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U. S. AIR FORCE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

PACIFIC AIR FORCES REGIONAL SUPPORT CENTER (PRSC)

611 CIVIL ENGINEER SQUADRON (611 CES)

2020 UPDATE

APPENDIX H. INSTALLATION-SPECIFIC INFORMATION

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APPENDIX H
INSTALLATION-SPECIFIC INFORMATION

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Acronyms and Abbreviations

611 ASG	611th Air Support Group
611 CES	611th Civil Engineer Squadron
AFB	Air Force Base
AFS	Air Force Station
ANCSA	Alaskan Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
AS	Air Station
CEMML	Center for Environmental Management of Military Lands
DEW	Distant Early Warning
DPS	Distinct Population Segment
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
ft	foot/feet
in	inch(es)
JBER	Joint Base Elmendorf-Richardson
m	meter(s)
MAR	Minimally Attended Rader
MSL	above mean sea level
NPS	National Park Service
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
POL	petroleum, oil, and lubricants
PRSC	Pacific Air Forces Regional Support Center
SAIC	Science Applications International Corporation
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USFWS	U.S. Fish and Wildlife Service

Appendix H: Installation-Specific Information

This appendix contains site-specific information for the 35 Alaska installations (16 active and 19 inactive) managed by the U.S. Air Force (USAF) Pacific Air Forces Regional Support Center (PRSC) (Table H-1 and Figure H-1). Installation acreages and site boundaries depicted on figues are based on GIS data provided by 611 CES as of July and August 2019.

Table H-1. Active and Inactive PRSC Sites Addressed in this INRMP

Active	Inactive
Barter Island LRRS	Anvil Mountain LRRS
Cape Lisburne LRRS	Bear Creek RRS
Cape Newenham LRRS	Beaver Creek RRS
Cape Romanzoff LRRS	Bethel RRS
Cold Bay LRRS	Big Mountain RRS
Fort Yukon LRRS	Campion AFS
Indian Mountain LRRS	Driftwood Bay RRS
King Salmon Airport	Flaxman (Bullen Pt) SRRS
Kotzebue LRRS	Granite Mountain RRS
Murphy Dome LRRS	Kalakaket Creek RRS
Oliktok LRRS	Lake Louise Recreation Site
Point Barrow LRRS	Port Heiden RRS
Eareckson AS	Point Lay LRRS
Sparrevohn LRRS	Point Lonely SRRS
Tatalina LRRS	Naknek Recreation Annex 1 – Rapids Camp
Tin City LRRS	Naknek Recreation Annex 2 – Lake Camp
	Nikolski RRS
	North River RRS
	Nome Field

Notes: AFS = Air Force Station; AS = Air Station; LRRS = Long Range Radar Site; RRS = Radio Relay Station; SRRS = Short Range Radar Site.

All cited references can be found in Chapter 11 (References) of the main INRMP document. Definitions of acronyms and abbreviations can be found on page xxxvi of this document.

Scientific names for all species mentioned in the text are provided in the accompanying species list tables for each installation/site (refer to the Attachments). Plant species are listed alphabetically by scientific name; fish, mammal, and bird species are listed alphabetically by common name. Common and scientific names for vascular plants, fish, mammals, and birds are based on the following taxonomic authorities:

- Vascular Plants: Biota of North America Program database (http://www.bonap.org).
- Fish: FishBase (www.fishbase.org/).
- Mammals: Wilson, D.E. and D.M. Reeder, eds. 2005. Mammal Species of the World: A Taxonomic and Geographic Reference. 3rd edition. (http://www.departments.bucknell.edu/biology/resources/msw3/).
- Birds
    - *North American species*: Chesser, R.T., K.J. Burns, C. Cicero, J.L. Dunn, A.W. Kratter, I.J. Lovette, P.C. Rasmussen, J.V. Remsen, Jr., D.F. Stotz, B.M. Winger, and K. Winker. 2018. Check-list of North American Birds. American Ornithological Society. http://checklist.aou.org/taxa.
    - *Accidental/rare species from Asia*: Gill, F. and D. Donsker, eds. 2019. IOC World Bird List (v9.2). (https://www.worldbirdnames.org/).

