 250-22607-9
Matrix: Water

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	0.024		0.010		mg/L			11/12/14 17:46	1

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Lab Sample ID: MB 250-32172/1-A
Matrix: Water
Analysis Batch: 32187

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 32172

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (C10-C25)	ND		0.10		mg/L		11/12/14 09:12	11/12/14 15:32	1
RRO (nC25-nC36)	ND		0.50		mg/L		11/12/14 09:12	11/12/14 15:32	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triacontane	*29*	*X*	*50 - 150*	*11/12/14 09:12*	*11/12/14 15:32*	*1*
1-Chlorooctadecane	*88*		*50 - 150*	*11/12/14 09:12*	*11/12/14 15:32*	*1*

Lab Sample ID: LCS 250-32172/2-A
Matrix: Water
Analysis Batch: 32187

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 32172

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
DRO (C10-C25)			2.50	2.08		mg/L		83	75 - 125		
RRO (nC25-nC36)			1.50	1.49		mg/L		100	60 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Triacontane	*42*	*X*	*50 - 150*
1-Chlorooctadecane	*86*		*50 - 150*

Lab Sample ID: LCSD 250-32172/3-A
Matrix: Water
Analysis Batch: 32187

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 32172

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
DRO (C10-C25)			2.50	2.17		mg/L		87	75 - 125	4	20
RRO (nC25-nC36)			1.50	1.50		mg/L		100	60 - 120	0	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
Triacontane	*40*	*X*	*50 - 150*
1-Chlorooctadecane	*93*		*50 - 150*

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 250-32059/1-A
Matrix: Water
Analysis Batch: 32078

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 32059

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 20:19	1
Barium	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 20:19	1
Chromium	ND		0.0020		mg/L		11/08/14 15:10	11/09/14 20:19	1
Lead	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 20:19	1
Silver	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 20:19	1
Selenium	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 20:19	1
Cadmium	ND		0.0010		mg/L		11/08/14 15:10	11/09/14 20:19	1

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 250-32059/2-A
Matrix: Water
Analysis Batch: 32078

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 32059

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	0.100	0.0995		mg/L		100	80 - 120
Barium	0.100	0.0954		mg/L		95	80 - 120
Chromium	0.100	0.0996		mg/L		100	80 - 120
Lead	0.100	0.0997		mg/L		100	80 - 120
Silver	0.0500	0.0486		mg/L		97	80 - 120
Selenium	0.100	0.0942		mg/L		94	80 - 120
Cadmium	0.100	0.0960		mg/L		96	80 - 120

Lab Sample ID: 250-22607-2 MS
Matrix: Water
Analysis Batch: 32078

Client Sample ID: AF52841 Hydro 1-2
Prep Type: Total/NA
Prep Batch: 32059

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	0.0011		0.100	0.0965		mg/L		95	75 - 125
Barium	0.058		0.100	0.161		mg/L		103	75 - 125
Chromium	ND		0.100	0.104		mg/L		104	75 - 125
Lead	ND		0.100	0.0799		mg/L		80	75 - 125
Silver	ND		0.0500	0.0431		mg/L		86	75 - 125
Selenium	0.0027		0.100	0.0911		mg/L		88	75 - 125
Cadmium	ND		0.100	0.0842		mg/L		84	75 - 125

Lab Sample ID: 250-22563-H-1-B DU
Matrix: Water
Analysis Batch: 32078

Client Sample ID: Duplicate
Prep Type: Total/NA
Prep Batch: 32059

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Arsenic	0.0021		0.00220		mg/L		2	20
Barium	0.54		0.557		mg/L		3	20
Chromium	ND		ND		mg/L		NC	20
Lead	0.0034		0.00347		mg/L		1	20
Silver	ND		ND		mg/L		NC	20
Selenium	ND		ND		mg/L		NC	20
Cadmium	0.0016		0.00158		mg/L		0.6	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 250-32150/11-A
Matrix: Water
Analysis Batch: 32166

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 32150

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020		mg/L		11/11/14 14:33	11/11/14 23:15	1

Lab Sample ID: LCS 250-32150/12-A
Matrix: Water
Analysis Batch: 32166

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 32150

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00509		mg/L		102	85 - 115

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: 250-22660-H-4-C MS — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 32166 — **Prep Batch: 32150**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		0.00500	0.00495		mg/L		99	75 - 125

Lab Sample ID: 250-22660-H-4-D MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 32166 — **Prep Batch: 32150**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		0.00500	0.00491		mg/L		98	75 - 125	1	20

Method: 353.2 - Nitrogen, Nitrate-Nitrite

Lab Sample ID: MB 580-175653/14 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 175653

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	ND		0.010		mg/L			11/12/14 17:37	1

Lab Sample ID: LCS 580-175653/15 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 175653

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate Nitrite as N	1.00	1.00		mg/L		100	90 - 110

Lab Sample ID: LCSD 580-175653/16 — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 175653

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate Nitrite as N	1.00	0.994		mg/L		99	90 - 110	1	20

Lab Sample ID: 250-22607-3 MS — **Client Sample ID: AF52842 Hydro 1-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 175653

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrate Nitrite as N	ND		1.00	0.964		mg/L		96	60 - 130

Lab Sample ID: 250-22607-3 MSD — **Client Sample ID: AF52842 Hydro 1-3**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 175653

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nitrate Nitrite as N	ND		1.00	0.975		mg/L		98	60 - 130	1	20

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-1

Method: 353.2 - Nitrogen, Nitrate-Nitrite (Continued)

Lab Sample ID: 250-22607-3 DU
Matrix: Water
Analysis Batch: 175653

Client Sample ID: AF52842 Hydro 1-3
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Nitrate Nitrite as N	ND			0.0196		mg/L				NC	20

Qualifiers

GC Semi VOA

Qualifier	Qualifier Description
X	Surrogate is outside control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Certification Summary

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-1

Laboratory: TestAmerica Portland

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-012	12-26-14
California	State Program	9	2597	09-30-15
Oregon	NELAP	10	OR100021	01-09-15
USDA	Federal		P330-11-00092	04-17-17
Washington	State Program	10	C586	06-23-15

Laboratory: TestAmerica Seattle

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-022	03-04-15
California	State Program	9	2901	01-31-15
L-A-B	DoD ELAP		L2236	01-19-16
L-A-B	ISO/IEC 17025		L2236	01-19-16
Montana (UST)	State Program	8	N/A	04-30-20
Oregon	NELAP	10	WA100007	11-06-15
USDA	Federal		P330-11-00222	04-08-17
Washington	State Program	10	C553	02-17-15

TestAmerica Portland
9405 SW Nimbus Avenue

Beaverton, OR 97008
phone 503.906.9200 fax 503.906.9210

Chai

250-22607 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NP

Client Contact	Project Manager: John Fot/Mike Hawley	Site Contact:	Lab Contact: John Fot/Mike Hawley	Carrier: 5/14 GOLDSTREAK	COC No:
Arctic Fox Environmental	Tel/Fax: 907-659-2145				1 of 1 COCs
Pouch 340043	Analysis Turnaround Time				Sampler: JRR
Prudhoe Bay, AK 99734	☑ CALENDAR DAYS ☐ WORKING DAYS				For Lab Use Only:
Phone 907-659-2145	TAT if different from Below _____				Walk-in Client: No
FAX 907-659-2146	☐ 2 weeks				Lab Sampling: No
Project Name: COLVILLE FISH STUDY	☒ 1 week				
Site: NUIQSUIT	☐ 2 days				Job / SDG No.:
P O # 1114-1844	☐ 1 day				

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	DRO/RRO	TOTAL METALS	NO2/NO3 NITRATES	Sample Specific Notes:
AFS2840	11/3/14	1200	G	L	1	N	Y				HYDRO 1-1
AFS2841									Y		HYDRO 1-2
AFS2842										Y	HYDRO 1-3
AFS2843		1240						Y			HYDRO 3-1
AFS2844									Y		HYDRO 3-2
AFS2845										Y	HYDRO 3-3
AFS2846		1520						Y			HYDRO 4-1
AFS2847									Y		HYDRO 4-2
AFS2848										Y	HYDRO 4-3

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4= HNO3; 5= NaOH; 6= Other

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

4.0 3.8 dig: 1/3

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:		Cooler Temp. (°C): Obs'd: _____ Corr'd: _____ Therm ID No.: _____		
Relinquished by:	Company: AFS	Date/Time: 11/5/14 1400	Received by:	Company: TAP	Date/Time: 11/7/14 0855
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.2, dated 04/02/2013

11/14/2014

Login Sample Receipt Checklist

Client: Arctic Fox Environmental, Inc

Job Number: 250-22607-1

Login Number: 22607

List Source: TestAmerica Portland

List Number: 1

Creator: Svabik-Seror, Philip M

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	False	No HNO3 volume provided for metals analsysi.
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	N/A	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Arctic Fox Environmental, Inc

Job Number: 250-22607-1

Login Number: 22607
List Number: 2
Creator: Abello, Andrea N

List Source: TestAmerica Seattle
List Creation: 11/08/14 11:09 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	A2TB = 0.1 / 0.4
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Tel: (503)906-9200

TestAmerica Job ID: 250-22607-2
Client Project/Site: 1114-1844/Coleville Fish Study

For:
Arctic Fox Environmental, Inc
Pouch 340043
Prudhoe Bay, Alaska 99734

Attn: Ralph Allphin

Kelly A. Garretts

Authorized for release by:
2/20/2015 9:33:08 AM

Kelly Garretts, Project Manager II
(253)248-4961
kelly.garretts@testamericainc.com

Table of Contents

Sample Summary

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
250-22607-2	AF52841 Hydro 1-2	Water	11/03/14 12:00	11/07/14 08:55
250-22607-5	AF52844 Hydro 3-2	Water	11/03/14 12:40	11/07/14 08:55
250-22607-8	AF52847 Hydro 4-2	Water	11/03/14 15:20	11/07/14 08:55

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-2

Job ID: 250-22607-2

Laboratory: TestAmerica Portland

Narrative

Job Narrative
250-22607-2

Comments
No additional comments.

Receipt
The samples were received on 11/7/2014 8:55 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.8º C.

Except:

The following samples were received unpreserved and were preserved upon receipt to the laboratory: AF52841 Hydro 1-2 (250-22607-2), AF52844 Hydro 3-2 (250-22607-5), AF52847 Hydro 4-2 (250-22607-8). Regulatory documents require a 24-hour waiting period from the time of the addition of the acid preservative to the time of digestion.

