Summaries of 2023 Environmental Field Studies

Each year, ConocoPhillips Alaska conducts scientific field studies throughout the Colville River delta, Kuparuk area, and northeastern National Petroleum Reserve – Alaska (NPR-A) on the North Slope of Alaska. These studies are conducted by third-party scientists with many years of experience on the North Slope. In 2023, our studies focused on several avian species (eiders, loons, geese, shorebirds), air quality, fish and subsistence fisheries, caribou, hydrology, cultural resources, and subsistence.

In an effort to share the study information more broadly with stakeholders, the scientists prepared a one-page summary explaining their work; where it was conducted; the reason(s) for the research; and an overview of their preliminary study findings. This booklet contains the one-page summaries of the biological and physical environmental field studies conducted in the Alpine and Kuparuk areas and the NPR-A during calendar year 2023. ConocoPhillips Alaska has also posted these one-page summaries on the North Slope Science Initiative (NSSI) Nuiqsut Environmental Information Website. This website contains all the ConocoPhillips scientific reports from environmental monitoring studies conducted within 50 miles of the Nuiqsut area.

https://northslopescience.org/nuiqsut/

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AMBIENT AIR QUALITY MONITORING FOR THE COLVILLE RIVER UNIT

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), SLR International Corporation (SLR) operates air quality monitoring stations in the Colville River Unit to collect continuous ambient air quality and meteorological data. These stations monitor concentrations of “criteria pollutants” (carbon monoxide, ground-level ozone, particulate matter, nitrogen dioxide, & sulfur dioxide). Each station utilizes pollutant-specific analyzers approved by the Environmental Protection Agency (EPA). Meteorological sensors are installed on a tower in Nuiqsut to determine local climate and atmospheric dispersion. Data has been collected at various sites since 1999, prior to the construction of the Alpine Central Processing Facility, and has continued throughout construction and operational phases of Alpine and its satellites.

Where did we go?
There are three monitoring stations: the Nuiqsut Monitoring Site (est. 1999) located at the northern edge of the village of Nuiqsut; the Alpine CD1 monitoring site (2012-2015; 2017-present); and the Alpine CD5 monitoring site (est. 2015). The data collected at these sites are remotely monitored by technicians in SLR’s Anchorage office. On-site monthly maintenance is performed by SLR technicians to ensure quality data is being collected.

Why were we working in the area?
Nuiqsut Monitoring Site – This station collects Prevention of Significant Deterioration (PSD) quality data to document Nuiqsut air quality near regional oilfield development. This site measures a) background ambient concentrations of air quality pollutants and particulate matter to establish National Ambient Air Quality Standards (NAAQS) compliance status for the monitoring location, and b) meteorological parameters at the project site. It provides meteorological data that is required for air quality permitting. Data from the Nuiqsut monitoring station is published to a state web page that displays current air quality conditions throughout the state: [https://dec.alaska.gov/air/air-monitoring/alaska-air-quality-real-time-data](https://dec.alaska.gov/air/air-monitoring/alaska-air-quality-real-time-data)

CD1 Monitoring Site – Originally, ambient air pollutant data was collected at this station to represent the CD1 area to support potential PSD permitting, for minor air quality permitting under state regulations, and to demonstrate “real-world conditions” representative of an operating production facility. Since 2017, this site has served to fulfill specific PM$_{2.5}$ quality assurance requirements.

CD5 Monitoring Site – Complies with North Slope Borough Rezone ordinance 75-6-46 stipulations. Additionally, this station collects ambient air pollutant data representative of the CD5 area to support potential PSD or minor air quality permitting under State of Alaska regulations.

What are our preliminary findings?
Data collected in 2023:
- Demonstrates compliance with NAAQS and Alaska Department of Environmental Conservation standards.
- Meets or exceeds EPA data quality requirements for PSD monitoring.
- Captured and quantified the impact of North American wildfires to North Slope air quality. Wildfires in western Canada contributed to three days where air quality in Nuiqsut was observed to be in the “Moderate” or “Unhealthy for Sensitive Groups” categories.
- Documents ambient air quality to be in “Good” to “Moderate” Index following the United States EPA Air Quality Index.
VOLATILE ORGANIC COMPOUND STUDY

What did we do?

On behalf of ConocoPhillips Alaska, Inc. (CPAI), SLR International (SLR) has been collecting volatile organic compounds (VOC) samples since 2014. The United States Environmental Protection Agency (EPA) defines VOC as “any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions.” VOC originates from natural sources (forest, soil, etc.) and anthropogenic sources (urban and industrial activities). Samples of ambient air have been collected monthly in Summa canisters (see diagram below) from multiple sites near the Alpine oilfield and one site in Anchorage, then transferred to an accredited laboratory for analysis of VOC using standard EPA test methods. In 2023, CPAI installed continuous VOC monitors at the CD1 and Nuiqsut air monitoring stations. These continuous samplers measure total ambient VOC (TVOC) concentrations. The sampler’s response is verified against a known standard monthly to ensure accurate measurement. Data is summarized in semi-annual VOC monitoring reports.

Where did we go?

The study area includes Nuiqsut, CD1, and Anchorage. The North Slope samples are collected near the CPAI air quality monitoring stations (see map). The Nuiqsut station is at the northern edge of Nuiqsut, approximately 450 yards northwest of the community electrical generators. The CD1 samples are collected at the Alpine CD1 facility, approximately nine miles north of the village of Nuiqsut. The Anchorage sampling site is collected at the CPAI downtown parking lot. The continuous monitors are installed inside the air monitoring stations at CD1 and Nuiqsut and sample ambient air continuously through a non-reactive glass and Teflon manifold.

Why were we working in the area?

VOC samples are collected to address concerns of the residents of Nuiqsut regarding air quality in the village and to assess potential impacts associated with nearby oilfield construction, drilling, and production activities. The VOC sampling program is an expansion of the ongoing air quality monitoring program on the North Slope, and it was designed to collect scientifically rigorous, accurate VOC data to document regional VOC concentrations that are representative of Nuiqsut, Alaska. The continuous TVOC monitors provide the ability to trend changes in VOC concentrations in the area and data is compared to that from the manual samples collected each month.

What are our preliminary findings?

- The initial 2014 VOC study demonstrated that VOC concentrations were below national toxic screening levels of concern, and the long-term trend has been consistent with those findings.
- The seemingly random nature of VOC detections with respect to wind speeds and wind directions in 2023 suggests that VOC detections are not directly attributable to a single local source but are more likely representative of regional “background” concentrations that could originate from any number of sources including natural and anthropogenic origin.
- VOC samples collected at the North Slope sites continue to demonstrate lower VOC concentrations than are observed in Anchorage and provides further evidence of good air quality conditions on the North Slope.