Figure H-1. Location of PRSC Installations Addressed in this INRMP

H.1 EARECKSON AIR STATION (AS), SHEMYA ISLAND

H.1.1 Location and Area

Eareckson AS occupies Shemya Island, which is located 1,450 miles from Anchorage (Figure H-1). Shemya Island is approximately 3.5 miles long and 1.5 miles wide with a total area of 3,520 acres (Figure H-2). It is one of the Near Islands of the Aleutian Archipelago, located near the western tip of the Aleutian Chain. Shemya is the largest of the three Semichi Islands (Shemya, Alaid, and Nizki) (Hostman 1988).

H.1.2 Installation History

The installation was first established as Shemya Air Force Base (AFB) in May 1943 during the U.S. campaign to retake Attu Island, which had been occupied by Japanese troops since June 1942. In June/August 1943, aircraft runways, with hangars and other support facilities, were constructed on Shemya. The base was used for bombing raids on Japanese military targets in the northern Kurile Islands during 1943-1945 (611 CES 2015a). Some 25,000 military personnel lived on the island during 1944 and 1945 (TRA/Farr & Dowl Engineering 1988). Figure H-3 is an undated photograph but appears to show Shemya Island prior to World War II. Figure H-4 and Figure H-5 show Shemya Island in October 1944 and September 2014, respectively.

The geographic location of Shemya Island provided for continued strategic military importance in the Cold War era. During the Korean Conflict (1950-1953), Shemya AFB was used as a refueling stop for support and supply aircraft en route to South Korea. In 1954 the base was deactivated, and during 1955-1957, base facilities were used for refueling commercial aircraft (611 CES 2015a).

The base was reactivated in 1958 to support collection of intelligence data on Soviet ballistic missile tests. By 1962 both detection and tracking radars were used to monitor Soviet Intercontinental Ballistic Missiles tested on nearby Kamchatka and adjacent northern Pacific waters. In 1977, conventional radars were replaced with the Cobra Dane phased array system, which continued to track Soviet missiles and also performed space surveillance and early missile attack warning missions. Data on Soviet missile tests were also gathered by reconnaissance aircraft (Cobra Ball) operating from both Eielson AFB and Shemya AFB (611 CES 2015a).

In 1985-1986, the U.S. Army constructed the Queen's Match facility on Shemya for conducting research related to the Strategic Defense Initiative. In 1993, the installation was renamed Eareckson AS in honor of Col. William O. Eareckson. The importance of the base declined with the end of the Cold War, and in 1995 Eareckson AS was drawn down and converted to contractor operations and maintenance (611 CES 2015a).

In 1993 approximately 700 personnel were assigned to Eareckson AS, including about 400 USAF personnel and 300 contractor personnel and DoD civilian employees. During summer the population often increased by 200-400 people, mostly contractors providing installation restoration and constructionrelated support services (Hostman 1988). Although Eareckson AS was drawn down and converted to contractor operations and maintenance in 1995, it continues to support the mission of the PRSC. The AS also currently serves as a diversion airport for civilian aircraft which encounter an emergency while travelling across the Pacific Ocean.