PSS 11/7/14@1015 M039

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-2

Client Sample ID: AF52841 Hydro 1-2

Lab Sample ID: 250-22607-2

Date Collected: 11/03/14 12:00
Matrix: Water
Date Received: 11/07/14 08:55

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	290		1.0		mg/L		02/18/15 07:27	02/19/15 02:35	10
Magnesium	890		1.0		mg/L		02/18/15 07:27	02/19/15 02:35	10

Method: SM 2340B - Hardness, Calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness	4400		0.20		mg/L			02/19/15 21:28	1
Calcium hardness as calcium carbonate	720		0.20		mg/L			02/19/15 21:28	1
Magnesium hardness as calcium carbonate	3600		0.20		mg/L			02/19/15 21:28	1

Client Sample ID: AF52844 Hydro 3-2

Lab Sample ID: 250-22607-5

Date Collected: 11/03/14 12:40
Matrix: Water
Date Received: 11/07/14 08:55

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	200		1.0		mg/L		02/18/15 07:27	02/19/15 02:42	10
Magnesium	560		1.0		mg/L		02/18/15 07:27	02/19/15 02:42	10

Method: SM 2340B - Hardness, Calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness	2800		0.20		mg/L			02/19/15 21:28	1
Calcium hardness as calcium carbonate	500		0.20		mg/L			02/19/15 21:28	1
Magnesium hardness as calcium carbonate	2300		0.20		mg/L			02/19/15 21:28	1

Client Sample ID: AF52847 Hydro 4-2

Lab Sample ID: 250-22607-8

Date Collected: 11/03/14 15:20
Matrix: Water
Date Received: 11/07/14 08:55

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	150		1.0		mg/L		02/18/15 07:27	02/19/15 02:54	10
Magnesium	380		1.0		mg/L		02/18/15 07:27	02/19/15 02:54	10

Method: SM 2340B - Hardness, Calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness	1900		0.20		mg/L			02/19/15 21:28	1
Calcium hardness as calcium carbonate	380		0.20		mg/L			02/19/15 21:28	1
Magnesium hardness as calcium carbonate	1600		0.20		mg/L			02/19/15 21:28	1

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-2

Method: 200.7 Rev 4.4 - Metals (ICP)

Lab Sample ID: MB 250-34496/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 34561 — **Prep Batch: 34496**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		0.10		mg/L		02/18/15 07:27	02/19/15 00:43	1
Magnesium	ND		0.10		mg/L		02/18/15 07:27	02/19/15 00:43	1

Lab Sample ID: LCS 250-34496/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 34561 — **Prep Batch: 34496**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	20.0	20.8		mg/L		104	85 - 115
Magnesium	20.0	20.7		mg/L		104	85 - 115

Lab Sample ID: 250-22607-5 MS — **Client Sample ID: AF52844 Hydro 3-2**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 34561 — **Prep Batch: 34496**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	200		20.0	226	4	mg/L		121	75 - 125
Magnesium	560		20.0	589	4	mg/L		155	75 - 125

Lab Sample ID: 250-22991-E-3-D DU — **Client Sample ID: Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 34561 — **Prep Batch: 34496**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Calcium	180		196		mg/L		7	20
Magnesium	480		511		mg/L		7	20

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-2

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Certification Summary

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1844/Coleville Fish Study

TestAmerica Job ID: 250-22607-2

Laboratory: TestAmerica Portland

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-012	12-26-15
California	State Program	9	2597	09-30-15
Oregon	NELAP	10	OR100021	01-09-16
USDA	Federal		P330-11-00092	04-17-17
Washington	State Program	10	C586	06-23-15

Login Sample Receipt Checklist

Client: Arctic Fox Environmental, Inc

Job Number: 250-22607-2

Login Number: 22607

List Source: TestAmerica Portland

List Number: 1

Creator: Svabik-Seror, Philip M

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	False	No HNO3 volume provided for metals analsysi.
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	N/A	
Residual Chlorine Checked.	N/A	

Arctic Fox Environmental, Inc.
Pouch 340043 / Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146
arcticfox@astacalaska.com / www.arcticfoxenv.com

Analytical Services Order and Chain of Custody Form

85525

1114-1844

Client Name and Address:
ABR, INC.
P.O. BOX 24068
ANCHORASE, AK 99524

Contact Person:

Phone Number: (907) 344-6777 Fax Number: 907-770-1443

E-mail: JSEIGLE@ABRINC.COM

Project Name:

Data Deliverables:
Level I ☐ Level II ☐ Level III ☐ EDD/Format:

Requested Turnaround Time and Special Instructions:

Account Number:

P.O. or Contract Number: 14-162

Authorization Number:

Sampled By: JRR

PWS Number:

Send Results to ADEC: ☐ YES ☒ No

Client Sample ID	Date Sampled	Time Sampled	Matrix	AF Sample ID	Number of Containers	DRO / RRO	TOTAL METALS	TOTAL NITROGEN NO_3 NO_2	CA/mg Hardness 2/3/15				Preservative / Remarks
						NONE	NONE	NONE					←
Hydro 1-1	3 Nov 14	12:00		AF52840	1	X							1000 mL Glass
Hydro 1-2	3 Nov 14	12:00		AF52841	1		X		X				500 mL poly
Hydro 1-3		12:00		AF54842	1			X					500 mL poly
Hydro 3-1		12:40		AF54843	1	X							1000mL Glass
Hydro 3-2		12:40		AF54844	1		X		X				500 mL poly
Hydro 3-3		12:40		AF54845	1			X					500 mL poly
Hydro 4-1		15:20		AF54846	1	X							1000 mL Glass
Hydro 4-2		15:20		AF54847	1		X		X				500mL poly
Hydro 4-3		15:20		AF54848	1			X					500 mL poly

	Date	Time	Received By	Date	Time
Relinquished By (1): JOHN ROSE John Rose	4 Nov 14		Received By: 11/5/14	0930	
Relinquished By (2):	Date:	Time:	Received By:		
Relinquished By (3):	Date:	Time:	Received for lab by:		

TO BE COMPLETED BY LABORATORY

Location Received/ Temp on Arrival: ANC ☐ ____ °C FBK ☐ ____ °C PB ~~4.6~~ 5 °C 8178

Chain of Custody Seal ☐ INTACT ☐ BROKEN ☐ ABSENT

Shipping Bill Number: _____

Arctic Fox Environmental, Inc.
Pouch 340043 / Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146
arcticfox@pobtacalaska.com / www.arcticfoxenv.com

Analytical Services Order and Chain of Custody Form

85526

1114-1860

Client Name and Address: ABR, INC. ENVIRONMENTAL RESEARCH AND SERVICES P.O. Box 240268 ANCHORAGE, AK 99524 Contact Person: JOHN SEIGLE				Account Number:										Preservative
				P.O. or Contract Number: 14-162	Number of Containers	NITRITES/NITRITE	DRO/RRO	TOTAL METALS	Calcium Hardness 2/13/15					
				Authorization Number:										
Phone Number: 907-344-6777 Fax Number: 907-770-1443				Sampled By: JCS, JRR										
E-mail: JSEIGLE@ABRINC.COM				PWS Number:										
Project Name: COLVILLE FALL FISHERY														
Data Deliverables: Level I ☐ Level II ☐ Level III ☐ EDD/Format:				Send Results to ADEC: ☐ YES ☒ No										
Requested Turnaround Time and Special Instructions:														
Client Sample ID	**Date Sampled**	**Time Sampled**	**Matrix**	**AF Sample ID**										Remarks
HYDRO 1-1	18 Nov 14	15:30	W	AF52919	1	X								500 mL poly
HYDRO 1-2	18 Nov 14	15:30	W	↓	1		X		*					1000 mL GLASS
HYDRO 1-3	"	15:30		↓	1			X	X					500 mL poly
HYDRO 3-1	"	16:30		AF52920	1	X								500 mL poly
HYDRO 3-2	"	16:30		↓	1		X							1000 mL GLASS
HYDRO 3-3	"	16:30		↓	1			X	X					500 mL poly
HYDRO 4-1	"	17:00		AF52921	1	X								500mL poly
HYDRO 4-2	"	17:00		↓	1		X							1000 mL GLASS
HYDRO 4-3	"	17:00		↓	1			X	X					500mL poly
Relinquished By (1): JOHN SEIGLE	Date: 11/19/2014	Time: 11:10am	Received By: Mark Hall Mark.		TO BE COMPLETED BY LABORATORY									
Relinquished By (2):	Date: 11/25/14	Time: 1430	Received By: Mark Hall		Location Received/ Temp on Arrival: ANC ☐ ____°C FBK ☐ ____°C PB ☐ 5.9 °C 8178									
Relinquished By (3):	Date:	Time:	Received for lab by:		Chain of Custody Seal ☐ INTACT ☐ BROKEN ☐ ABSENT									
					Shipping Bill Number:									

Arctic Fox Environmental, Inc.
Pouch 340043 - Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146 / arcticfox@astacalaska.com

ABR Inc. environmental Research & Services
PO BOX 24068
Anchorage, Alaska 99524

Report Date: 2/26/2015
Date Arrived: 11/25/2014
Date Sampled: 11/18/2014
Time Sampled: see below
Collected By: JCS, JRR

Attn: John Sigle
Phone: (907) 344-6777
Fax: (907) 770-1443
Email: jseigle@abrinc.com

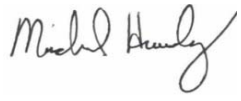
Arctic Fox Lab# AF52919-52921
Client Sample ID: See below
Location/Project: Colville Fall Fishery
COC#: 85526
Sample Matrix: Water

Comments: Attached are the results for analysis of your samples.
These samples were analyzed by Test America in Beaverton, OR.
Tracking information is as follows:

ABR Sample ID: Hydro 1-1; 1-2; and 1-3
Analysis : Nitrate/Nitrite, DRO/RRO, Total Metals
Ca/Mg Hardness
Time Sampled: 1530
Arctic Fox ID: AF52919
Test America ID: 250-22991-1

ABR Sample ID: Hyrdo 3-1; 3-2; and 3-3
Analysis : Nitrate/Nitrite, DRO/RRO, Total Metals
Ca/Mg Hardness
Time Sampled: 1630
Arctic Fox ID: AF52920
Test America ID: 250-22991-2

ABR Sample ID: Hydro 4-1; 4-2; and 4-3
Analysis : Nitrate/Nitrite, DRO/RRO, Total Metals
Ca/Mg Hardness
Time Sampled: 1700
Arctic Fox ID: AF52921
Test America ID: 250-22991-3



Reported By: Ralph E. Allphin/Michael J. Hawley/John M. Fot
Arctic Fox Environmental, Inc.

Arctic Fox Environmental, Inc.
Pouch 340043 / Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146
arcticfox@astacalaska.com / www.arcticfoxenv.com

Analytical Services Order and Chain of Custody Form

85526

1114-1860

Client Name and Address: ABR, INC. ENVIRONMENTAL RESEARCH AND SERVICES
P.O. Box 240068 ANCHORAGE, AK 99524

Contact Person: JOHN SEISLE

Phone Number: 907-344-6777 Fax Number: 907-770-1443

E-mail: JSEISLE@ABRINC.COM

Project Name: COLVILLE FALL FISHERY

Data Deliverables: Level I ☐ Level II ☐ Level III ☐ EDD/Format:

Requested Turnaround Time and Special Instructions:

Account Number:

P.O. or Contract Number: 14-162

Authorization Number:

Sampled By: JCS, JRR

PWS Number:

Send Results to ADEC: ☐ YES ☒ No

Client Sample ID	Date Sampled	Time Sampled	Matrix	AF Sample ID	Number of Containers	NITRATES/NITRITES	DRO/RRO	TOTAL METALS					Preservative / Remarks
HYDRO 1-1	18 Nov 14	15:30	W	AF52919	1	X							500 mL poly
HYDRO 1-2	18 Nov 14	15:30	W		1		X						1000 mL GLASS
HYDRO 1-3	"	15:30			1			X					500 mL poly
HYDRO 3-1	"	16:30		AF52920	1	X							500 mL poly
HYDRO 3-2	"	16:30			1		X						1000 mL GLASS
HYDRO 3-3	"	16:30			1			X					500 mL poly
HYDRO 4-1	"	17:00		AF52921	1	X							500mL poly
HYDRO 4-2	"	17:00			1		X						1000 mL GLASS
HYDRO 4-3	"	17:00			1			X					500mL poly

	Date:	Time:	
Relinquished By (1): JOHN SEISLE	11/19/2014	11:10am	Received By: Mark.
Relinquished By (2):	11/25/14	1430	Received By:
Relinquished By (3):	Date:	Time:	Received for lab by:

TO BE COMPLETED BY LABORATORY

Location Received/ Temp on Arrival: ANC ☐ ____ °C FBK ☐ ____ °C PB ☐ 5.9 °C

8178

Chain of Custody Seal ☐ INTACT ☐ BROKEN ☐ ABSENT

Shipping Bill Number: _____

Arctic Fox Environmental, Inc.
Pouch 340043 - Prudhoe Bay, AK 99734
Phone: (907) 659-2145 / Fax: (907) 659-2146 / arcticfox@astacalaska.com

ABR Inc. environmental Research & Services
PO BOX 24068
Anchorage, Alaska 99524

Report Date: 12/8/2014
Date Arrived: 11/25/2014
Date Sampled: 11/18/2014
Time Sampled: see below
Collected By: JCS, JRR

Attn: John Sigle
Phone: (907) 344-6777
Fax: (907) 770-1443
Email: jseigle@abrinc.com

Arctic Fox Lab# AF52919-52921
Client Sample ID: See below
Location/Project: Colville Fall Fishery
COC#: 85526
Sample Matrix: Water

Comments: Attached are the results for analysis of your samples.
These samples were analyzed by Test America in Beaverton, OR.
Tracking information is as follows:

ABR Sample ID: Hydro 1-1; 1-2; and 1-3
Analysis : Nitrate/Nitrite, DRO/RRO, Total Metals
Time Sampled: 1530
Arctic Fox ID: AF52919
Test America ID: 250-22991-1

ABR Sample ID: Hyrdo 3-1; 3-2; and 3-3
Analysis : Nitrate/Nitrite, DRO/RRO, Total Metals
Time Sampled: 1630
Arctic Fox ID: AF52920
Test America ID: 250-22991-2

ABR Sample ID: Hydro 4-1; 4-2; and 4-3
Analysis : Nitrate/Nitrite, DRO/RRO, Total Metals
Time Sampled: 1700
Arctic Fox ID: AF52921
Test America ID: 250-22991-3

John M Fot

Reported By: Ralph E. Allphin/Michael J. Hawley/John M. Fot
Arctic Fox Environmental, Inc.