FINAL REPORTS WILL BE AVAILABLE ONLINE AT NORTHSLOPESCIENCE.ORG/NUIQSUT/
What did we do?
In June, on behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) biologists conducted ground-based searches for nests of sensitive species such as Spectacled and Steller’s eiders, additionally recording nests of other bird species. The goal is to find nests of sensitive species before off-pad activities are conducted that may disrupt nesting birds. If active eider nests are found, their locations are communicated to CPAI field environmental staff, and planned activities near nests are modified as needed to prevent disturbance. Some areas (i.e., Alaska Clean Seas [ACS] sites) are searched yearly, providing valuable information on changes in species and numbers of nests over time.

Where did we go?
ABR biologists conducted ground nest searches on the Colville River delta near Alpine oilfield and Greater Mooses Tooth (GMT) infrastructure. Searches were conducted at ACS spill response sites, ice roads, multiseason ice pads, and lake sites that overlapped with preferred eider nesting habitat. The team walked to sites near the road when possible and used a helicopter to access sites far from roads.

Why were we working in the area?
The Alpine development is within the current or historical breeding ranges of Spectacled and Steller’s eiders, 2 species that are listed as threatened under the Endangered Species Act (ESA). Spectacled Eiders are regularly observed in the Alpine region, while Steller’s Eiders are extremely uncommon. CPAI occasionally conducts off-pad activities necessary for regulatory compliance and operations during the eider breeding season (June and July) such as tundra clean-up after the ice-roads melt, spill-response equipment deployment, hydrological monitoring, water access, or civil surveys. Searching for eider nests before conducting off-pad work is a requirement of ESA compliance and development permitting. This was the 15th summer that ABR has conducted eider nest searches in advance of off-pad work in the Alpine Oilfield.

What are our preliminary findings?
- In June 2023, a team of 4 biologists searched 18 sites in 7 days and found no Spectacled or Steller’s eider nests.
- The team recorded 341 nests of 18 species of birds. Most of the nests recorded were of 3 species of geese, which included: 175 Snow Goose nests (found in 4 ACS sites, compared to 29 nests in the same 4 sites in 2022); 123 Greater White-fronted Goose nests (97 nests in 2022), and 8 unidentified Cackling and/or Canada goose (16 nests in 2022). The remaining 35 nests recorded were of shorebirds, seabirds, passerines, and raptors.
AERIAL SURVEYS OF EIDERS ON THE COLVILLE RIVER DELTA

**What did we do?**
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) conducted aerial surveys of Spectacled and King eiders on the Colville River delta during the pre-nesting season (early June). Biologists recorded species, numbers, locations, and habitats for all eiders observed. This long-term study began in 1993, prior to oil development on the delta. During the past three decades, ABR has identified important locations and habitats used by eiders and monitored eider numbers throughout all phases of construction and operation of the oilfields in the Colville River delta.

**Where did we go?**
ABR surveyed the area between the Nechelik and East channels of the Colville River using a small fixed-wing aircraft. The survey area was bounded on the north by the mud flats of the outer delta, and on the south by an east-west line about 2 miles (3.2 km) north of the village of Nuiqsut (see map). Biologists flew a series of 64 east-west transects, each 0.25 miles (0.4 km) wide, and evenly spaced 0.25 miles (0.4 km) apart, resulting in 100% coverage of the delta.

**Why were we working in the area?**
The Colville River delta is recognized as an important breeding area for eiders. The Spectacled Eider was listed as threatened under the Endangered Species Act in 1993. CPAI was required by the U.S. Fish and Wildlife Service to study the species when the CD3 drill site was built in the early 2000s. King Eiders are an important subsistence resource in North Slope Borough communities, and migration studies have indicated that the species has declined in recent decades in the Arctic. The North Slope Borough has required continued monitoring of eiders on the delta due to its value to these species, and the importance of eiders to local communities.

**What are our preliminary findings?**
- The density of Spectacled Eiders on the Colville River delta was near average in 2023. Spectacled Eider numbers have varied from year to year, but overall, their numbers on the delta have not changed much since surveys began in 1993. In contrast, the density of King Eiders was well above average in 2023, and numbers have increased in the study area over the past 30 years.
- As in previous years, most Spectacled Eiders were found north of Alpine and east of the Elaktoveach Channel. King Eiders were widely distributed, with large flocks found in river channels, bays, and flooded areas near the coast.
- Based on the habitats that Spectacled and King eiders were observed using, and on past observations during ground nest searches, it is likely that most Spectacled Eiders seen during the prenesting survey were breeding on the Colville River delta and that many King Eiders were moving through the area to breed elsewhere.

[Colville River delta survey area with 2023 eider observations.

King Eider male. Spectacled Eider female. Survey aircraft and pilot.]
EIDER STUDY IN THE GREATER MOOSE TOOTH AND WILLOW AREAS

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) flew a survey over 2 new oil development areas searching for pairs of prenesting King and Spectacled eiders in early June. Following the aerial survey, 4–5 biologists searched for eider nests on the ground in 20 treatment plots (near planned or existing oil development) and 21 control plots (located far from developments). At each plot, biologists recorded details of all nests found (including those of non-eider species) and counted potential predators. A trail camera was set up on each active eider nest and each nest was revisited postbreeding to determine nest fate.

Where did we go?
For the aerial survey, a small fixed-wing aircraft flew along transects spaced evenly at half-mile intervals from Fish Creek south to include the Greater Mooses Tooth (GMT) and Willow project areas. For nest searching, the team used a truck to access all plots near the GMT road (within approx. 0.25 mile) and a helicopter to access plots that were far from the road.

Why were we working in the area?
As part of the rezone ordinance for Alpine-GMT2, the North Slope Borough (NSB) required a waterfowl study to examine the potential impacts of oil development on nesting birds. CPAI and NSB biologists decided that eiders—an important subsistence species in NSB communities—would be the focal species of the study. The goal of the study is to determine if construction and postconstruction activities of the GMT and Willow projects affect the nest site selection or reproductive success of eiders. This was the fourth year of a 5-year study.

What are our preliminary findings?
Aerial surveys:
- The team flew approximately 740 miles (1,200 km) of linear transects.
- King Eiders were broadly distributed throughout the study area. Biologists counted 112 King Eiders in 2023, about 15% more than in 2022, but fewer than in 2020 or 2021. Most occurred as pairs or single males, and likely were breeding in the area.
- No Spectacled Eiders were observed from the airplane in 2022. During the first 4 years of this study, the only Spectacled Eider recorded was a single male in 2021.

Ground surveys:
- In 10 days of nest-searching, the field crew found 7 active eider nests in the study areas. One nest was in the GMT treatment, and 2 in the GMT reference site. In the Willow study area 2 nests were in the treatment and 2 in reference sites. Two additional active nests were found near the road, but outside the study area.
- Cameras successfully recorded the fate of each active nest. Camera images will also be used to quantify incubation behaviors of female eiders.
- Of the 7 eider nests, 1 nest failed from predation by Glaucous Gulls (GMT treatment), 1 was abandoned (GMT reference), and the 3rd nest’s fate is unknown (Willow reference). Four nests successfully hatched at least 1 chick.
AERIAL SURVEYS FOR MOLTING AND BROOD-REARING BRANT AND SNOW GEESE ON THE COLVILLE RIVER DELTA

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) conducted an aerial survey for molting and brood-rearing Brant and Snow Geese on the Colville River delta in late July 2023. Surveys were timed to avoid impacts to subsistence users in the area. Biologists recorded the locations of all Brant and Snow Geese observed, estimated the numbers of adults and young in each group, and photographed brood groups to obtain precise counts. ABR has conducted surveys of molting and brood-rearing geese on the Colville River delta since 1988.