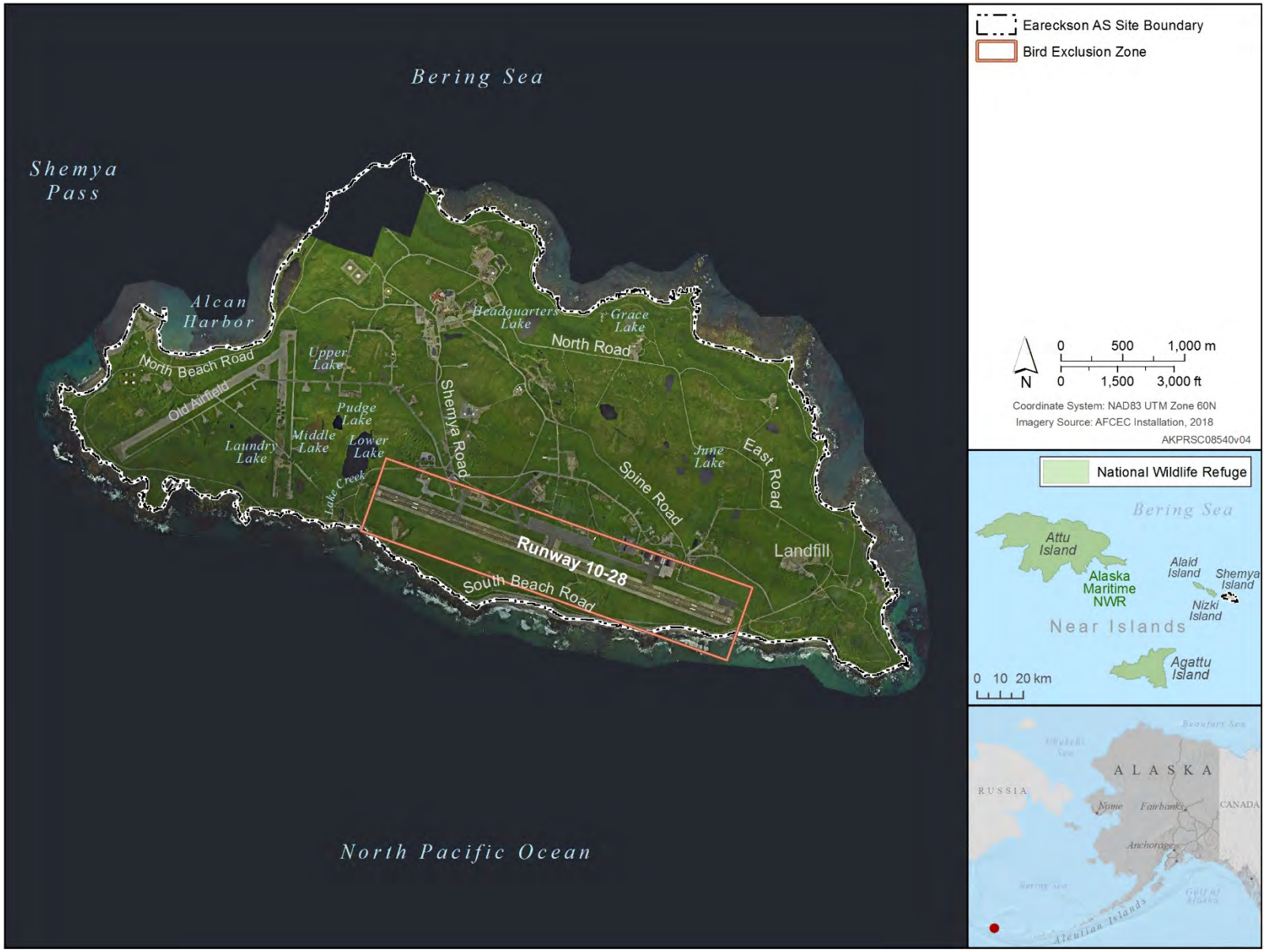

Figure H-2. Eareckson AS, Shemya Island

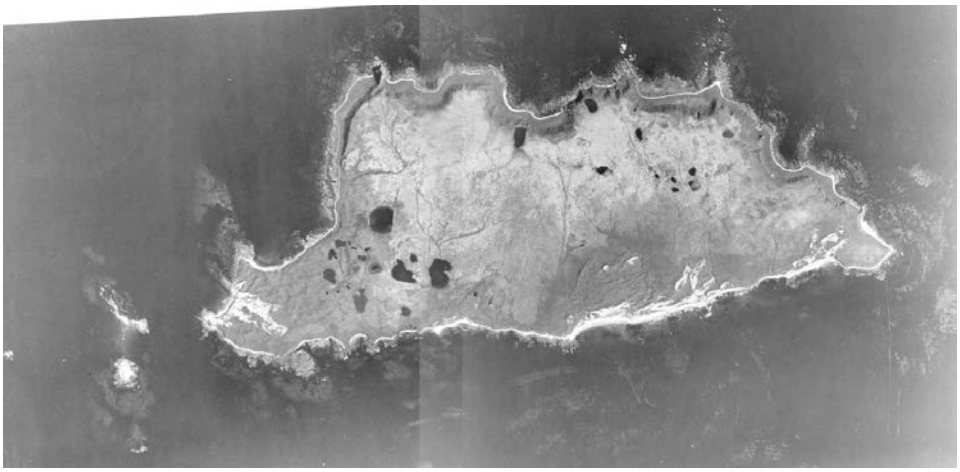

Figure H-3. Shemya Island, Pre-World War II

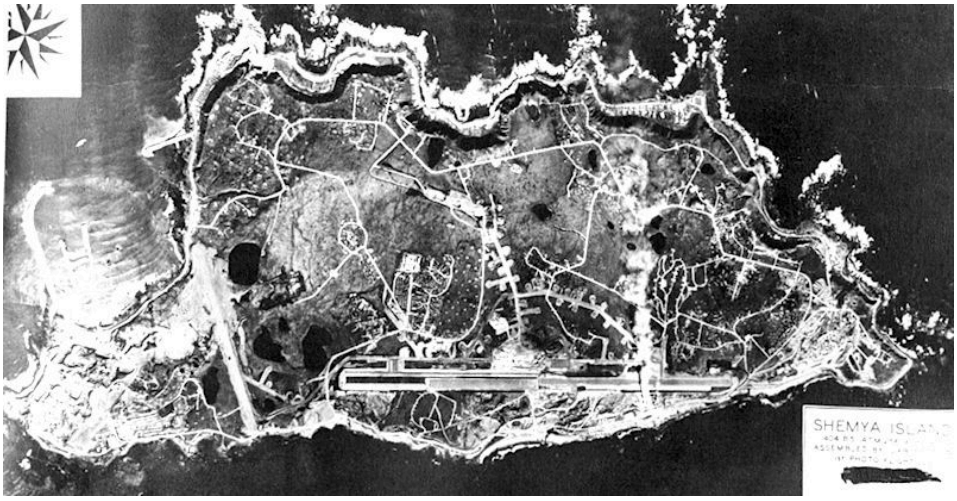

Figure H-4. Shemya Island, October 1944

Figure H-5. Shemya Island, September 2014
(*Source*: Google Earth)

H.1.3 Military Mission

The mission of Eareckson AS is to provide weather divert and emergency runway, enroute refueling for military aircraft, support and sustainment for Ground-based Midcourse Defense (GMD), and support to tenant organizations. A more recent addition to the Eareckson AS mission is the Missile Defense Agency, which is responsible for developing and testing the Ballistic Missile Defense System. An element of one phase of the Midcourse Defense Segment of their project is the GMD. The GMD is designed to protect all 50 states against limited ballistic missile attack by intercepting long-range ballistic missiles during the midcourse (ballistic) phase of their flight, before their reentry into the earth's atmosphere (611 CES 2015a).

The majority of Eareckson AS facilities were developed to serve past Air Force missions, but are in use to serve current missions or to maintain a high level of operational readiness on the island for potential future missions. The installation does not support regular Air Force flying activity outside of contracted passenger airlift, nor does it have any aircraft assigned to it. There are several buildings and facilities on the island that house mission-specific activities by other military entities, but the rest of the island is in an active maintenance state, ready and waiting for future missions to support (PRSC 2019).