Case Narrative

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1860/Coleville Fall Fishery

TestAmerica Job ID: 250-22991-1

Job ID: 250-22991-1

Laboratory: TestAmerica Portland

Narrative

Job Narrative
250-22991-1

Comments
No additional comments.

Receipt
The samples were received on 11/26/2014 8:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.2° C.

Except:

Only unpreserved volume received for all analyses. Containers poured off into HNO3 250mL poly (lot number N039) and H2SO4 250mL poly (lot number N004). PSS 11/26/14@1310, F52919 Hydro 1 (250-22991-1), AF52920 Hydro 3 (250-22991-2), AF52921 Hydro 4 (250-22991-3)

The following sample(s) was received outside of holding time for DRO/RRO extraction because samples were received in unpreserved sample containers. The client was contacted regarding this issue, and the laboratory was instructed to proceed with analysis: AF52919 Hydro 1 (250-22991-1), AF52920 Hydro 3 (250-22991-2), AF52921 Hydro 4 (250-22991-3).

The following samples were received unpreserved and were preserved upon receipt to the laboratory: AF52919 Hydro 1 (250-22991-1), AF52920 Hydro 3 (250-22991-2), AF52921 Hydro 4 (250-22991-3). Regulatory documents require a 24-hour waiting period from the time of the addition of the acid preservative to the time of digestion. PSS 11/26/14@1310

GC Semi VOA
Method(s) AK102 & 103: The following sample(s) were received outside of holding time: AF52919 Hydro 1 (250-22991-1), AF52920 Hydro 3 (250-22991-2), AF52921 Hydro 4 (250-22991-3).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client Sample ID: AF52919 Hydro 1

Lab Sample ID: 250-22991-1

Date Collected: 11/18/14 15:30

Matrix: Water

Date Received: 11/26/14 08:45

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (C10-C25)	ND	H	0.11		mg/L		12/03/14 14:24	12/04/14 11:17	1
RRO (nC25-nC36)	ND	H	0.56		mg/L		12/03/14 14:24	12/04/14 11:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triacontane	*67*		*50 - 150*	*12/03/14 14:24*	*12/04/14 11:17*	*1*
1-Chlorooctadecane	*85*		*50 - 150*	*12/03/14 14:24*	*12/04/14 11:17*	*1*

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.0021**		0.0010		mg/L		11/30/14 15:52	12/01/14 16:24	1
Barium	**0.081**		0.0010		mg/L		11/30/14 15:52	12/01/14 16:24	1
Chromium	ND		0.0020		mg/L		11/30/14 15:52	12/01/14 16:24	1
Lead	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:24	1
Silver	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:24	1
Selenium	**0.0043**		0.0010		mg/L		11/30/14 15:52	12/01/14 16:24	1
Cadmium	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:24	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.00057**		0.00020		mg/L		12/02/14 16:00	12/02/14 20:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	ND		0.10		mg/L			11/29/14 13:43	1

Client Sample ID: AF52920 Hydro 3

Lab Sample ID: 250-22991-2

Date Collected: 11/18/14 16:30

Matrix: Water

Date Received: 11/26/14 08:45

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (C10-C25)	ND	H	0.11		mg/L		12/03/14 14:24	12/04/14 11:36	1
RRO (nC25-nC36)	ND	H	0.54		mg/L		12/03/14 14:24	12/04/14 11:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triacontane	*68*		*50 - 150*	*12/03/14 14:24*	*12/04/14 11:36*	*1*
1-Chlorooctadecane	*84*		*50 - 150*	*12/03/14 14:24*	*12/04/14 11:36*	*1*

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.0014**		0.0010		mg/L		11/30/14 15:52	12/01/14 16:29	1
Barium	**0.10**		0.0010		mg/L		11/30/14 15:52	12/01/14 16:29	1
Chromium	ND		0.0020		mg/L		11/30/14 15:52	12/01/14 16:29	1
Lead	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:29	1
Silver	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:29	1
Selenium	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:29	1
Cadmium	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:29	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020		mg/L		12/02/14 16:00	12/02/14 20:07	1

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1860/Coleville Fall Fishery

TestAmerica Job ID: 250-22991-1

Client Sample ID: AF52920 Hydro 3

Lab Sample ID: 250-22991-2

Date Collected: 11/18/14 16:30

Matrix: Water

Date Received: 11/26/14 08:45

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	ND		0.10		mg/L			11/29/14 13:49	1

Client Sample ID: AF52921 Hydro 4

Lab Sample ID: 250-22991-3

Date Collected: 11/18/14 17:00

Matrix: Water

Date Received: 11/26/14 08:45

Method: AK102 & 103 - Alaska - Diesel Range Organics & Residual Range Organics (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
DRO (C10-C25)	ND	H	0.11		mg/L		12/03/14 14:24	12/04/14 11:55	1
RRO (nC25-nC36)	ND	H	0.54		mg/L		12/03/14 14:24	12/04/14 11:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Triacontane	*67*		*50 - 150*	*12/03/14 14:24*	*12/04/14 11:55*	*1*
1-Chlorooctadecane	*85*		*50 - 150*	*12/03/14 14:24*	*12/04/14 11:55*	*1*

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**0.0010**		0.0010		mg/L		11/30/14 15:52	12/01/14 16:48	1
Barium	**0.13**		0.0010		mg/L		11/30/14 15:52	12/01/14 16:48	1
Chromium	ND		0.0020		mg/L		11/30/14 15:52	12/01/14 16:48	1
Lead	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:48	1
Silver	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:48	1
Selenium	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:48	1
Cadmium	ND		0.0010		mg/L		11/30/14 15:52	12/01/14 16:48	1

Method: 7470A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00020		mg/L		12/02/14 16:00	12/02/14 20:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate Nitrite as N	ND		0.10		mg/L			11/29/14 13:51	1

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Tel: (503)906-9200

TestAmerica Job ID: 250-22991-2
Client Project/Site: 1114-1860/Coleville Fall Fishery

For:
Arctic Fox Environmental, Inc
Pouch 340043
Prudhoe Bay, Alaska 99734

Attn: Ralph Allphin

Kelly R Garretts

Authorized for release by:
2/20/2015 9:36:47 AM

Kelly Garretts, Project Manager II
(253)248-4961
kelly.garretts@testamericainc.com

Table of Contents

Sample Summary

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1860/Coleville Fall Fishery

TestAmerica Job ID: 250-22991-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
250-22991-1	AF52919 Hydro 1	Water	11/18/14 15:30	11/26/14 08:45
250-22991-2	AF52920 Hydro 3	Water	11/18/14 16:30	11/26/14 08:45
250-22991-3	AF52921 Hydro 4	Water	11/18/14 17:00	11/26/14 08:45

Case Narrative

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1860/Coleville Fall Fishery

TestAmerica Job ID: 250-22991-2

Job ID: 250-22991-2

Laboratory: TestAmerica Portland

Narrative

Job Narrative
250-22991-2

Comments
No additional comments.

Receipt
The samples were received on 11/26/2014 8:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.2° C.

Except:

Only unpreserved volume received for all analyses. Containers poured off into HNO3 250mL poly (lot number N039) and H2SO4 250mL poly (lot number N004).

PSS 11/26/14@1310

AF52919 Hydro 1 (250-22991-1), AF52920 Hydro 3 (250-22991-2), AF52921 Hydro 4 (250-22991-3)

The following samples were received unpreserved and were preserved upon receipt to the laboratory: AF52919 Hydro 1 (250-22991-1), AF52920 Hydro 3 (250-22991-2), AF52921 Hydro 4 (250-22991-3). Regulatory documents require a 24-hour waiting period from the time of the addition of the acid preservative to the time of digestion.

PSS 11/26/14@1310

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Client Sample ID: AF52919 Hydro 1

Lab Sample ID: 250-22991-1

Date Collected: 11/18/14 15:30

Matrix: Water

Date Received: 11/26/14 08:45

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	290		1.0		mg/L		02/18/15 07:27	02/19/15 01:23	10
Magnesium	880		1.0		mg/L		02/18/15 07:27	02/19/15 01:23	10

Method: SM 2340B - Hardness, Calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness	4300		0.20		mg/L			02/19/15 21:28	1
Calcium hardness as calcium carbonate	730		0.20		mg/L			02/19/15 21:28	1
Magnesium hardness as calcium carbonate	3600		0.20		mg/L			02/19/15 21:28	1

Client Sample ID: AF52920 Hydro 3

Lab Sample ID: 250-22991-2

Date Collected: 11/18/14 16:30

Matrix: Water

Date Received: 11/26/14 08:45

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	250		1.0		mg/L		02/18/15 07:27	02/19/15 01:29	10
Magnesium	720		1.0		mg/L		02/18/15 07:27	02/19/15 01:29	10

Method: SM 2340B - Hardness, Calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness	3600		0.20		mg/L			02/19/15 21:28	1
Calcium hardness as calcium carbonate	630		0.20		mg/L			02/19/15 21:28	1
Magnesium hardness as calcium carbonate	3000		0.20		mg/L			02/19/15 21:28	1

Client Sample ID: AF52921 Hydro 4

Lab Sample ID: 250-22991-3

Date Collected: 11/18/14 17:00

Matrix: Water

Date Received: 11/26/14 08:45

Method: 200.7 Rev 4.4 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	180		1.0		mg/L		02/18/15 07:27	02/19/15 01:35	10
Magnesium	480		1.0		mg/L		02/18/15 07:27	02/19/15 01:35	10

Method: SM 2340B - Hardness, Calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness	2400		0.20		mg/L			02/19/15 21:28	1
Calcium hardness as calcium carbonate	460		0.20		mg/L			02/19/15 21:28	1
Magnesium hardness as calcium carbonate	2000		0.20		mg/L			02/19/15 21:28	1

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1860/Coleville Fall Fishery

TestAmerica Job ID: 250-22991-2

Method: 200.7 Rev 4.4 - Metals (ICP)

Lab Sample ID: MB 250-34496/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 34561 — **Prep Batch: 34496**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		0.10		mg/L		02/18/15 07:27	02/19/15 00:43	1
Magnesium	ND		0.10		mg/L		02/18/15 07:27	02/19/15 00:43	1

Lab Sample ID: LCS 250-34496/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 34561 — **Prep Batch: 34496**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	20.0	20.8		mg/L		104	85 - 115
Magnesium	20.0	20.7		mg/L		104	85 - 115

Lab Sample ID: 250-22607-B-5-D MS — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 34561 — **Prep Batch: 34496**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Calcium	200		20.0	226	4	mg/L		121	75 - 125
Magnesium	560		20.0	589	4	mg/L		155	75 - 125

Lab Sample ID: 250-22991-3 DU — **Client Sample ID: AF52921 Hydro 4**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 34561 — **Prep Batch: 34496**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Calcium	180		196		mg/L		7	20
Magnesium	480		511		mg/L		7	20

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1860/Coleville Fall Fishery

TestAmerica Job ID: 250-22991-2

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Certification Summary

Client: Arctic Fox Environmental, Inc
Project/Site: 1114-1860/Coleville Fall Fishery

TestAmerica Job ID: 250-22991-2

Laboratory: TestAmerica Portland

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska (UST)	State Program	10	UST-012	12-26-15
California	State Program	9	2597	09-30-15
Oregon	NELAP	10	OR100021	01-09-16
USDA	Federal		P330-11-00092	04-17-17
Washington	State Program	10	C586	06-23-15

Login Sample Receipt Checklist

Client: Arctic Fox Environmental, Inc

Job Number: 250-22991-2

Login Number: 22991

List Source: TestAmerica Portland

List Number: 1

Creator: Svabik-Seror, Philip M

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	False	Sampling dates taken from container labels.
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	False	DRO/RRO extraction received expired.
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	False	Only unpreserved containers received.
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	N/A	
Residual Chlorine Checked.	N/A	

Appendix F. Benthic river bed sediment chemistry results (in mg/kg) collected from 2 sampling locations during the fall subsistence harvest of Arctic Cisco in the Niġliq Channel, Colville River, Alaska on 18 November 2014.