Where did we go?
ABR used a small fixed-wing airplane to survey the area between the Nechelik and East channels of the Colville River. The survey area included a series of east-west oriented transects, each 0.5 mi (0.8 km) wide, and evenly spaced 1 mi (1.6 km) apart, resulting in 50% coverage of the delta. Biologists surveyed a total of 14 transects, which were bounded on the north by the mud flats of the outer delta and on the south by an east-west line about 5 mi (8 km) north of Nuiqsut.

Why were we working in the area?
CPAI funded these surveys to satisfy North Slope Borough rezone stipulations for the Alpine and Greater Mooses Tooth developments. Geese are an important subsistence resource, and these surveys provide valuable information on the status of Brant and Snow Geese near current and future oil development. Data will be used to look for changes in numbers of Brant and Snow Geese over time and to identify important habitats and specific locations used by brood-rearing geese on the Colville River delta.

What are our preliminary findings?
- Aerial photos are still being examined for precise counts, but biologists visually estimated 1,309 Brant (604 adults and 705 goslings) and 31,371 Snow Geese (15,320 adults and 16,051 goslings) during the survey. Considering that only half of the delta was surveyed, there were probably at least 2,500 Brant and over 60,000 Snow Geese on the delta in 2023.
- Although quite variable, numbers of brood-rearing adult Brant have increased by about 10%/yr on the Colville River delta over the past 3 decades, from fewer than 2,000 birds/yr prior to 1998 to over 5,000 birds/yr in some years since 2017.
- Most Brant rear their broods on the outer delta north of CD3, although hundreds of birds regularly use a lake near Alpine.
- Snow Geese were rarely seen on the Colville River delta prior to the early 2000s, but their numbers have increased dramatically over the past 18 years, from fewer than 1,000 brood-rearing birds in 2005 to over 60,000 in 2023.
- Snow Geese have expanded their range inland, from primarily coastal saline habitats prior to the mid-2010s, to a mix of habitats favoring freshwater lakes and meadows up to 9 miles (45.5 km) from the coast in recent years.
AERIAL SURVEYS FOR MOLTING AND BROOD-REARING GEESE IN THE WILLOW PROJECT AREA

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) conducted an aerial survey for molting and brood-rearing geese in the Willow Project area during late July. Surveys were timed to avoid impacts to subsistence users in the area. Biologists recorded species, locations, and numbers of adults and young for all geese observed. ABR previously surveyed geese in the area in 2001–2004. Biologists will compare the current number of geese in the Willow Project area with the numbers observed in 2001–2004, and with the numbers in other locations on the Arctic Coastal Plain. This was the third year of a multi-year study.

Where did we go?
ABR flew a series of 29 east-west transects over the Willow and Greater Mooses Tooth (GMT) project areas in a small, fixed-wing aircraft. Transects were 0.5 mi (0.8 km) wide and evenly spaced 1 mi (1.6 km) apart, resulting in 50% coverage of the survey area. The survey encompassed about 760 mi² (1,970 km²) and was 4.5 mi (~7 km) west of Nuiqsut (see map).

Why were we working in the area?
CPAI funded these surveys to satisfy North Slope Borough rezone stipulations for the Willow Project. Geese are an important subsistence resource, and molting and brood-rearing geese are sensitive to disturbance as they are unable to fly at this stage of their life cycle. These surveys provide valuable information on the status of goose species near current and future oil development. Data from this project will be used to identify any important goose brood-rearing and molting areas in the Willow and GMT project areas.

What are our preliminary findings?
- Biologists recorded 121 groups of geese (5,313 adults and 2,294 goslings) on water bodies (excluding birds seen only in flight). Densities were highest in lakes and streams along the Fish Creek corridor in the northeast corner of the study area.
- Greater White-fronted Geese were recorded throughout the study area and were the most abundant species (3,873 adults and 1,222 goslings). The density of Greater White-fronted Geese appears to have increased in the area since 2001–2004.
- Snow Geese prefer coastal areas for brood-rearing and molting, and they were found exclusively in the northeast corner of the survey area in 2023, within 5 mi of the coast.
- Over 2,150 Snow Geese were recorded in the survey area in 2023, up from around 750 in 2021 and 300 in 2022. Very few Snow Geese were recorded in the area during earlier surveys in 2001–2004, but their numbers and range have increased substantially in the region over the past 15 years.
- White-cheeked geese (Cackling and/or Canada geese) were found in lower numbers than Greater White-fronted or Snow geese in 2023, but numbers were up compared to 2021 and 2022, and some molting groups included goslings.
- Like Snow Geese, Brant prefer coastal areas for brood-rearing and molting, and all Brant recorded since 2021 have occurred in the northeast corner of the survey area. No Brant were observed during the survey in 2023.
SHOREBIRD MONITORING IN THE WILLOW PROJECT AREA

What did we do?
On behalf of ConocoPhillips Alaska (CPAI), ABR, Inc.—Environmental Research & Services (ABR) searched for nests of shorebirds, songbirds, and waterfowl during early June through mid-July 2023. A team of biologists monitored plots that were established in the Willow Project area at a variety of distances from planned infrastructure. The team found nests using 2 methods: rope dragging to find nests of species that tend to flush from nests at close distances, and behavioral observation to find nests of species that tend to flush at farther distances. They also visited historical plots located north of the GMT2 pad that ABR surveyed during 2001–2004 and in 2021–2022. ABR is monitoring these historical plots to see whether there have been any changes to the distribution and number of shorebird nests since 2004. At all plots, biologists collected data on predators and environmental factors such as snow cover and habitat type. In 2023, biologists also set up traps to catch bees as part of the Alaska Bee Atlas, a statewide effort to gather data on the biodiversity of bees in Alaska. This was the third and final year of pre-construction monitoring, and the team will continue to monitor these plots during and after construction of the Willow Project.

Where did we go?
Biologists used a helicopter to access 24 research plots in the Willow Project and GMT2 areas and visited each plot multiple times during the season. As infrastructure is built, biologists will rely less on helicopters and more on trucks and walking to access plots in future years.

Why were we working in the area?
The Willow shorebird monitoring project began in 2021, and 2023 is the third year of the project. This project satisfies North Slope Borough (NSB) rezone stipulations for the Willow Project. Data collected during this study will help CPAI and the NSB understand the baseline (preconstruction) distribution, numbers, and success rates of shorebird nests in the Willow Project area. Comparing baseline results to during- and postconstruction findings will help biologists, land users, and land managers understand what effects development and environmental factors may have on breeding shorebirds. Long-term studies such as this one also help them understand how nesting conditions vary in a given area from year to year.