A Base Operations Support (BOS) contract is used to provide personnel for Eareckson AS operations, maintenance, and support. Approximately 175 full-time military and BOS contract personnel are present on the island (PRSC 2019).

H.1.4 Surrounding Communities

Shemya Island has no communities other than the AS itself. Important regional locations and approximate distances include:

- Kamchatka Peninsula, Russia (450 miles to the west).
- Adak, AK (265 miles to the east) is the nearest community; estimated 2018 population = 296.
- Unalaska/Dutch Harbor (664 miles to the east); estimated 2018 population = 4,333.
- Joint Base Elmendorf-Richardson (JBER)/Anchorage, AK (1,450 miles to the northeast).

H.1.5 Regional Land Use

The entirety of Shemya Island is part of Eareckson AS. As discussed below, Shemya Island is within the Alaska Maritime NWR and activities associated with the management of the NWR are the only non-military regional land uses.

H.1.6 Local and Regional Natural Areas

Shemya Island is located within and is part of the Alaska Maritime NWR. The NWR is spread along most of the 47,300 miles of Alaska's coastline. The refuge includes more than 2,500 islands, islets, spires, rocks, reefs, waters and headlands extending from Forrester Island to the north of Canada's Queen Charlotte Islands deep in the southeastern tongue of the state, to the westernmost tip of the Aleutians, and north to Cape Lisburne on the Arctic Ocean. No other maritime refuge in America is as large or as productive. Alaska Maritime's seashore lands provide nesting habitat for approximately 40 million seabirds, or about 80% of Alaska's nesting seabird population. The refuge hosts seabird populations of both national and international significance. Activities focus on long-term ecosystem monitoring, marine resources research, and invasive species management (U.S. Fish and Wildlife Service [USFWS] 2019a).