Analyte (mg/kg)	Analytical method	Reporting Limit[a]	Alaska Soil Quality Standards Arctic Zone Direct Contact[b]	Upstream Sediment Chemistry Collection Site	Downstream Sediment Chemistry Collection Site
Arsenic	SW6020A	0.479, 0.427	6.1	7.49	8.79
Barium	SW6020A	0.145, 0.130	27,400	443	386
Cadmium	SW6020A	0.0957, 0.086	110	0.277	0.225
Chromium	SW6020A	0.185, 0.165	410	22.6	22.9
Lead	SW6020A	0.0957, 0.086	400	12.2	12.8
Mercury	SW6020A	0.0185, 0.0165	41	0.0516	0.0632
Selenium	SW6020A	0.479, 0.427	680	0.557	0.658
Silver	SW6020A	0.0957, 0.086	680	0.136	0.161
Diesel Range Organics	AK102 & AK 103	10.5, 9.3	12,500[c]	12.8	17.6
Residual Range Organics	AK102 & AK 103	10.5, 9.3	13,700[c]	135	108
1-Methylnaphthalene	8270D SIMS (PAH)	0.00251, 0.00224	380	0.0149	0.0434
2-Methylnaphthalene	8270D SIMS (PAH)	0.00251, 0.00224	380	0.0177	0.0562
Acenaphthene	8270D SIMS (PAH)	0.00251, 0.00224	3,800	ND	ND
Acenaphthylene	8270D SIMS (PAH)	0.00251, 0.00224	3,800	ND	ND
Anthracene	8270D SIMS (PAH)	0.00251, 0.00224	27,800	ND	ND
Benzo(a)anthracene	8270D SIMS (PAH)	0.00251, 0.00224	6.6	ND	0.0158
Benzo(a)pyrene	8270D SIMS (PAH)	0.00251, 0.00224	0.66	ND	ND
Benzo(b)fluoranthene	8270D SIMS (PAH)	0.00251, 0.00224	6.6	0.00708	0.0124
Benzo(g,h,i)perylene	8270D SIMS (PAH)	0.00251, 0.00224	1,900	ND	0.00485
Benzo(k)fluoranthene	8270D SIMS (PAH)	0.00251, 0.00224	6.6	ND	ND
Chrysene 16.6	8270D SIMS (PAH)	0.00251, 0.00224	660	0.00849	0.0166
Dibenzo(a,h)anthracene	8270D SIMS (PAH)	0.00251, 0.00224	0.66	ND	ND
Fluoranthene	8270D SIMS (PAH)	0.00251, 0.00224	2,500	0.00561	0.0132
Fluorene	8270D SIMS (PAH)	0.00251, 0.00224	3,200	0.00278	0.00764
Indeno(1,2,3-c,d)pyrene	8270D SIMS (PAH)	0.00251, 0.00224	6.6	ND	ND

Appendix F. Continued.

Analyte (mg/kg)	Analytical method	Reporting Limit[a]	Alaska Soil Quality Standards Arctic Zone Direct Contact[b]	Upstream Sediment Chemistry Collection Site	Downstream Sediment Chemistry Collection Site
Naphthalene	8270D SIMS (PAH)	0.00251, 0.00224	1,900	0.0088	0.0252
Phenanthrene	8270D SIMS (PAH)	0.00251, 0.00224	27,800	0.0019	0.0439
Pyrene	8270D SIMS (PAH)	0.00251, 0.00224	1,900	0.00706	0.0139

[a] Detection limit values are for upstream and downstream locations respectively
[b] From Alaska Department of Environmental Conservation (ADEC), Table B1 in 18 AAC 75
[c] From ADEC Table B2 in 18 AAC 75
ND=None Detected

Appendix G. Raw laboratory river bed chemistry results from SGS Environmental Services, Inc., for samples collected from 2 locations during the fall subsistence harvest of Arctic Cisco, Niġliq Channel, Colville River, Alaska, 4 December 2014.

Laboratory Report of Analysis

To: ABR, Inc.
PO Box 240268
Anchorage, AK 99524
(907) 344-6777

Report Number: **1145790**

Client Project: **14-162 Colville Fall Fishery**

Dear Joel Gottschalk,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Stephen at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Stephen Ede Date
Project Manager
Stephen.Ede@sgs.com

Print Date: 12/04/2014 3:59:25PM

Case Narrative

SGS Client: **ABR, Inc.**
SGS Project: **1145790**
Project Name/Site: **14-162 Colville Fall Fishery**
Project Contact: **Joel Gottschalk**

Refer to sample receipt form for information on sample condition.

Site #1 (Colville Fall) (1145790001) PS

AK103 - Unknown hydrocarbon with several peaks is present.

Site #4 (Colville Fall) (1145790002) PS

AK103 - Unknown hydrocarbon with several peaks is present.

1145773004MS (1247047) MS

8270D SIM - MS/MSD recovery for multiple analytes is outside of QC criteria. Refer to LCS for accuracy.

1145798005MS (1247516) MS

8270D SIM - MS/MSD recovery for multiple analytes is outside of QC criteria. Refer to LCS for accuracy.

1145773004MSD (1247048) MSD

8270D SIM - MS/MSD recovery for multiple analytes is outside of QC criteria. Refer to LCS for accuracy.

1145798005MSD (1247517) MSD

8270D SIM - MS/MSD recovery for multiple analytes is outside of QC criteria. Refer to LCS for accuracy.
8270D SIM - MS/MSD RPD for fluoranthene and benzo[g,h,i]perylene does not meet QC criteria.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.

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Report of Manual Integrations

Laboratory ID	Client Sample ID	Analytical Batch	Analyte	Reason
8270D SIMS (PAH)				
1145798005	LABREFQC	XMS8435	Benzo(a)Anthracene	RP
1145798005	LABREFQC	XMS8435	Chrysene	RP
1145798005	LABREFQC	XMS8435	Naphthalene	SP
1247516	1145798005MS	XMS8435	Benzo(a)Anthracene	RP
1247516	1145798005MS	XMS8435	Benzo[g,h,i]perylene	RP
1247516	1145798005MS	XMS8435	Dibenzo[a,h]anthracene	RP
1247516	1145798005MS	XMS8435	Indeno[1,2,3-c,d] pyrene	RP
1247517	1145798005MSD	XMS8435	Benzo(a)Anthracene	RP
1247517	1145798005MSD	XMS8435	Dibenzo[a,h]anthracene	RP
1247517	1145798005MSD	XMS8435	Indeno[1,2,3-c,d] pyrene	RP

Manual Integration Reason Code Descriptions

Code	Description
O	Original Chromatogram
M	Modified Chromatogram
SS	Skimmed surrogate
BLG	Closed baseline gap
RP	Reassign peak name
PIR	Pattern integration required
IT	Included tail
SP	Split peak
RSP	Removed split peak
FPS	Forced peak start/stop
BLC	Baseline correction
PNF	Peak not found by software

All DRO/RRO analysis are integrated per SOP.

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Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. If you have any questions regarding this report, or if we can be of any other assistance, please contact your SGS Project Manager at 907-562-2343. All work is provided under SGS general terms and conditions (<http://www.sgs.com/terms_and_conditions.htm>), unless other written agreements have been accepted by both parties.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020A, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035B, 6020, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040B, 9045C, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

*	The analyte has exceeded allowable regulatory or control limits.
!	Surrogate out of control limits.
B	Indicates the analyte is found in a blank associated with the sample.
CCV	Continuing Calibration Verification
CL	Control Limit
D	The analyte concentration is the result of a dilution.
DF	Dilution Factor
DL	Detection Limit (i.e., maximum method detection limit)
E	The analyte result is above the calibrated range.
F	Indicates value that is greater than or equal to the DL
GT	Greater Than
IB	Instrument Blank
ICV	Initial Calibration Verification
J	The quantitation is an estimation.
JL	The analyte was positively identified, but the quantitation is a low estimation.
LCS(D)	Laboratory Control Spike (Duplicate)
LOD	Limit of Detection (i.e., 1/2 of the LOQ)
LOQ	Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT	Less Than
M	A matrix effect was present.
MB	Method Blank
MS(D)	Matrix Spike (Duplicate)
ND	Indicates the analyte is not detected.
Q	QC parameter out of acceptance range.
R	Rejected
RPD	Relative Percent Difference
U	Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content.
All DRO/RRO analyses are integrated per SOP.

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Sample Summary

Client Sample ID	Lab Sample ID	Collected	Received	Matrix
Site #1 (Colville Fall)	1145790001	11/18/2014	11/24/2014	Soil/Solid (dry weight)
Site #4 (Colville Fall)	1145790002	11/19/2014	11/24/2014	Soil/Solid (dry weight)

Method	Method Description
8270D SIMS (PAH)	8270 PAH SIM Semi-Volatiles GC/MS
AK102	Diesel/Residual Range Organics
AK103	Diesel/Residual Range Organics
SW6020A	Metals by ICP-MS (S)
SM21 2540G	Percent Solids SM2540G

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Detectable Results Summary

Client Sample ID: **Site #1 (Colville Fall)**
Lab Sample ID: 1145790001

	Parameter	Result	Units
Metals by ICP/MS	Arsenic	8.79	mg/Kg
	Barium	386	mg/Kg
	Cadmium	0.225J	mg/Kg
	Chromium	22.9	mg/Kg
	Lead	12.8	mg/Kg
	Mercury	0.0632	mg/Kg
	Selenium	0.658J	mg/Kg
	Silver	0.161J	mg/Kg
Polynuclear Aromatics GC/MS	1-Methylnaphthalene	43.4	ug/Kg
	2-Methylnaphthalene	56.2	ug/Kg
	Benzo(a)Anthracene	15.8	ug/Kg
	Benzo[b]Fluoranthene	12.4	ug/Kg
	Benzo[g,h,i]perylene	4.85J	ug/Kg
	Chrysene	16.6	ug/Kg
	Fluoranthene	13.2	ug/Kg
	Fluorene	7.64	ug/Kg
	Naphthalene	25.2	ug/Kg
	Phenanthrene	43.9	ug/Kg
	Pyrene	13.9	ug/Kg
Semivolatile Organic Fuels	Diesel Range Organics	17.6J	mg/Kg
	Residual Range Organics	108	mg/Kg