What are our preliminary findings?
- Temperatures in early June were cool but quickly warmed, and most shorebirds began nesting earlier in 2023 than in 2022.
- Biologists found 237 nests of 19 species across all plots, including 143 nests of 9 shorebird species. As in previous years, the most common nesting shorebird species were Pectoral Sandpipers, Long-billed Dowitchers, and Red-necked Phalaropes. The most common non-shorebird species was Lapland Longspur.
- Biologists installed small temperature loggers in the nests of Pectoral Sandpipers \( (n = 12) \), Long-billed Dowitchers \( (n = 4) \), and Red-necked Phalaropes \( (n = 8) \) to study nesting behavior and determine the exact date of hatch or failure. In 2023, biologists also installed loggers in the nests of Black-bellied Plovers \( (n = 8) \).
- Most shorebird nests found in 2023 hatched at least 1 chick. The number of shorebird nests that hatch varies widely by species.
- No bees were captured in 2023, despite extensive survey efforts. Biologists may attempt these surveys again in 2024.
What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) flew surveys around lakes to look for Yellow-billed Loon nests in June and for chicks in August. During the surveys, a biologist flew in a helicopter along the shoreline of specific lakes, islands and peninsulas and recorded loon observations. The purpose of the study is to document the abundance, distribution, and nesting success of Yellow-billed Loons in the project area. ABR first surveyed the area in 1993, prior to Alpine’s development. Surveys have continued throughout the construction and operational phases of Alpine and its satellite developments. This is the 29th summer that ABR has been monitoring breeding Yellow-billed Loons on the Colville River delta for CPAI.

Where did we go?
When surveys were first conducted, ABR surveyed all large lakes on the Colville River delta. In more recent years, however, only the lakes where Yellow-billed Loons have been seen during the previous 23 years were included. The survey area, shown in the map to the right, is more than 200 mi² and contains roughly 120 survey lakes.

Why were we working in the area?
Yellow-billed Loons breeding in Alaska have a small, unevenly distributed population. In 2009, the species was proposed but not listed under the Endangered Species Act. Today, state and federal agencies still consider the Yellow-billed Loon a species that warrants special management. These surveys have been critical in assessing the status of the population and are helping land managers understand how future oilfield development in the National Petroleum Reserve-Alaska might affect loons. Continued monitoring of this species satisfies North Slope Borough requirements (2018 Alpine-GMT Rezone Ordinance).

What are our preliminary findings?
• Biologists counted 33 nests and 23 chicks during 2023, which is more than they typically find on the Colville River delta. The number of chicks seen in 2023 was the third-highest number counted since surveys began in 1993.
• Approximately 70% of the nests found in 2023 hatched chicks. In a typical year, just over 50% of nests hatch chicks.
• Although biologists have not detected increasing or decreasing trends in numbers of adult loons over the long-term dataset, the number of nests generally has been increasing over the last 10 years.
YELLOW-BILLED LOONS IN THE WILLOW AREA

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) flew surveys around lakes to look for Yellow-billed Loon nests in June and chicks in August. The purpose of the study is to determine the abundance, distribution, and nesting success of Yellow-billed Loons in the Willow project area. During the surveys, a biologist flew in a helicopter along the shoreline of lakes, islands, and peninsulas, and recorded loon observations. Scientists also set up time-lapse cameras at some nests to monitor the behavior of loons, identify egg and chick predators, and confirm the nest fate. ABR has conducted Yellow-billed Loon surveys in the Willow area since 2017.

Where did we go?
The Willow survey area includes over 300 lakes within 3 miles of the proposed Willow roads and pads—a survey area that extends 330 mi². A helicopter must be used for surveys because the study area is large, and nests and young are most visible and best counted during short periods of the summer. It is important to fly surveys at the same time each year to compare the number of adults, nests, and chicks seen among survey years.

Why were we working in the area?
The Bureau of Land Management (BLM) designated the Yellow-billed Loon as a Sensitive Species, meaning that the BLM works cooperatively with other agencies and organizations to proactively conserve Yellow-billed Loons on federal lands. Yellow-billed Loons are sensitive to disturbances and leave nests when people are nearby, exposing nests to predators. BLM stipulations for oil and gas leases in the National Petroleum Reserve-Alaska specify setbacks between infrastructure and nest sites and lakes used by Yellow-billed Loons. Data from this study helps CPAI comply with setbacks and informs oilfield design and mitigations. Monitoring of nesting Yellow-billed Loons also satisfies North Slope Borough rezone stipulations for the Willow Project.

What are our preliminary findings?
- Biologists counted 39 Yellow-billed Loon nests and 20 chicks during surveys in 2023. Although biologists found a record number of nests, indicating high nesting effort, the number of chicks produced was near the 6-year average.
- During 2023, biologists saw Yellow-billed Loons breeding on 5 lakes that were previously not known to support breeding loons. With these additional lakes, biologists have identified 60 lakes that have been used by breeding Yellow-billed Loons in the Willow project area.
- Of the 15 nests monitored with time-lapse cameras, 8 hatched chicks, 4 failed due to egg predation (2 nests to Glaucous Gull, 1 nest each to a Parasitic Jaeger and a red fox), 1 was crushed by wind-blown lake ice, 1 was abandoned due to a territorial conflict with other loons, and 1 contained infertile eggs that were abandoned and scavenged by a wolverine.
What did we do?
On behalf of Conoco Phillips Alaska, Inc. (CPAI), Reanier & Associates, Inc. conducts cultural resource reconnaissance surveys in areas where there might be exploration or development projects in the future. These studies have been conducted annually since 1979 by CPAI to locate cultural resource sites that will need protection. Such sites are places where people have left evidence of past activities like camping, fishing, and hunting on the landscape. Sod house ruins, campsites, reindeer corrals, and scatters of stone flakes from stone tool manufacture are examples. Protecting these sites helps to preserve Iñupiat cultural heritage.

Where did we go?
In 2023, cultural resources surveys were conducted in various CPAI areas of interest on the North Slope, primarily in the National Petroleum Reserve – Alaska. Both aerial and on-the-ground surveys were conducted in 2023, with transportation to and from the survey sites conducted via helicopter.

Why were we working in the area?
Archaeological and historic sites are places where people once lived and worked, leaving behind traces of their presence. Many such sites are also part of the cultural heritage of North Slope villages. In order to adequately protect such sites, their locations must be precisely known, which requires an archaeological survey to find and record them. There are numerous Borough, State, and Federal laws and regulations that require these surveys. Visiting previously recorded sites to verify locations with modern GPS coordinates is also an ongoing part of the program.

Examples of findings
Above is a sod house ruin typical of the coastal area, showing remains of traditional vertical wall boards made from split driftwood. Although it looks like a foundation, the berm around the floor results from the collapse of the sod blocks that once entirely covered the house. Archie Ahkviviana stands in the doorway. Many such sod houses, either standing or in ruins, dot the Beaufort Sea coast.