H.1.7 Physical Environment

H.1.7.1 Climate

Shemya Island is dominated by a persistent low pressure system that stands out in global climatology as the "Aleutian low" region. Frequent storms track across the north Pacific into the Aleutian Islands. Aleutian low pressure cells are responsible for the relatively mild maritime climate of the Aleutian Islands. Average summer high temperatures rarely exceed 55 degrees Fahrenheit (°F), and average winter low temperatures typically are at of just below freezing (Table H-2). Monthly precipitation averages 2 inches (in) per month every month of the year, with an average annual precipitation of 32 in. Average annual snowfall is 74 inches. Precipitation occurs more than 330 days per year.

Table H-2. Monthly Climate Averages for Shemya Island, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	33.8	33.5	34.8	37.8	41.2	44.9	49.1	51.8	50.7	45.4	39.1	35.3
Avg. Low (ºF)	28.4	28.2	29.3	32.2	35.8	39.9	44.2	47.0	45.0	39.3	33.1	29.6
Avg. Precipitation (inches)	2.5	2.0	2.0	1.8	1.9	1.8	2.8	3.4	2.9	3.7	3.8	3.0
Avg. Snowfall (inches)	16.5	14.4	11.1	5.0	1.2	0	0	0	0	0.6	8.8	16.4

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

All months of the year have recorded winds greater than 55 knots with an annual average of 17 knots. This persistent wind results in drifting snow and driving rain conditions. Summertime fogs are the most severe and preclude flying as often as one day in four. The persistent wind, fog, and salt spray are responsible for the highly corrosive and harsh conditions on the island (Hostman 1988).

H.1.7.2 Topography

Shemya Island is generally characterized by rolling topography. The island is a flat-topped seamount or guyot. The topography gently slopes south-southwest to 20-25 feet (ft) above the Pacific Ocean. The northfacing (Bering Sea) side of the island has a rugged stony shoreline, steep sloping banks, and rocky cliffs. The southern (Pacific) side of the island is a sandy/gravely beach that is gently to moderately sloping. The island is rimmed with small sandy/gravely beaches and rugged bedrock crags. A small raised beach platform nearly encircles Shemya Island suggesting rising and falling sea levels. The maximum local relief of the island is 275 ft on the Bering Sea flank (Hostman 1988).

H.1.7.3 Geology and Soils

Regionally, Shemya Island is part of the Aleutian volcanic arc of the north Pacific Ocean. Tectonic and volcanic activities along the Aleutian arc are frequent and often times violent. Earthquakes are relatively common along the Aleutian arc and Eareckson AS has experienced six major earthquakes since 1906 measuring 7.6 to 8.6 in magnitude (https://en.wikipedia.org/wiki/List_of_earthquakes_in_Alaska; accessed July 9, 2019).

A veneer of post or mid-Wisconsin (10,000 to 25,000 years ago) brecciated tuffs and other unconsolidated sediments cover the raised wavecut platform of Shemya Island. A thin layer of outwash sand and ground moraine cover the island. Coarse beach sands, gravels, and discontinuous lenses of till are in low areas, directly overlying the structurally southwestern-sloping bedrock. Bedrock is predominantly exposed in sea cliffs and two quarries near the central part of the island (Hostman 1988).

A matted accumulation of tundra peat is the predominant surficial deposit on the island. This highly saturated material is typical of tundra regions. This layer varies in thickness but is usually 2-5 ft deep overlaying loamy sands and gravel in the substrata. Depth to bedrock varies from zero to over 25 ft. Sand

soils over bedrock tend to dominate south shore beaches. Most surficial materials on Shemya Island can retain and transmit water. Shemya Island has no permafrost (Hostman 1988).

H.1.8 Hydrology

H.1.8.1 General

The surface is typical of hummocky glaciated terrain and tundra regions. Surface and subsurface drainage flows in the south-southwest direction. Interior drainage is poor, primarily as a result of tundra degradation, frost ponds, and open pits resulting in standing water. The construction of the 10,000-ft airstrip has greatly modified the natural surface drainage of the island. Two distinct surface drainage systems divide the island in half. The watershed on the eastern half of the island is used for the installation water supply (Hostman 1988).