Client Sample ID: **Site #4 (Colville Fall)**
Lab Sample ID: 1145790002

	Parameter	Result	Units
Metals by ICP/MS	Arsenic	7.49	mg/Kg
	Barium	443	mg/Kg
	Cadmium	0.277J	mg/Kg
	Chromium	22.6	mg/Kg
	Lead	12.2	mg/Kg
	Mercury	0.0516J	mg/Kg
	Selenium	0.557J	mg/Kg
	Silver	0.136J	mg/Kg
Polynuclear Aromatics GC/MS	1-Methylnaphthalene	14.9	ug/Kg
	2-Methylnaphthalene	17.7	ug/Kg
	Benzo[b]Fluoranthene	7.08J	ug/Kg
	Chrysene	8.49	ug/Kg
	Fluoranthene	5.61J	ug/Kg
	Fluorene	2.78J	ug/Kg
	Naphthalene	8.80	ug/Kg
	Phenanthrene	19.0	ug/Kg
	Pyrene	7.06J	ug/Kg
Semivolatile Organic Fuels	Diesel Range Organics	12.8J	mg/Kg
	Residual Range Organics	135	mg/Kg

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Results of **Site #1 (Colville Fall)**

Client Sample ID: **Site #1 (Colville Fall)**
Client Project ID: **14-162 Colville Fall Fishery**
Lab Sample ID: 1145790001
Lab Project ID: 1145790

Collection Date: 11/18/14 14:15
Received Date: 11/24/14 12:11
Matrix: Soil/Solid (dry weight)
Solids (%): 66.3
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Arsenic	8.79		1.38	0.427	mg/Kg	10		11/26/14 16:31
Barium	386		0.414	0.130	mg/Kg	10		11/26/14 16:31
Cadmium	0.225	J	0.276	0.0855	mg/Kg	10		11/26/14 16:31
Chromium	22.9		0.552	0.165	mg/Kg	10		11/26/14 16:31
Lead	12.8		0.276	0.0855	mg/Kg	10		11/26/14 16:31
Mercury	0.0632		0.0552	0.0165	mg/Kg	10		11/26/14 16:31
Selenium	0.658	J	1.38	0.427	mg/Kg	10		11/26/14 16:31
Silver	0.161	J	0.276	0.0855	mg/Kg	10		11/26/14 16:31

Batch Information

Analytical Batch: MMS8756
Analytical Method: SW6020A
Analyst: ACF
Analytical Date/Time: 11/26/14 16:31
Container ID: 1145790001-A

Prep Batch: MXX28310
Prep Method: SW3050B
Prep Date/Time: 11/25/14 08:31
Prep Initial Wt./Vol.: 1.093 g
Prep Extract Vol: 50 mL

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Results of **Site #1 (Colville Fall)**

Client Sample ID: **Site #1 (Colville Fall)**
Client Project ID: **14-162 Colville Fall Fishery**
Lab Sample ID: 1145790001
Lab Project ID: 1145790

Collection Date: 11/18/14 14:15
Received Date: 11/24/14 12:11
Matrix: Soil/Solid (dry weight)
Solids (%): 66.3
Location:

Results by **Polynuclear Aromatics GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1-Methylnaphthalene	43.4		7.46	2.24	ug/Kg	1		11/26/14 12:41
2-Methylnaphthalene	56.2		7.46	2.24	ug/Kg	1		11/26/14 12:41
Acenaphthene	3.73	U	7.46	2.24	ug/Kg	1		11/26/14 12:41
Acenaphthylene	3.73	U	7.46	2.24	ug/Kg	1		11/26/14 12:41
Anthracene	3.73	U	7.46	2.24	ug/Kg	1		11/26/14 12:41
Benzo(a)Anthracene	15.8		7.46	2.24	ug/Kg	1		11/26/14 12:41
Benzo[a]pyrene	3.73	U	7.46	2.24	ug/Kg	1		11/26/14 12:41
Benzo[b]Fluoranthene	12.4		7.46	2.24	ug/Kg	1		11/26/14 12:41
Benzo[g,h,i]perylene	4.85	J	7.46	2.24	ug/Kg	1		11/26/14 12:41
Benzo[k]fluoranthene	3.73	U	7.46	2.24	ug/Kg	1		11/26/14 12:41
Chrysene	16.6		7.46	2.24	ug/Kg	1		11/26/14 12:41
Dibenzo[a,h]anthracene	3.73	U	7.46	2.24	ug/Kg	1		11/26/14 12:41
Fluoranthene	13.2		7.46	2.24	ug/Kg	1		11/26/14 12:41
Fluorene	7.64		7.46	2.24	ug/Kg	1		11/26/14 12:41
Indeno[1,2,3-c,d] pyrene	3.73	U	7.46	2.24	ug/Kg	1		11/26/14 12:41
Naphthalene	25.2		7.46	2.24	ug/Kg	1		11/26/14 12:41
Phenanthrene	43.9		7.46	2.24	ug/Kg	1		11/26/14 12:41
Pyrene	13.9		7.46	2.24	ug/Kg	1		11/26/14 12:41
Surrogates								
2-Fluorobiphenyl	91.9		45-105		%	1		11/26/14 12:41
Terphenyl-d14	98.6		30-125		%	1		11/26/14 12:41

Batch Information

Analytical Batch: XMS8431
Analytical Method: 8270D SIMS (PAH)
Analyst: RTS
Analytical Date/Time: 11/26/14 12:41
Container ID: 1145790001-A

Prep Batch: XXX32474
Prep Method: SW3550C
Prep Date/Time: 11/25/14 13:54
Prep Initial Wt./Vol.: 22.734 g
Prep Extract Vol: 1 mL

Print Date: 12/04/2014 3:59:27PM

Results of **Site #1 (Colville Fall)**

Client Sample ID: **Site #1 (Colville Fall)**
Client Project ID: **14-162 Colville Fall Fishery**
Lab Sample ID: 1145790001
Lab Project ID: 1145790

Collection Date: 11/18/14 14:15
Received Date: 11/24/14 12:11
Matrix: Soil/Solid (dry weight)
Solids (%): 66.3
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	17.6	J	30.0	9.30	mg/Kg	1		11/25/14 23:54
Surrogates								
5a Androstane	70.7		50-150		%	1		11/25/14 23:54

Batch Information

Analytical Batch: XFC11694
Analytical Method: AK102
Analyst: AYC
Analytical Date/Time: 11/25/14 23:54
Container ID: 1145790001-A

Prep Batch: XXX32472
Prep Method: SW3550C
Prep Date/Time: 11/25/14 12:29
Prep Initial Wt./Vol.: 30.14 g
Prep Extract Vol: 1 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	108		30.0	9.30	mg/Kg	1		11/25/14 23:54
Surrogates								
n-Triacontane-d62	67.3		50-150		%	1		11/25/14 23:54

Batch Information

Analytical Batch: XFC11694
Analytical Method: AK103
Analyst: AYC
Analytical Date/Time: 11/25/14 23:54
Container ID: 1145790001-A

Prep Batch: XXX32472
Prep Method: SW3550C
Prep Date/Time: 11/25/14 12:29
Prep Initial Wt./Vol.: 30.14 g
Prep Extract Vol: 1 mL

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Results of **Site #4 (Colville Fall)**

Client Sample ID: **Site #4 (Colville Fall)**
Client Project ID: **14-162 Colville Fall Fishery**
Lab Sample ID: 1145790002
Lab Project ID: 1145790

Collection Date: 11/19/14 16:30
Received Date: 11/24/14 12:11
Matrix: Soil/Solid (dry weight)
Solids (%): 58.9
Location:

Results by **Metals by ICP/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Arsenic	7.49		1.54	0.479	mg/Kg	10		11/26/14 16:40
Barium	443		0.463	0.145	mg/Kg	10		11/26/14 16:40
Cadmium	0.277	J	0.309	0.0957	mg/Kg	10		11/26/14 16:40
Chromium	22.6		0.618	0.185	mg/Kg	10		11/26/14 16:40
Lead	12.2		0.309	0.0957	mg/Kg	10		11/26/14 16:40
Mercury	0.0516	J	0.0618	0.0185	mg/Kg	10		11/26/14 16:40
Selenium	0.557	J	1.54	0.479	mg/Kg	10		11/26/14 16:40
Silver	0.136	J	0.309	0.0957	mg/Kg	10		11/26/14 16:40

Batch Information

Analytical Batch: MMS8756
Analytical Method: SW6020A
Analyst: ACF
Analytical Date/Time: 11/26/14 16:40
Container ID: 1145790002-A

Prep Batch: MXX28310
Prep Method: SW3050B
Prep Date/Time: 11/25/14 08:31
Prep Initial Wt./Vol.: 1.099 g
Prep Extract Vol: 50 mL

SGS North America Inc.
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Results of **Site #4 (Colville Fall)**

Client Sample ID: **Site #4 (Colville Fall)**
Client Project ID: **14-162 Colville Fall Fishery**
Lab Sample ID: 1145790002
Lab Project ID: 1145790

Collection Date: 11/19/14 16:30
Received Date: 11/24/14 12:11
Matrix: Soil/Solid (dry weight)
Solids (%): 58.9
Location:

Results by **Polynuclear Aromatics GC/MS**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
1-Methylnaphthalene	14.9		8.36	2.51	ug/Kg	1		12/02/14 22:15
2-Methylnaphthalene	17.7		8.36	2.51	ug/Kg	1		12/02/14 22:15
Acenaphthene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Acenaphthylene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Anthracene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Benzo(a)Anthracene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Benzo[a]pyrene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Benzo[b]Fluoranthene	7.08	J	8.36	2.51	ug/Kg	1		12/02/14 22:15
Benzo[g,h,i]perylene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Benzo[k]fluoranthene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Chrysene	8.49		8.36	2.51	ug/Kg	1		12/02/14 22:15
Dibenzo[a,h]anthracene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Fluoranthene	5.61	J	8.36	2.51	ug/Kg	1		12/02/14 22:15
Fluorene	2.78	J	8.36	2.51	ug/Kg	1		12/02/14 22:15
Indeno[1,2,3-c,d] pyrene	4.18	U	8.36	2.51	ug/Kg	1		12/02/14 22:15
Naphthalene	8.80		8.36	2.51	ug/Kg	1		12/02/14 22:15
Phenanthrene	19.0		8.36	2.51	ug/Kg	1		12/02/14 22:15
Pyrene	7.06	J	8.36	2.51	ug/Kg	1		12/02/14 22:15
Surrogates								
2-Fluorobiphenyl	77.3		45-105		%	1		12/02/14 22:15
Terphenyl-d14	76.5		30-125		%	1		12/02/14 22:15

Batch Information

Analytical Batch: XMS8435
Analytical Method: 8270D SIMS (PAH)
Analyst: RTS
Analytical Date/Time: 12/02/14 22:15
Container ID: 1145790002-A

Prep Batch: XXX32489
Prep Method: SW3550C
Prep Date/Time: 12/02/14 11:27
Prep Initial Wt./Vol.: 22.848 g
Prep Extract Vol: 1 mL

Print Date: 12/04/2014 3:59:27PM

Results of **Site #4 (Colville Fall)**

Client Sample ID: **Site #4 (Colville Fall)**
Client Project ID: **14-162 Colville Fall Fishery**
Lab Sample ID: 1145790002
Lab Project ID: 1145790

Collection Date: 11/19/14 16:30
Received Date: 11/24/14 12:11
Matrix: Soil/Solid (dry weight)
Solids (%): 58.9
Location:

Results by **Semivolatile Organic Fuels**

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Diesel Range Organics	12.8	J	33.9	10.5	mg/Kg	1		11/26/14 00:03
Surrogates								
5a Androstane	77.4		50-150		%	1		11/26/14 00:03