Occasionally unexpected objects are found during these surveys, such as this folding sled found north of Fish Creek. The Fold-A-Sled was manufactured in Minnesota, probably in the 1960s or 1970s. These sleds were sold in Alaska in the 1980s and perhaps earlier. This sled had broken down and had been abandoned. There is evidence of earlier repairs – some of the wood had been replaced and the tow bar repaired by welding. The sled originally had side rails, and a bar that the standing rider could grasp. The reason for the sled’s presence north of Fish Creek and the story of its abandonment are unknown, and will probably remain so.

This data is shared with appropriate cultural resource agencies, but reports are not available on the North Slope Science Initiative website due to confidentiality requirements.
**What did we do?**

On behalf of ConocoPhillips Alaska, Inc. (CPAI), Owl Ridge Natural Resource Consultants conducted a fish monitoring study in the Tinmiaqsiugvik River drainage in the National Petroleum Reserve-Alaska. This study builds upon earlier studies in the area that began in 2001. Researchers sampled the drainage for three 7-day periods in 2023: after break-up in June, during mid-summer in July, and just before freeze-up in late August. Fish moving both upstream and downstream were captured in specialized nets, called fyke nets, that funnel fish into a live-trap end. Water chemistry measurements were recorded daily at each site and all fish captured were identified and measured. Fish longer than approximately seven inches were tagged with a unique number to help evaluate seasonal and annual movements within and between drainages. Local fishers who catch a tagged fish can help researchers understand fish movement by calling or emailing the contact information on the tag.

**Where did we go?**

Researchers sampled six sites in 2023. Sampling sites were located along the mainstem of the Tinmiaqsiugvik River and in small creeks flowing into it. Sites were located both downstream and upstream of the bridge crossing and were accessed by boat.

**Why were we working in the area?**

The goal of this study is to better understand how, when, where, and what species, numbers, and ages of fish are using the Tinmiaqsiugvik River drainage. The 2023 surveys are the last year of a four-year monitoring study in the drainage. Data collected will support Alpine-GMT2 Rezone monitoring conditions required by the North Slope Borough. Fish tagging data is used to track fish movements and to develop population estimates that can be compared to past and future estimates. Monitoring of fish using the Tinmiaqsiugvik River may also allow an assessment of the potential effects of development activities and climate change on these fish populations.

**What are our preliminary findings?**

- A total of 11,988 fish and 11 species were captured across 2,923 total effort hours in 2023.
- Arctic grayling accounted for about 62% of the total catch, followed by ninespine stickleback (29%), least cisco (3%) and slimy sculpin (2%). All other species accounted for about 4% of the catch.
- Catches in June were some of the highest recorded over the past 20+ years, while catches in July and August were lower than average.
- Fluctuations in catch highlight the large variation in seasonal and annual fish movements and the importance of long-term monitoring.
- In 2023, 583 fish were tagged and 102 fish were recaptured from being tagged in previous years, including two Arctic grayling from 2014.
- Continued data analysis will be conducted to generate population estimates and to determine the age, growth, maturity, and other characteristics of fish populations using the drainage.
WILLOW AREA FISH SURVEYS

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), Owl Ridge Natural Resource Consultants studied fish use of streams in the Willow area. Researchers identified the composition of fish species, their seasonal distribution and movements, and population characteristics, such as the size and numbers of fish using streams in the study area. The team sampled fish in three 7-day periods: just after break-up in June, mid-summer in July, and just before freeze-up in late August. Fish moving both upstream and downstream were captured using specialized nets, called fyke nets, that funnel fish into a live-trap end. Each fish was identified, measured, and released. Fish longer than approximately seven inches were tagged with a unique number to help evaluate seasonal and annual movements within and between drainages. Water chemistry was recorded each day at each site. Local fishers who catch a tagged fish can help researchers understand fish movement by calling or emailing the contact information on the tag.

Where did we go?
In the 2023 season, the team sampled 8 fyke net sites distributed across the mainstem and headwater lakes of Judy Creek Kayyaq and along a tributary of Fish Creek (Uvlutuuq), named Willow 2. Researchers traveled to and from the sampling sites by helicopter.

Why were we working in the area?
This study was initially required by the Bureau of Land Management and the Alaska Department of Fish and Game to provide a baseline for understanding how fish use streams in the Willow area and to assess potential future impacts to fish from development activities and climate change. The study is also required by the North Slope Borough Willow Rezone Ordinance to help detect and understand possible changes to fish within the project area over time. Collected data is used in stream crossing design and construction to ensure adequate fish passage and habitat. The 2023 sampling goals placed emphasis on two specific streams that are representative of other streams in the area in terms of fish use and size. Sampling enables estimates of fish populations using the streams and monitoring of seasonal use patterns.

What are our preliminary findings?
- The team captured 6,529 fish consisting of 8 different species from 4,200 hours of net soaking time.
- Least cisco were the most abundant fish captured and accounted for about 37% of total catch, followed by Arctic grayling (31%), ninespine stickleback (16%), broad whitefish (7%), and humpback whitefish (6%). All other species accounted for about 3% of the remaining catch.
- A total of 2,390 fish were tagged, and another 181 fish were recaptured that were previously tagged.
- Of fish recaptured in 2023, 59 were tagged from 2017-2022 and the remaining 122 were tagged in 2023.
- One Arctic grayling was recaptured seven times since 2017 in the same stream it was initially tagged in and grew 126 mm, showing a high degree of site fidelity.
- Other fish traveled considerable distances between recapture events, including a broad whitefish and two Arctic grayling that moved from the Willow Area, over 60 stream miles to the Tinmiaqsiugvik River drainage, showing the importance of habitat connectivity.
ICE BRIDGE SUPPORT & WATER QUALITY MONITORING

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), Michael Baker International (Michael Baker) supported the ice bridge across the Colville River by monitoring three locations upstream and three locations downstream of the ice bridge. Data collected includes ice thickness, freeboard, snow and water depth, as well as in-situ water quality readings consisting of temperature, specific conductance, dissolved oxygen, salinity, and water velocity. The team also monitors pH and performs a settleable solids test on water collected from gravel mine site as specified by the CPAI Field Environmental Coordinators (FECs). Lastly, measurements are collected on the total dissolved solids, conductivity, and salinity of various lakes used for ice road construction.

Where did we go?
Hydrologists work at locations 1200, 800, and 400 feet upstream and downstream of the Colville River Ice Bridge crossing, and travel to the mine site on the east side of the Colville River. Additionally, the team travels to Nanuq Lake, Lake M0675, and other lakes as requested by CPAI FECs. Monitoring locations are depicted on the map to the right. Travel to the monitoring locations is typically overland using vehicles approved for tundra and ice travel, as depicted in the photos.

Why were we working in the area?
This work meets permit stipulations set forth by the Alaska Department of Fish and Game, Fish Habitat Permits, and Alaska Department of Natural Resources Temporary Water Use Authorizations. Monitoring reports are provided to agencies weekly during ice bridge construction and operation.

What are our preliminary findings?
- By April 24, 2023, the average ice thickness at CPAI sample site on the Colville River was 4.8 feet and the average snow depth was 0.9 feet.
- Colville River water velocity (measured at 1200 feet downstream of the Colville River Ice Bridge) was an average of 0.20 ft/s.
- The water at the ice bridge location is salty due to influence from Harrison Bay. The average salinity reading was 21.3 parts per thousand (ppt) on March 29, 2023; normal saltwater is 33-38 ppt and freshwater is 0.5 ppt or less.
- pH measurements did not exceed permit limits throughout the sampling season at the mine site.