All potential aquifers on Shemya Island are either thin, have low porosity, or have low permeability. Surface and groundwater discharges respond directly and rapidly to precipitation. During dry months stream flow comes from groundwater discharge. Much of the precipitation percolates through peat, gravel, and sand deposits and the surface-soil interface. Some water finds its way to fractures in the bedrock where it is stored. Remaining water is discharged by streams or springs on the southern coastline. The fresh water supply for the island is obtained from an infiltration gallery located on the northern side of the runway. Numerous small freshwater ponds are found on the island and there are 15 permanent small lakes (Hostman 1988).

H.1.8.2 Floodplains

Interior drainage of Eareckson AS is poor, primarily as a result of tundra degradation, frost ponds, and open pits resulting in standing water. The shoreline drops precipitously 20 to 25 ft into a small raised beach platform that nearly encircles the island. There is no record of either rainfall-induced flooding or coastal flooding on Shemya Island. The coastline is sufficiently high and steep that 100-year storm waves would not overtop the beach crest. Lakes and interior streams have not been gauged. The 100-year flood level of the lakes should not exceed 3 ft above their normal level, due to their limited watersheds and normally wet conditions (U.S. Army Corps of Engineers [USACE] 1998). Floodplain maps are in Attachment 1.

H.1.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Shemya Island and the surrounding area. Attachment 2 contains lists of plants (Table H-6), fish (Table H-7), mammals (Table H-8), and birds (Table H-9) known to occur or potentially occurring in the Eareckson AS area. ESA- and MMPA-listed species that may occur at Eareckson AS are discussed in in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.1.9.1 Ecoregion Classification

Eareckson AS is located in the Aleutian Islands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.1.9.2 Vegetation/Habitat

A general vegetation map of Eareckson AS was prepared in 1995 (611 ASG 1995a). Significant improvements in vegetation mapping at Eareckson AS were accomplished in 2005 using 2003 digital aerial photography, conducting flora and fauna surveys, and preparation of a wildlife habitat map (Frost et al. 2005a). Roth and Macander (2009) updated this mapping and data analysis for Eareckson AS using 2008

Worldview-1 imagery. In 2019, the Center for Environmental Management of Military Lands (CEMML) updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 4 habitat classes were identified (Table H-3 and). A list of vascular plants known to occur or potentially occurring on Shemya Island is provided in Table H-6.

Table H-3. Eareckson AS Habitat Classes (2017)

Habitats Class	Acres	Proportion
Meadow and Herbaceous	1,519.9	43.5%
Developed and Barren Land	999.3	28.6%
Shrub or Scrub	894.5	25.6%
Open Water	80.4	2.3%
Total	**3,494.1**	

Source: CEMML 2019a.