Batch Information

Analytical Batch: XFC11694
Analytical Method: AK102
Analyst: AYC
Analytical Date/Time: 11/26/14 00:03
Container ID: 1145790002-A

Prep Batch: XXX32472
Prep Method: SW3550C
Prep Date/Time: 11/25/14 12:29
Prep Initial Wt./Vol.: 30.019 g
Prep Extract Vol: 1 mL

Parameter	Result	Qual	LOQ/CL	DL	Units	DF	Allowable Limits	Date Analyzed
Residual Range Organics	135		33.9	10.5	mg/Kg	1		11/26/14 00:03
Surrogates								
n-Triacontane-d62	78.1		50-150		%	1		11/26/14 00:03

Batch Information

Analytical Batch: XFC11694
Analytical Method: AK103
Analyst: AYC
Analytical Date/Time: 11/26/14 00:03
Container ID: 1145790002-A

Prep Batch: XXX32472
Prep Method: SW3550C
Prep Date/Time: 11/25/14 12:29
Prep Initial Wt./Vol.: 30.019 g
Prep Extract Vol: 1 mL

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Method Blank

Blank ID: MB for HBN 1681567 [MXX/28310]
Blank Lab ID: 1246964

Matrix: Soil/Solid (dry weight)

QC for Samples:
1145790001, 1145790002

Results by **SW6020A**

Parameter	Results	LOQ/CL	DL	Units
Arsenic	0.500U	1.00	0.310	mg/Kg
Barium	0.150U	0.300	0.0940	mg/Kg
Cadmium	0.100U	0.200	0.0620	mg/Kg
Chromium	0.200U	0.400	0.120	mg/Kg
Lead	0.100U	0.200	0.0620	mg/Kg
Mercury	0.0200U	0.0400	0.0120	mg/Kg
Selenium	0.500U	1.00	0.310	mg/Kg
Silver	0.100U	0.200	0.0620	mg/Kg

Batch Information

Analytical Batch: MMS8756
Analytical Method: SW6020A
Instrument: Perkin Elmer Sciex ICP-MS P3
Analyst: ACF
Analytical Date/Time: 11/26/2014 4:09:50PM

Prep Batch: MXX28310
Prep Method: SW3050B
Prep Date/Time: 11/25/2014 8:31:44AM
Prep Initial Wt./Vol.: 1 g
Prep Extract Vol: 50 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1145790 [MXX28310]
Blank Spike Lab ID: 1246965
Date Analyzed: 11/26/2014 16:12

Matrix: Soil/Solid (dry weight)

QC for Samples: 1145790001, 1145790002

Results by **SW6020A**

Blank Spike (mg/Kg)

Parameter	Spike	Result	Rec (%)	CL
Arsenic	50	52.0	104	(80-120)
Barium	50	49.6	99	(80-120)
Cadmium	5	5.26	105	(80-120)
Chromium	20	20.9	105	(80-120)
Lead	50	52.6	105	(80-120)
Mercury	0.5	0.517	103	(80-120)
Selenium	50	52.6	105	(80-120)
Silver	5	5.11	102	(80-120)

Batch Information

Analytical Batch: **MMS8756**
Analytical Method: **SW6020A**
Instrument: **Perkin Elmer Sciex ICP-MS P3**
Analyst: **ACF**

Prep Batch: **MXX28310**
Prep Method: **SW3050B**
Prep Date/Time: **11/25/2014 08:31**
Spike Init Wt./Vol.: 50 mg/Kg Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:

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Matrix Spike Summary

Original Sample ID: 1246970
MS Sample ID: 1246968 MS
MSD Sample ID: 1246969 MSD

Analysis Date: 11/26/2014 16:52
Analysis Date: 11/26/2014 16:56
Analysis Date: 11/26/2014 16:59
Matrix: Soil/Solid (dry weight)

QC for Samples: 1145790001, 1145790002

Results by **SW6020A**

		Matrix Spike (mg/Kg)			Spike Duplicate (mg/Kg)					
Parameter	Sample	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Arsenic	0.682J	48.0	49.9	102	47.8	49.6	102	80-120		
Barium	18.4	48.0	68.8	105	47.8	67.1	102	80-120		
Cadmium	0.0940U	4.80	4.98	104	4.78	4.97	104	80-120		
Chromium	1.47	19.2	21.4	104	19.1	21.4	104	80-120		
Lead	0.516	48.0	50	103	47.8	50.9	105	80-120		
Mercury	0.0149J	0.480	.512	104	0.478	0.492	100	80-120		
Selenium	0.470U	48.0	50	104	47.8	50.3	105	80-120		
Silver	0.0940U	4.80	4.78	100	4.78	4.76	100	80-120		

Batch Information

Analytical Batch: MMS8756
Analytical Method: SW6020A
Instrument: Perkin Elmer Sciex ICP-MS P3
Analyst: ACF
Analytical Date/Time: 11/26/2014 4:56:45PM

Prep Batch: MXX28310
Prep Method: Soils/Solids Digest for Metals by ICP-MS
Prep Date/Time: 11/25/2014 8:31:44AM
Prep Initial Wt./Vol.: 1.04g
Prep Extract Vol: 50.00mL

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Method Blank

Blank ID: MB for HBN 1681462 [SPT/9498]
Blank Lab ID: 1246934

Matrix: Soil/Solid (dry weight)

QC for Samples:
1145790001, 1145790002

Results by **SM21 2540G**

Parameter	Results	LOQ/CL	DL	Units
Total Solids	100			%

Batch Information

Analytical Batch: SPT9498
Analytical Method: SM21 2540G
Instrument:
Analyst: MJN
Analytical Date/Time: 11/24/2014 6:15:00PM

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Duplicate Sample Summary

Original Sample ID: 1145788003
Duplicate Sample ID: 1246935
QC for Samples:

Analysis Date: 11/24/2014 18:15
Matrix: Soil/Solid (dry weight)

Results by **SM21 2540G**

NAME	Original ()	Duplicate ()	RPD (%)	RPD CL
Total Solids	99.4	99.4	0.08	15.00

Batch Information

Analytical Batch: SPT9498
Analytical Method: SM21 2540G
Instrument:
Analyst: MJN

Print Date: 12/04/2014 3:59:30PM

Duplicate Sample Summary

Original Sample ID: 1145789001
Duplicate Sample ID: 1246936
QC for Samples:
1145790001, 1145790002

Analysis Date: 11/24/2014 18:15
Matrix: Soil/Solid (dry weight)

Results by **SM21 2540G**

NAME	Original ()	Duplicate ()	RPD (%)	RPD CL
Total Solids	97.0	97.0	0.07	15.00

Batch Information

Analytical Batch: SPT9498
Analytical Method: SM21 2540G
Instrument:
Analyst: MJN

Print Date: 12/04/2014 3:59:30PM

Method Blank

Blank ID: MB for HBN 1681763 [XXX/32472]
Blank Lab ID: 1247031

Matrix: Soil/Solid (dry weight)

QC for Samples:
1145790001, 1145790002

Results by **AK102**

Parameter	Results	LOQ/CL	DL	Units
Diesel Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
5a Androstane	86.4	60-120		%

Batch Information

Analytical Batch: XFC11694
Analytical Method: AK102
Instrument: HP 6890 Series II FID SV D R
Analyst: AYC
Analytical Date/Time: 11/25/2014 9:26:00PM

Prep Batch: XXX32472
Prep Method: SW3550C
Prep Date/Time: 11/25/2014 12:29:44PM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 1 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1145790 [XXX32472]
Blank Spike Lab ID: 1247032
Date Analyzed: 11/25/2014 21:06

Spike Duplicate ID: LCSD for HBN 1145790 [XXX32472]
Spike Duplicate Lab ID: 1247033
Matrix: Soil/Solid (dry weight)

QC for Samples: 1145790001, 1145790002

Results by **AK102**

	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Diesel Range Organics	167	138	83	167	153	92	(75-125)	10.20	(< 20)
Surrogates									
5a Androstane	3.33	90.3	90	3.33	98.5	99	(60-120)	8.70	

Batch Information

Analytical Batch: **XFC11694**
Analytical Method: **AK102**
Instrument: **HP 6890 Series II FID SV D R**
Analyst: **AYC**

Prep Batch: **XXX32472**
Prep Method: **SW3550C**
Prep Date/Time: **11/25/2014 12:29**
Spike Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL

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Method Blank

Blank ID: MB for HBN 1681763 [XXX/32472]
Blank Lab ID: 1247031

Matrix: Soil/Solid (dry weight)

QC for Samples:
1145790001, 1145790002

Results by **AK103**

Parameter	Results	LOQ/CL	DL	Units
Residual Range Organics	10.0U	20.0	6.20	mg/Kg
Surrogates				
n-Triacontane-d62	82.2	60-120		%

Batch Information

Analytical Batch: XFC11694
Analytical Method: AK103
Instrument: HP 6890 Series II FID SV D R
Analyst: AYC
Analytical Date/Time: 11/25/2014 9:26:00PM

Prep Batch: XXX32472
Prep Method: SW3550C
Prep Date/Time: 11/25/2014 12:29:44PM
Prep Initial Wt./Vol.: 30 g
Prep Extract Vol: 1 mL

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1145790 [XXX32472]
Blank Spike Lab ID: 1247032
Date Analyzed: 11/25/2014 21:06

Spike Duplicate ID: LCSD for HBN 1145790 [XXX32472]
Spike Duplicate Lab ID: 1247033
Matrix: Soil/Solid (dry weight)

QC for Samples: 1145790001, 1145790002

Results by **AK103**

	Blank Spike (mg/Kg)			Spike Duplicate (mg/Kg)					
Parameter	Spike	Result	Rec (%)	Spike	Result	Rec (%)	CL	RPD (%)	RPD CL
Residual Range Organics	167	140	84	167	155	93	(60-120)	10.30	(< 20)
Surrogates									
n-Triacontane-d62	3.33	84	84	3.33	94.1	94	(60-120)	11.30	

Batch Information

Analytical Batch: **XFC11694**
Analytical Method: **AK103**
Instrument: **HP 6890 Series II FID SV D R**
Analyst: **AYC**

Prep Batch: **XXX32472**
Prep Method: **SW3550C**
Prep Date/Time: **11/25/2014 12:29**
Spike Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: 167 mg/Kg Extract Vol: 1 mL

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Method Blank

Blank ID: MB for HBN 1681772 [XXX/32474]
Blank Lab ID: 1247045

Matrix: Soil/Solid (dry weight)

QC for Samples:
1145790001

Results by **8270D SIMS (PAH)**

Parameter	Results	LOQ/CL	DL	Units
1-Methylnaphthalene	2.50U	5.00	1.50	ug/Kg
2-Methylnaphthalene	2.50U	5.00	1.50	ug/Kg
Acenaphthene	2.50U	5.00	1.50	ug/Kg
Acenaphthylene	2.50U	5.00	1.50	ug/Kg
Anthracene	2.50U	5.00	1.50	ug/Kg
Benzo(a)Anthracene	2.50U	5.00	1.50	ug/Kg
Benzo[a]pyrene	2.50U	5.00	1.50	ug/Kg
Benzo[b]Fluoranthene	2.50U	5.00	1.50	ug/Kg
Benzo[g,h,i]perylene	2.50U	5.00	1.50	ug/Kg
Benzo[k]fluoranthene	2.50U	5.00	1.50	ug/Kg
Chrysene	2.50U	5.00	1.50	ug/Kg
Dibenzo[a,h]anthracene	2.50U	5.00	1.50	ug/Kg
Fluoranthene	2.50U	5.00	1.50	ug/Kg
Fluorene	2.50U	5.00	1.50	ug/Kg
Indeno[1,2,3-c,d] pyrene	2.50U	5.00	1.50	ug/Kg
Naphthalene	2.50U	5.00	1.50	ug/Kg
Phenanthrene	2.50U	5.00	1.50	ug/Kg
Pyrene	2.50U	5.00	1.50	ug/Kg
Surrogates				
2-Fluorobiphenyl	75.1	45-105		%
Terphenyl-d14	109	30-125		%