Interesting facts!
Snow is a great insulator, and where there is more snow accumulation on frozen rivers and lakes, there will be thinner ice. Snow is comprised of 90-95% air and has an average R-value of 1 per inch (similar to wood). Twelve inches of snow will have roughly the same insulating value as a 2x4 wall filled with fiberglass insulation. So, dig a snow cave this winter and invite the neighbors over.
What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), Michael Baker International (Michael Baker) deployed remote equipment and field personnel to monitor and assess spring breakup flooding within the existing Alpine and Greater Mooses Tooth (GMT) developments as well as in the proposed Willow development area. Michael Baker measured hydrologic data including stage and discharge; observed breakup water levels around oil and gas facilities (pipelines, roads, pads, and locations of hydraulic importance); monitored performance of culverts and bridges; and documented breakup flood extents, ice jams, and associated backwater effects. The team additionally monitored proposed Willow stream crossing locations during the summer to document base flow conditions. This was the 32nd consecutive year of monitoring in the Colville River Delta.

Where did we go?
Michael Baker worked at lakes, streams, and flow paths throughout the Colville River Delta and west into the National Petroleum Reserve–Alaska (NPRA). Field personnel used the road system to access sites along the CD1, CD2, CD4, CD5, GMT1/MT6, and GMT2/MT7 roads. Helicopter use was required to access sites in the delta not on the road system and sites in the proposed Willow development area.

Why were we working in the area?
This work meets permit stipulations set by the U.S Army Corps of Engineers (USACE) and the Alaska Department of Fish and Game to monitor and mitigate the impacts of installing infrastructure in and around water bodies and to support maintenance of fish habitat. Flood monitoring is also required to inform facility design. Spring breakup monitoring is required at Alpine facilities annually throughout the life of the project per the CD5 USACE permit and for three years post-construction at facilities outside the Colville River Delta (standard USACE stipulation).

What are our preliminary findings?
- The 2023 spring breakup flood occurred over a two-week period and was characterized as a long-duration, historically low-magnitude event.
- Peak flood in 2023 occurred between May 26 and June 2. Peak breakup flooding typically occurs between May 23 and June 5.
- Peak discharge at MON1 was a result of an ice jam at Putu Island releasing.
- Preliminary 2023 peak stage (water level) at the MON1 monitoring location (see map) was 14.17-ft. The highest stage on record was 23.47-ft in 2015 and the average stage is around 17-ft (based on data from the last 32 years).
AERIAL INFRARED SURVEY OF POLAR BEAR DENNING HABITAT

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), Environmental Research and Consulting (ERC) conducted aerial infrared surveys in the winter of 2023/2024 to locate potential maternal polar bear dens in the vicinity of ongoing and planned industrial operations occurring on the North Slope of Alaska. Mapped polar bear denning habitat in the CPAI project areas was surveyed multiple times to increase the likelihood of den detection. The surveys were conducted using aircraft equipped with infrared sensors. Infrared sensors are used to detect heat signatures on the snow surface from the emitted body heat of denned bears.

Where did we go?
Prime terrestrial maternal polar bear denning habitat in northern Alaska has been identified as snow drifts that form on banks or bluffs measuring ≥16° in slope and ≥1.3 m in height. These features have been mapped as denning habitat and were overlaid with the proposed CPAI winter activities. Denning habitat within the Kuparuk River Unit, Colville River Unit, Greater Mooses Tooth Unit, Bear Tooth Unit, non-unit areas, and along select pipeline routes were surveyed. The above map shows the survey areas.

Why were we working in the area?
These surveys are an integral part of a multi-tiered approach to minimizing potential den disturbance from industrial activities, and to better understand bear’s use of the landscape. CPAI conducts surveys for polar bear dens prior to initiating winter activities in order to maintain compliance with the U.S. Fish and Wildlife Service issued Letters of Authorization. CPAI has relied on aerial infrared surveys since the early 2000s as the preferred method to meet this requirement.

What are our preliminary findings?
- No suspected den sites were identified in the CPAI project areas.
- Other points of interest were identified during the survey effort. Several points of interest required re-visits or additional scrutiny of recorded survey footage and were determined to be landscape features, fox excavations, or other snow conditions, and were rejected from further consideration as potential polar bear dens.

MAMMALS

FINAL REPORTS WILL BE AVAILABLE ONLINE AT NORTHSLOPESCIENCE.ORG/NUIQSUT/
CARIBOU IN THE BEAR TOOTH UNIT

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) used a combination of aerial surveys, satellite imagery, and analysis of radio collars to assess the seasonal distribution and movements of caribou in northeastern portion of the National Petroleum Reserve, Alaska (NPR-A). ABR has been conducting aerial surveys in northeastern NPR-A between February and October annually since 2001. Radio collar data for the Teshekpuk caribou herd has been collected since 1990 to determine how the densities of caribou vary seasonally and annually (see map). In 2023, CPAI funded 20 collars that were deployed on the Teshekpuk herd, the herd that uses the study area, by the Alaska Department of Fish & Game. Satellite imagery is used to map the timing of spring snowmelt and the growth of vegetation in the spring and summer. Using these data, ABR examines how the seasonal movements of caribou are influenced by snow cover, vegetation, terrain ruggedness, insect harassment, distance to coast, and distance to ice roads. This multiyear dataset provides detailed information on which areas are used consistently during different seasons, how those areas correspond with new development, and if patterns change after construction.

Where did we go?
For this project, ABR studied caribou in the Bear Tooth Unit, which includes the area of the permitted Willow Development and an area to the south. ABR biologists conducted aerial surveys from small fixed-wing aircraft. A related project studied caribou use within the Greater Mooses Tooth Unit and the Colville River delta. Most caribou in this area are from the Teshekpuk herd.

Why were we working in the area?
Caribou are a culturally important subsistence species and the most abundant large terrestrial mammal in the area. The potential impacts of oilfield development on caribou distribution, movements, or abundance are of great interest to stakeholders. Data from this project can help address and mitigate public concerns related to potential impacts from oil development on caribou. Caribou studies conducted prior to construction are required by the North Slope Borough rezone ordinances and the NPR-A Integrated Activity Plan because they are necessary to understand how caribou use the area prior to development to predict and minimize potential changes after development occurs.

What are our preliminary findings?
• One 2023 survey was canceled to avoid potential conflicts with subsistence hunters.
• Preliminary results suggest that seasonal use of the area in 2023 was similar to recent years. Most calving occurs near Teshekpuk Lake, and the area north of the lake is important during periods of mosquito harassment, riverine areas along Fish and Judy creeks are important areas for caribou in late summer, and approximately one-third of the herd winters in the Brooks Range in most years.
• Species distribution models indicated that broad geographic patterns were important factors influencing caribou distribution during all seasons, but caribou distribution can also be explained by differences in lichen and graminoid abundance, wetness, topography, and habitat type.
• Based on caribou locations 2 hours apart, caribou selected different landscape attributes during different seasons. Caribou selected areas with more lichens during winter and avoided wetter areas in all seasons.
• Now that gravel mining and construction and occurring for the Willow Road, we will compare baseline data to newly collected data to determine if changes in distribution or behavior are occurring as a result of the road.
CARIBOU IN THE COLVILLE RIVER DELTA AND GREATER MOOSES TOOTH UNIT

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) used a combination of aerial surveys, satellite imagery, and analysis of radio collar data to assess the seasonal distribution and movements of caribou in northeastern portion of the National Petroleum Reserve—Alaska (NPR-A), and Colville River delta. ABR has been conducting aerial surveys in northeastern NPR-A between February and October annually since 2001. Radio collar data for the Teshekpuk caribou herd has been collected since 1990 to determine how the distribution of caribou vary seasonally and annually (see map). In 2023, CPAI funded 30 new collars: 10 were deployed on caribou of the Central Arctic herd; and 20 were deployed on the Teshekpuk herd by the Alaska Department of Fish and Game. Satellite imagery is used to map the timing of spring snowmelt and the growth of vegetation in the spring and summer. The team uses these data to examine how seasonal movements are influenced by snow cover, vegetation, terrain ruggedness, insect harassment, distance to coast, and distance to roads. This multiyear dataset provides detailed information on which areas are used consistently during different seasons, how those areas correspond with proposed development, and if patterns change after construction.

Where did we go?
For this project, ABR studied caribou in the Greater Mooses Tooth Unit (GMTU) and the Colville River delta, which includes the Alpine development, Alpine satellite pads, and the GMT pads. ABR biologists conducted aerial surveys from small fixed-wing aircraft. A related project studies caribou use within the Bear Tooth Unit. Most caribou in the GMT area are from the Teshekpuk herd, but both the Teshekpuk and Central Arctic herds may use the Colville River delta during summer.

Why were we working in the area?
Caribou are a culturally important subsistence species and the most abundant large terrestrial mammal in the area. The potential impacts of oilfield development on caribou distribution, movements, or abundance are of great interest to stakeholders. Caribou studies are required by the North Slope Borough rezone ordinances and the NPR-A Integrated Activity Plan to better understand how caribou use the area and detect any impacts from development to mitigate potential impacts of future development.

What are our preliminary findings?
• Preliminary results suggest that seasonal use of the area in 2023 was similar to recent years. As in 2022, caribou were somewhat farther west during calving than usual.
• Large numbers of Central Arctic herd animals were on the Colville River delta during midsummer during the last three years, and some animals from that herd moved west into NPR-A in 2023.
• Species distribution models indicated that broad geographic patterns were important factors influencing caribou distribution during all seasons, but caribou distribution can also be explained by differences in lichen and graminoid abundance, wetness, topography, and habitat type.
• Based on caribou locations 2 hours apart, caribou selected different landscape attributes during different seasons. Caribou selected areas with more lichens during winter and avoided wetter areas all year. Caribou also selected areas with later snow-free dates during calving.
• There was some indication of less use of the area within 2–4 km of the GMT roads during oestrid fly season and fall. Unlike the roads in the Kuparuk oilfield, GMT and Alpine roads are used for subsistence hunting. Potential changes in density or movements near the gravel and ice roads will continue to be assessed.

Estimated caribou density within the study area by season based on aerial survey data 2002–2022.
2023 STUDIES  MAMMALS

CARIBOU IN THE GREATER KUPARUK AREA

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) is collaborating with the Alaska Department of Fish and Game (ADF&G) to monitor caribou in and near the Kuparuk oilfield using radio collars. ABR has studied caribou near the Kuparuk oilfield since the 1980s, including aerial surveys from 1993 to 2017. The team is now using data from radio collars to better understand caribou use of the Kuparuk area. Data from these collars can be used to describe seasonal caribou movements and distribution in relation to infrastructure. In 2023, CPAI funded 30 new collars: 10 were deployed on caribou of the Central Arctic herd; and 20 were deployed on the Teshekpuk herd by the ADF&G. Most collars are deployed on female caribou because they tend to be more reactive to infrastructure and female survival and reproduction rates are very important for population models of herd growth.

Where did we go?
Biologists studied caribou distribution and movements near the Kuparuk Oilfield, between the Colville and Kuparuk rivers (see map). The main herd in this area is the Central Arctic herd, currently estimated to have a population of about 35,000 caribou. No fieldwork was conducted by ABR for this project in 2023, but data from radio collars is being analyzed to expand our knowledge of caribou movements and distribution in relation to oilfield infrastructure.

Why were we working in the area?
Caribou are a culturally important subsistence species and the most abundant large terrestrial mammal on the North Slope. The Central Arctic herd has been interacting with the Prudhoe Bay, Milne Point, and Kuparuk oilfields seasonally for about 50 years. This herd, therefore, provides an opportunity to study caribou within existing oilfield infrastructure to see how those findings can be applied to new developments to help minimize potential impacts on caribou distribution, movements, or abundance.

What are our preliminary findings?
- In 2023, similar to recent years, most of the collared Central Arctic herd caribou were west of the Kuparuk River during calving and some large groups were on the Colville River delta during the insect harassment seasons in July for the third year in a row.
- Results of recent analyses have been generally consistent with previous studies in the area showing behaviors and response to oilfields differ depending on the season.
- During calving, caribou tend to avoid roads and pads, but the avoidance declines after calving when the calves are more mobile.
- In mid-summer, caribou move rapidly through the oilfields and cross roads frequently to reach coastal mosquito-relief habitat or use gravel roads and pads to avoid harassment by oestrid flies.
- In 2023, we are using GPS locations recorded every 15 minutes to determine caribou behavior at each location (e.g., resting, walking/feeding, or moving), we can then determine how caribou behavior changes with different factors like distance to roads.
NUIQSUT CARIBOU SUBSISTENCE MONITORING PROJECT

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), Stephen R. Braund & Associates (SRB&A) conducted annual active harvester interviews with Nuiqsut caribou hunters to document harvest activities, and household harvest surveys to document community-level harvests for the 2022 (Study Year 15) hunting year. These interviews and surveys document baseline caribou subsistence harvesting data and harvester observations regarding development-related impacts on caribou harvesting activities. Data analysis and reporting for Year 15 are underway. In 2023, SRB&A completed reporting for the 2021 (Year 14) study year and a one-time comprehensive (all resources) 10-year subsistence mapping study.

Where did we go?
SRB&A took three trips to Nuiqsut to conduct active harvester interviews and household harvest surveys for the 2022 (Year 15) study year: first in November 2022, then in March and May of 2023. The study team conducted additional 2022 (Year 15) household surveys remotely by telephone and using an online survey form. The study area for the Nuiqsut Caribou Subsistence Monitoring Project is all areas used by Nuiqsut residents for caribou hunting activities.