Batch Information

Analytical Batch: XMS8430
Analytical Method: 8270D SIMS (PAH)
Instrument: HP 6890/5973 MS SVQA
Analyst: RTS
Analytical Date/Time: 11/25/2014 8:31:00PM

Prep Batch: XXX32474
Prep Method: SW3550C
Prep Date/Time: 11/25/2014 1:54:44PM
Prep Initial Wt./Vol.: 22.5 g
Prep Extract Vol: 1 mL

Print Date: 12/04/2014 3:59:33PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1145790 [XXX32474]
Blank Spike Lab ID: 1247046
Date Analyzed: 11/25/2014 20:45

Matrix: Soil/Solid (dry weight)

QC for Samples: 1145790001

Results by **8270D SIMS (PAH)**

Blank Spike (ug/Kg)

Parameter	Spike	Result	Rec (%)	CL
1-Methylnaphthalene	22.2	18.0	81	(44-107)
2-Methylnaphthalene	22.2	16.4	74	(45-105)
Acenaphthene	22.2	18.8	85	(45-110)
Acenaphthylene	22.2	16.4	74	(45-105)
Anthracene	22.2	18.0	81	(55-105)
Benzo(a)Anthracene	22.2	21.5	97	(50-110)
Benzo[a]pyrene	22.2	16.6	75	(50-110)
Benzo[b]Fluoranthene	22.2	23.6	106	(45-115)
Benzo[g,h,i]perylene	22.2	21.3	96	(40-125)
Benzo[k]fluoranthene	22.2	21.1	95	(45-125)
Chrysene	22.2	23.0	104	(55-110)
Dibenzo[a,h]anthracene	22.2	21.3	96	(40-125)
Fluoranthene	22.2	21.8	98	(55-115)
Fluorene	22.2	19.4	87	(50-110)
Indeno[1,2,3-c,d] pyrene	22.2	21.4	96	(40-120)
Naphthalene	22.2	17.4	78	(40-105)
Phenanthrene	22.2	20.7	93	(50-110)
Pyrene	22.2	21.2	95	(45-125)
Surrogates				
2-Fluorobiphenyl	22.2	84.3	84	(45-105)
Terphenyl-d14	22.2	110	110	(30-125)

Batch Information

Analytical Batch: **XMS8430**
Analytical Method: **8270D SIMS (PAH)**
Instrument: **HP 6890/5973 MS SVQA**
Analyst: **RTS**

Prep Batch: **XXX32474**
Prep Method: **SW3550C**
Prep Date/Time: **11/25/2014 13:54**
Spike Init Wt./Vol.: 22.2 ug/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: Extract Vol:

Matrix Spike Summary

Original Sample ID: 1145773004
MS Sample ID: 1247047 MS
MSD Sample ID: 1247048 MSD

Analysis Date: 11/25/2014 20:59
Analysis Date: 11/25/2014 21:13
Analysis Date: 11/25/2014 21:27
Matrix: Soil/Solid (dry weight)

QC for Samples: 1145790001

Results by **8270D SIMS (PAH)**

		Matrix Spike (ug/Kg)				Spike Duplicate (ug/Kg)					
Parameter	Sample	Spike	Result	Rec (%)		Spike	Result	Rec (%)		CL	RPD (%)	RPD CL
Acenaphthene	11.9	23.7	31.2	81		23.7	30.4	78		45-110	2.30	(< 30)
Acenaphthylene	5.30U	23.7	26.5	112	*	23.7	25.0	106	*	45-105	5.60	(< 30)
Anthracene	3.83J	23.7	24.8	105		23.7	23.7	100		55-105	4.40	(< 30)
Benzo(a)Anthracene	4.30J	23.7	25.4	107		23.7	25.7	108		50-110	1.10	(< 30)
Benzo[a]pyrene	5.30U	23.7	22.9	97		23.7	22.3	94		50-110	2.80	(< 30)
Benzo[b]Fluoranthene	3.56J	23.7	26.8	113		23.7	25.1	106		45-115	6.90	(< 30)
Benzo[g,h,i]perylene	4.01J	23.7	24.8	105		23.7	25.0	105		40-125	0.61	(< 30)
Benzo[k]fluoranthene	5.30U	23.7	22.8	97		23.7	24.2	102		45-125	5.70	(< 30)
Chrysene	4.68J	23.7	27.0	114	*	23.7	27.7	117	*	55-110	2.80	(< 30)
Dibenzo[a,h]anthracene	5.30U	23.7	24.8	104		23.7	23.6	100		40-125	4.70	(< 30)
Fluoranthene	5.72J	23.7	28.2	119	*	23.7	27.9	118	*	55-115	1.10	(< 30)
Fluorene	12.1	23.7	32.2	85		23.7	30.4	78		50-110	5.60	(< 30)
Indeno[1,2,3-c,d] pyrene	5.30U	23.7	25.1	106		23.7	23.5	99		40-120	6.80	(< 30)
Phenanthrene	17.7	23.7	39.8	93		23.7	38.3	87		50-110	4.00	(< 30)
Pyrene	6.20J	23.7	28.1	118		23.7	27.2	115		45-125	3.00	(< 30)
1-Methylnaphthalene	1120	23.7	1121	-1	*	23.7	1078	-142	*	44-107	3.00	(< 30)
2-Methylnaphthalene	1860	23.7	1708	-658	*	23.7	1665	-837	*	45-105	2.50	(< 30)
Naphthalene	2090	23.7	1942	-608	*	23.7	1868	-939	*	40-105	4.10	(< 30)
Surrogates												
2-Fluorobiphenyl		23.7	20.2	85		23.7	19.5	83		45-105	2.90	
Terphenyl-d14		23.7	24.9	105		23.7	23.5	99		30-125	5.80	

Batch Information

Analytical Batch: XMS8430
Analytical Method: 8270D SIMS (PAH)
Instrument: HP 6890/5973 MS SVQA
Analyst: RTS
Analytical Date/Time: 11/25/2014 9:13:00PM

Prep Batch: XXX32474
Prep Method: Sonication Extraction Soil 8270 PAH SIM
Prep Date/Time: 11/25/2014 1:54:44PM
Prep Initial Wt./Vol.: 22.55g
Prep Extract Vol: 1.00mL

Print Date: 12/04/2014 3:59:34PM

Method Blank

Blank ID: MB for HBN 1686961 [XXX/32489]
Blank Lab ID: 1247514

Matrix: Soil/Solid (dry weight)

QC for Samples:
1145790002

Results by **8270D SIMS (PAH)**

Parameter	Results	LOQ/CL	DL	Units
1-Methylnaphthalene	2.50U	5.00	1.50	ug/Kg
2-Methylnaphthalene	2.50U	5.00	1.50	ug/Kg
Acenaphthene	2.50U	5.00	1.50	ug/Kg
Acenaphthylene	2.50U	5.00	1.50	ug/Kg
Anthracene	2.50U	5.00	1.50	ug/Kg
Benzo(a)Anthracene	2.50U	5.00	1.50	ug/Kg
Benzo[a]pyrene	2.50U	5.00	1.50	ug/Kg
Benzo[b]Fluoranthene	2.50U	5.00	1.50	ug/Kg
Benzo[g,h,i]perylene	2.50U	5.00	1.50	ug/Kg
Benzo[k]fluoranthene	2.50U	5.00	1.50	ug/Kg
Chrysene	2.50U	5.00	1.50	ug/Kg
Dibenzo[a,h]anthracene	2.50U	5.00	1.50	ug/Kg
Fluoranthene	2.50U	5.00	1.50	ug/Kg
Fluorene	2.50U	5.00	1.50	ug/Kg
Indeno[1,2,3-c,d] pyrene	2.50U	5.00	1.50	ug/Kg
Naphthalene	2.50U	5.00	1.50	ug/Kg
Phenanthrene	2.50U	5.00	1.50	ug/Kg
Pyrene	2.50U	5.00	1.50	ug/Kg
Surrogates				
2-Fluorobiphenyl	69	45-105		%
Terphenyl-d14	87.3	30-125		%

Batch Information

Analytical Batch: XMS8435
Analytical Method: 8270D SIMS (PAH)
Instrument: HP 6890/5973 MS SVQA
Analyst: RTS
Analytical Date/Time: 12/2/2014 9:06:00PM

Prep Batch: XXX32489
Prep Method: SW3550C
Prep Date/Time: 12/2/2014 11:27:44AM
Prep Initial Wt./Vol.: 22.5 g
Prep Extract Vol: 1 mL

Print Date: 12/04/2014 3:59:34PM

Blank Spike Summary

Blank Spike ID: LCS for HBN 1145790 [XXX32489]
Blank Spike Lab ID: 1247515
Date Analyzed: 12/02/2014 21:19

Matrix: Soil/Solid (dry weight)

QC for Samples: 1145790002

Results by **8270D SIMS (PAH)**

Blank Spike (ug/Kg)

Parameter	Spike	Result	Rec (%)	CL
1-Methylnaphthalene	22.2	12.8	58	(44-107)
2-Methylnaphthalene	22.2	12.2	55	(45-105)
Acenaphthene	22.2	13.4	60	(45-110)
Acenaphthylene	22.2	11.3	51	(45-105)
Anthracene	22.2	14.1	63	(55-105)
Benzo(a)Anthracene	22.2	18.0	81	(50-110)
Benzo[a]pyrene	22.2	12.4	56	(50-110)
Benzo[b]Fluoranthene	22.2	17.9	81	(45-115)
Benzo[g,h,i]perylene	22.2	16.4	74	(40-125)
Benzo[k]fluoranthene	22.2	18.2	82	(45-125)
Chrysene	22.2	18.7	84	(55-110)
Dibenzo[a,h]anthracene	22.2	16.5	74	(40-125)
Fluoranthene	22.2	19.7	89	(55-115)
Fluorene	22.2	14.7	66	(50-110)
Indeno[1,2,3-c,d] pyrene	22.2	16.8	76	(40-120)
Naphthalene	22.2	12.6	57	(40-105)
Phenanthrene	22.2	16.5	74	(50-110)
Pyrene	22.2	19.2	86	(45-125)
Surrogates				
2-Fluorobiphenyl	22.2	66.5	67	(45-105)
Terphenyl-d14	22.2	91.6	92	(30-125)

Batch Information

Analytical Batch: **XMS8435**
Analytical Method: **8270D SIMS (PAH)**
Instrument: **HP 6890/5973 MS SVQA**
Analyst: **RTS**

Prep Batch: **XXX32489**
Prep Method: **SW3550C**
Prep Date/Time: **12/02/2014 11:27**
Spike Init Wt./Vol.: 22.2 ug/Kg Extract Vol: 1 mL
Dupe Init Wt./Vol.: Extract Vol:

Matrix Spike Summary

Original Sample ID: 1145798005
MS Sample ID: 1247516 MS
MSD Sample ID: 1247517 MSD

Analysis Date: 12/02/2014 21:33
Analysis Date: 12/02/2014 21:47
Analysis Date: 12/02/2014 22:01
Matrix: Soil/Solid (dry weight)