Why were we working in the area?
CPAI initiated the Nuiqsut Caribou Subsistence Monitoring Project in response to a stipulation in the North Slope Borough’s (NSB) permit to CPAI for the CD4 development. While the original stipulation required that the study occur for 10 years, both the NSB (2018 Alpine-GMT Rezone Ordinance) and BLM (GMT2 ROD) required that monitoring continue beyond the initial 10-year time period. The monitoring study, which began in 2009 for the 2008 study year, is now in its 15th year. The purpose of the subsistence monitoring project is to monitor caribou subsistence harvester activity, harvest experiences, and hunter observations of impacts related to CD4 and other Alpine satellite developments.

What are our preliminary findings?
Data from the Year 15 Caribou Subsistence Monitoring study (2022 hunter year) are not yet analyzed and will be reported later in 2023/2024. CPAI and NSB review of the 10-year mapping report is underway. In 2023, SRB&A produced a report for the 2021 (Year 14) study year. Findings from the 2021 harvest year report included the following:

• The community of Nuiqsut harvested an estimated 479 caribou, within the range of all previous study years (between 258 and 774 caribou).
• The majority of 2021 caribou subsistence use areas and harvest locations were located along the Colville River (including Nigliq Channel and East Channel) and along the Nuiqsut Spur Road and CD5/GMT1/GMT2 roads north and northwest of the community.
• The extent of Colville River travel in 2021 was similar to previous study years, but with no travel along the Chandler and Milugiaq Rivers. Similar to recent years, the overall extent of overland travel in 2021 was somewhat limited. The extent of road travel was larger than most previous years because of access to recently constructed roads. This includes the road to GMT2 and the Colville River Access Road, as well as increased use of seasonal ice and snow roads extending east and south of the community.
• In 2021, 41% of respondents reported one or more perceived development-related impacts on their caribou hunting, somewhat higher than the previous two study years, but lower than some earlier study years. Other traffic impacts (specifically ground traffic along roads) were the most commonly reported impact for the first time (20% of respondents), higher than helicopter traffic and man-made structures (15% of respondents each).
**2023 STUDIES**

**SUBSISTENCE**

**COLVILLE AREA FALL FISHERY HARVEST MONITORING**

**What did we do?**

On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc.—Environmental Research & Services (ABR) conducted on-site harvest monitoring surveys from 13 October to 20 November 2023 during the annual under-ice fall fishery on the Niqiq Channel of the Colville River near Nuiqsut. Additional monitoring continued after the field season via social media. ABR’s fish and aquatics team:

- Monitored timing of deployment and removal of nets, total fishing effort, and total harvest of Arctic Cisco (Qaaktaq in Iñupiaq) and other subsistence fish.
- Regularly monitored salinity and other ambient water conditions at 4 stations on the Niqiq Channel.
- Dissected donated fish tissues in the laboratory to assist in analyzing length, weight, and age data.

ABR has monitored the fall fishery in the Village of Nuiqsut with support from CPAI since 2007 and Oil Search Alaska/Santos since 2020. This is the 38th year of industry-sponsored harvest monitoring.

**Where did we go?**

All the 2023 subsistence fishing effort and harvest monitoring was conducted via snowmachine in the Niqiq Channel.

**Why were we working in the area?**

This monitoring program has operated under various permit requirements over the years since its inception in 1985. CPAI and Santos continue to support the monitoring program as required by the North Slope Borough (NSB) rezone ordinances.

**What are our preliminary findings?**

- We conducted 197 interviews while in Nuiqsut for the 2023 season.
- A total of 21 fishers set 40 nets during the 2023 fall fishery, an increase of 5 nets compared to 2022 (35 nets). A total of 17 net sets were in the Upper Niqiq near town, 12 net sets occurred in the Nanaq area, and 11 net sets were in the Niqiq Delta.
- Nets fished for a total of 476 days in the Upper Niqiq, 388 days in the Nanaq, and 233 days in the Niqiq Delta areas. Multiple periods of severe storms and overflow events hampered travel on the river for fishers and monitors during late October and early November. These storm events may have contributed to a lack of Main Channel fishing effort. Catch per unit effort (CPUE) on the Niqiq Channel was 17.7 fish/net-day. Total annual harvest was 15,464 Qaaktaq, an increase of ~4,000 fish compared to 2022.
- During harvest interviews, 9,646 fish were documented by monitors (37.3% increase compared to 2022). Qaaktaq represented 77.0% of the documented harvest and Fourhorn Sculpin (Kanayuq) represented 9.3% with 6 other species contributing to the remaining 13.7% of harvest. Qaaktaq were larger than in recent years and fishers reported being happy with fish condition.
- In the Niqiq Channel, ABR harvest monitors did not observe any fish infected with Saprolegnia mold. Several reports of infections were reported directly to NSB biologist Todd Sformo, who was in Nuiqsut at the start of harvest activities.
- When we departed on 20 November, 18 nets (13 fishers) were active. On 1 December, 5 nets (2 fishers) were still active. The last net was pulled on 6 January 2024. Data were collected via social media/direct messaging after the harvest team left Nuiqsut.
INDIGENOUS SEEDS FOR LAND REHABILITATION

What did we do?
On behalf of ConocoPhillips Alaska, Inc. (CPAI), ABR, Inc. - Environmental Research & Services (ABR) biologists collected seeds from local populations of indigenous plants on the North Slope for future land rehabilitation projects. Seeds were collected during late summer 2023.

Where did we go?
ABR collected seeds at the former West Sak River State 3 exploratory well site and Mine Site C in the Kuparuk field, as well as tundra near the CD5 access road at Alpine.

Why were we working in the area?
CPAI is committed to using indigenous plants for land rehabilitation. Commercial seed sources are not available, so we harvest from local populations, including some that have developed on rehabilitated sites like the former gravel pad at the West Sak River State 3 exploratory well site.

What are our preliminary findings?
- Plant materials can be sourced from local populations. In past years, seeds were collected in Prudhoe Bay and near Franklin Bluffs along the Dalton Highway.
- Cultivating indigenous vegetation, instead of the native grass cultivars that have been widely used in the past, should increase diversity and promote a healthy plant community.
- Five species were selected for harvesting and testing in 2023:
  - Dwarf Fireweed (*Epilobium latifolium*, see photo, below) and Tilesius’ Wormwood (*Artemisia tilesii*, see National Park Service photo, right)—two herbaceous forbs that readily establish at dry sites.
  - Curved Sedge (*Carex maritima*, see photo, below)—a sedge adapted to gravelly substrates and a range of soil moisture conditions.
  - Tall Cottongrass (*Eriophorum angustifolium*) and White Cottongrass (*E. scheuchzeri*, see photo)—two common sedges that thrive in wet conditions.
- Harvested materials were sent to the Alaska Plant Materials Center (Palmer, AK) for seed counting. Each seed batch will be tested for viability and germination and used to treat other North Slope sites in the future.

Seed collection sites at Alpine and Kuparuk.

Curved sedge.

Collecting cottongrass seeds on the former gravel pad at West Sak 3.

Dwarf Fireweed.

Tilesius’ Wormwood (NPS)