QC for Samples: 1145790002

Results by **8270D SIMS (PAH)**

		Matrix Spike (ug/Kg)				Spike Duplicate (ug/Kg)					
Parameter	Sample	Spike	Result	Rec (%)		Spike	Result	Rec (%)		CL	RPD (%)	RPD CL
1-Methylnaphthalene	8.62	23.2	25.6	73		23.2	24.8	70		44-107	2.80	(< 30)
2-Methylnaphthalene	10.3	23.2	26.0	68		23.2	25.3	65		45-105	3.00	(< 30)
Acenaphthene	5.19U	23.2	14.4	62		23.2	16.5	71		45-110	13.50	(< 30)
Acenaphthylene	5.19U	23.2	19.5	84		23.2	19.2	83		45-105	2.10	(< 30)
Anthracene	5.19U	23.2	15.2	66		23.2	13.8	60		55-105	9.40	(< 30)
Benzo(a)Anthracene	20.1	23.2	25.3	22	*	23.2	30.8	46	*	50-110	19.50	(< 30)
Benzo[a]pyrene	5.19U	23.2	2.60U	0	*	23.2	2.60U	0	*	50-110	0.00	(< 30)
Benzo[b]Fluoranthene	5.19U	23.2	2.60U	0	*	23.2	2.60U	0	*	45-115	0.00	(< 30)
Benzo[g,h,i]perylene	5.19U	23.2	25.5	110		23.2	35.0	151	*	40-125	31.40	* (< 30)
Benzo[k]fluoranthene	5.19U	23.2	2.60U	0	*	23.2	2.60U	0	*	45-125	0.00	(< 30)
Chrysene	34.5	23.2	37.7	14	*	23.2	48.4	60		55-110	24.70	(< 30)
Dibenzo[a,h]anthracene	5.19U	23.2	17.8	77		23.2	20.5	89		40-125	14.20	(< 30)
Fluoranthene	48.3	23.2	43.7	-20	*	23.2	60.4	52	*	55-115	32.00	* (< 30)
Fluorene	12.7	23.2	30.0	74		23.2	27.5	64		50-110	8.70	(< 30)
Indeno[1,2,3-c,d] pyrene	5.19U	23.2	23.6	102		23.2	30.5	132	*	40-120	25.60	(< 30)
Naphthalene	5.19U	23.2	21.0	70		23.2	21.3	72		40-105	1.50	(< 30)
Phenanthrene	17.9	23.2	33.2	66		23.2	35.7	77		50-110	7.20	(< 30)
Pyrene	44.0	23.2	43.5	-2	*	23.2	55.5	50		45-125	24.10	(< 30)
Surrogates												
2-Fluorobiphenyl		23.2	18.2	78		23.2	17.9	78		45-105	1.20	
Terphenyl-d14		23.2	19.1	82		23.2	17.1	74		30-125	11.40	

Batch Information

Analytical Batch: XMS8435
Analytical Method: 8270D SIMS (PAH)
Instrument: HP 6890/5973 MS SVQA
Analyst: RTS
Analytical Date/Time: 12/2/2014 9:47:00PM

Prep Batch: XXX32489
Prep Method: Sonication Extraction Soil 8270 PAH SIM
Prep Date/Time: 12/2/2014 11:27:44AM
Prep Initial Wt./Vol.: 22.59g
Prep Extract Vol: 1.00mL

Print Date: 12/04/2014 3:59:35PM

SGS

SGS North America Inc.
CHAIN OF CUSTODY RECORD

1145790

Instructions: Sections 1 - 5 must be filled out. Omissions may delay the onset of analysis.

Page ___ of ___

Section 1

CLIENT: JOHN SEIGLE (ABR inc.)

CONTACT: ~~STEPHEN EDE~~ JOHN SEIGLE PHONE NO: 907-344-6777 x206

PROJECT NAME: COLVILLE FALL FISHERY PROJECT/ PWSID/ PERMIT#: 14-162

REPORTS TO: JOHN SEIGLE E-MAIL: jseigle@abrinc.com

INVOICE TO: QUOTE #:

P.O. #: 14-162

Section 2

RESERVED for lab use	SAMPLE IDENTIFICATION	DATE mm/dd/yy	TIME HH:MM	MATRIX/ MATRIX CODE	Section 3 # CONTAINERS	Type C = COMP G = GRAB MI = Multi Incre-mental Soils	Preservative: METALS	DRO/RRO	PAH SIM								REMARKS/ LOC ID
①A-B	SITE #1 (COLVILLE FALL)	11/18/2014	14:15		2		X	X	X								
②A-B	SITE #2 (COLVILLE FALL)	11/19/2014	16:30		2		X	X	X								

Section 5

	Date	Time	
Relinquished By: (1) JOHN SEIGLE	11/24/14	12:11 pm	Received By:
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	11/24/14	12:11	Received For Laboratory By:

Section 4

DOD Project? Yes No

Cooler ID: _____

Data Deliverable Requirements:

Requested Turnaround Time and/or Special Instructions:

Temp Blank °C: Chilled

or Ambient [ ]

(See attached Sample Receipt Form)

Chain of Custody Seal: (Circle)

INTACT BROKEN (ABSENT)

(See attached Sample Receipt Form)

[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

F083-Kit_Request_and_COC_Templates-Blank
Revised 2013-03-24

SGS

1145790

SAMPLE RECEIPT FORM

Review Criteria:	Condition:	Comments/Action Taken:
Were **custody seals** intact? Note # & location, if applicable. COC accompanied samples?	Yes No (N/A) Yes No	☐ *Exemption permitted if sampler hand carries/delivers.*
Temperature blank compliant* (i.e., 0-6°C after CF)? *If >6°C, were samples collected <8 hours ago?* *If <0°C, were all sample containers ice free?* Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ Cooler ID: _____ @ _____ w/ Therm.ID: _____ If samples are received without a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "**COOLER TEMP**" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled."	Yes (No) Yes (No) N/A Yes No (N/A) Chilled	☐ *Exemption permitted if chilled & collected <8 hrs ago.* *Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.*
Delivery method (specify all that apply): ~~Client (hand carried)~~ USPS Lynden AK Air Alert Courier UPS FedEx RAVN C&D Delivery Carlile Pen Air Warp Speed Other: _____ → *For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?*	Tracking/AB # or see attached or (N/A) Yes No (N/A)	
→ For samples received with payment, note amount ($) and whether cash / check / CC (**circle one**) was received.		
→ For samples **received in FBKS**, ANCH staff will verify all criteria are reviewed. SRF initiated in FBKS by:		
Were samples received within hold time? Do samples **match COC*** (i.e., sample IDs, dates/times collected)? Were analyses requested unambiguous?	(Yes) No N/A (Yes) No N/A (Yes) No N/A	*Note: Refer to form F-083 "Sample Guide" for hold times.* *Note: If times differ <1hr, record details and login per COC.*
Were samples in **good condition** (no leaks/cracks/breakage)? Packing material used (specify all that apply): Bubble Wrap Separate plastic bags Vermiculite Other:	(Yes) No	
Were **proper containers** (type/mass/volume/preservative*) used? Were **Trip Blanks** (i.e., VOAs, LL-Hg) in cooler with samples? Were all VOA vials **free of headspace** (i.e., bubbles ≤6 mm)? Were all soil VOAs **field extracted** with MeOH+BFB?	Yes No (N/A) Yes No (N/A) Yes No (N/A) Yes No (N/A)	☒ *Exemption permitted for metals (e.g., 200.8/6020A).*
For preserved waters (other than VOA vials, LL-Mercury or microbiological analyses), was **pH verified and compliant**? If pH was adjusted, were bottles flagged (i.e., stickers)?	Yes No (N/A) Yes No (N/A)	
For **special handling** (e.g., "MI" soils, foreign soils, lab filter for dissolved…, lab extract for volatiles, Ref Lab, limited volume), were bottles/paperwork flagged (e.g., sticker)?	Yes No (N/A)	
For **RUSH/SHORT Hold Time**, were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?	Yes No (N/A)	
For **SITE-SPECIFIC QC, e.g. BMS/BMSD/BDUP**, were containers / paperwork flagged accordingly?	Yes No (N/A)	
For any question answered "No," has the PM been notified and the problem resolved (or paperwork put in their bin)?	Yes No N/A	SRF Completed by: CRD PM notified: N/A
Was **PEER REVIEW** of ***sample numbering/labeling completed?***	Yes No (N/A)	Peer Reviewed by: N/A
Additional notes (if applicable):		

Note to Client: *Any "no" circled above indicates non-compliance with standard procedures and may impact data quality.*

Sample Containers and Preservatives

Container Id	Preservative	Container Condition	Container Id	Preservative	Container Condition
1145790001-A	No Preservative Required	OK			
1145790001-B	No Preservative Required	OK			
1145790002-A	No Preservative Required	OK			
1145790002-B	No Preservative Required	OK			

Container Condition Glossary

OK - The container was received at an acceptable pH for the analysis requested.

PA - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

PH - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

BU - The container was received with headspace greater than 6mm.

Appendix H. Age frequencies of Arctic Cisco caught in 7.6-cm mesh gill nets in the fall subsistence fishery, Niġliq Channel, Colville River, 1988–2014.

Season[a]	Age (Years)									Sample Size
	3	4	5	6	7	8	9	10	11	
1984	0.0	0.0	10.2	77.2	9.1	0.0	0.0	0.0	0.0	est
1985	0.0	0.0	3.3	21.5	68.2	4.8	1.3	0.0	0.0	est
1986	0.0	0.0	0.0	41.2	50.8	8.0	0.0	0.0	0.0	199
1987	0.0	0.5	0.0	1.0	59.0	32.0	7.6	0.0	0.0	196
1988	0.8	0.0	63.5	1.6	0.8	31.0	2.4	0.0	0.0	126
1989	0.0	18.3	0.0	72.0	0.0	0.0	9.3	0.3	0.0	est
1990	0.0	7.3	86.0	3.3	2.7	0.0	0.0	0.7	0.0	150
1991	0.0	4.9	51.0	33.6	1.4	5.6	0.0	2.1	0.0	143
1992	0.0	0.0	59.7	36.4	3.9	0.0	0.0	0.0	0.0	154
1993	0.0	0.0	3.4	79.7	14.9	2.0	0.0	0.0	0.0	148
1994	0.0	0.7	10.8	31.7	46.8	9.4	0.7	0.0	0.0	139
1995	0.0	0.0	59.5	23.6	7.4	7.4	2.0	0.0	0.0	148
1996	0.0	0.0	5.3	84.7	9.3	0.7	0.0	0.0	0.0	150
1997	0.0	0.0	43.2	11.6	41.1	4.1	0.0	0.0	0.0	146
1998	0.0	27.2	13.2	45.7	4.0	8.6	1.3	0.0	0.0	151
1999	0.0	23.3	62.0	2.7	8.0	2.7	1.3	0.0	0.0	150
2000	0.0	3.5	33.6	37.1	4.2	11.2	4.2	3.5	2.8	143
2001	0.0	10.3	16.5	37.1	14.4	4.1	12.4	5.2	0.0	97
2002	0.0	7.6	72.9	14.6	4.2	0.7	0.0	0.0	0.0	144
2003	0.0	0.0	20.0	75.0	5.0	0.0	0.0	0.0	0.0	est
2004	0.0	0.7	11.3	51.1	34.8	1.4	0.0	0.7	0.0	141
2005	0.0	1.0	1.0	50.5	36.9	10.7	0.0	0.0	0.0	103
2006	0.0	0.0	3.2	24.2	58.9	12.6	1.1	0.0	0.0	95
2007	0.0	12.8	17.9	28.2	35.9	5.1	0.0	0.0	0.0	39
2008	0.0	5.1	32.2	61.0	1.7	0.0	0.0	0.0	0.0	59
2009	0.0	11.7	69.2	17.5	1.7	0.0	0.0	0.0	0.0	120
2010	0.0	0.7	23.4	46.8	24.8	3.5	0.7	0.0	0.0	141
2011	0.0	0.0	15.2	64.5	15.2	5.1	0.0	0.0	0.0	138
2012	0.0	21.8	68.9	9.2	0.0	0.0	0.0	0.0	0.0	119
2013	0.0	20.9	67.2	11.9	0.0	0.0	0.0	0.0	0.0	134
2014	0.0	15.6	53.8	28.9	1.7	0.0	0.0	0.0	0.0	173

[a] Monitoring was conducted by 4 different entities: North Slope Borough in 1984; MJM Research 1985–2005; LGL Limited in 2006; and ABR, Inc. 2007–2014

est = estimated