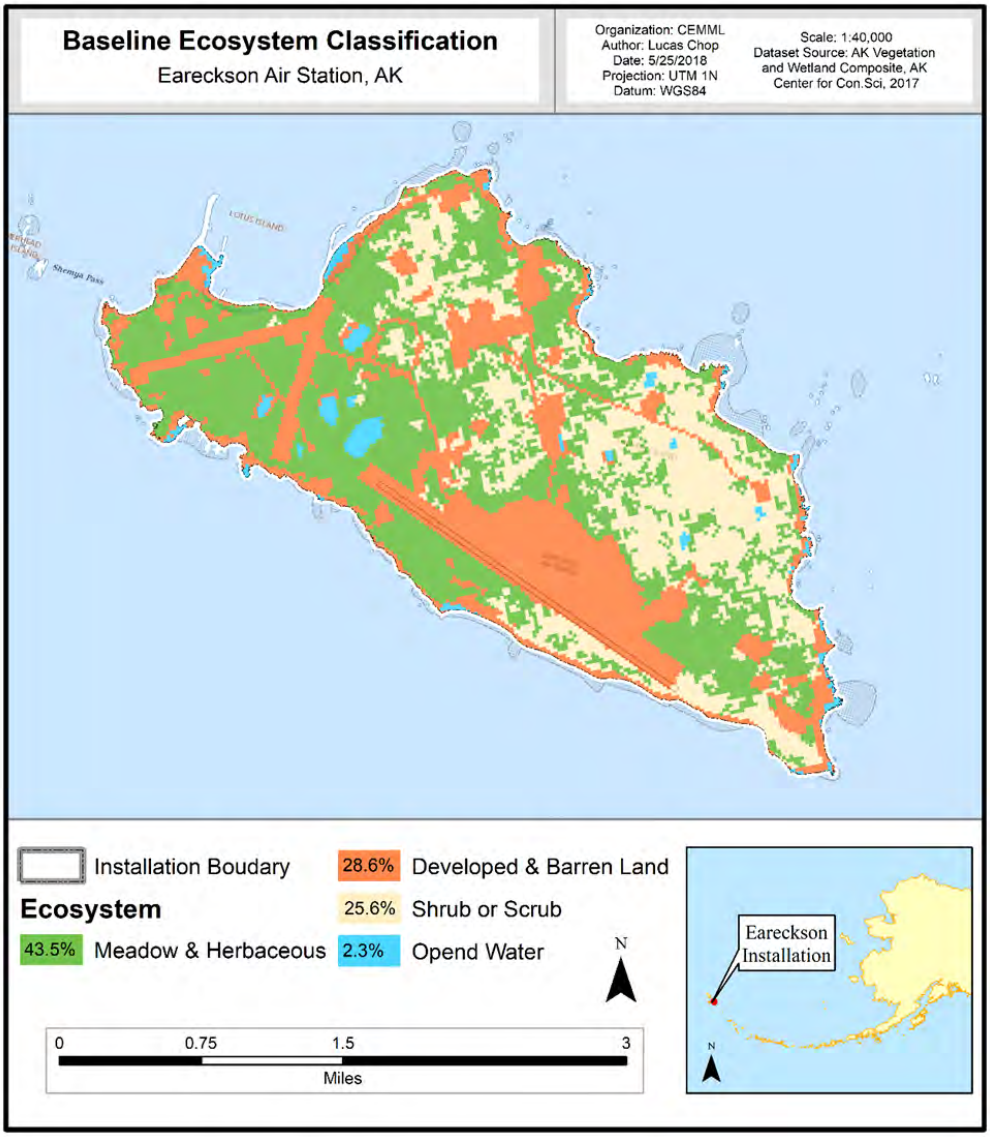

Figure H-6. Eareckson AS Habitat Classes (2017)
(*Source*: CEMML 2019a)

The plant community of Shemya Island has been greatly influenced by extensive habitat alterations dating back to World War II. Existing communities include an almost continuous mat of mosses and lichens in which other plants, such as tufted hairgrass, are rooted. Grasses are common, and cotton grass may be predominant in poorly drained areas. At slightly higher locations with better drainage, dwarf shrubs, including crowberry, cloudberry, lapland cornel, and blueberry, are dominant; there are few trees. During summer, colorful flowers produced by forbs, such as buttercup, lousewort, monkshood, and violet, are scattered throughout this community (TRA/Farr & Dowl Engineering 1988).

Plants of the beach community inhabit the rugged and rocky shoreline within bays, inlets, and coves of the island. Beach grass dominates this shoreline community, especially along the northern shore. Other plants that inhabit this area include beach pea, sea bluebell, seabeach sandwort, cow parsnip, cinquefoil, and various species of sedge. During summer, grasslands are often more than 3 ft high and usually very dense near sea level.

Almost half the island is categorized as meadows and herbaceous areas which occur on altered ground surfaces where artificial mounds and pits are common. Man-made/developed areas, including buildings, roads, and regularly maintained vegetation, such as runway rights-of-way, and barren areas comprise about a third of the island. Several water bodies occur on Shemya Island (Figure H-2), but most are deep lakes with steep shorelines that provide little wetland habitat (Frost et al. 2005a).

H.1.9.3 Wetlands

A USACE wetland jurisdictional delineation was completed in 1986 and was included in the 1995 Natural Resources Plan for Eareckson AS (611 ASG 1995a). Most of Shemya Island fell within a wetland classification. The USFWS performed a habitat survey and wetlands mapping project to better define wetland values. This was further enhanced by the 2002 and 2008 habitat mapping projects (Frost et al. 2005a; Roth and Macander 2009).

The current mapping of wetlands at Eareckson AS is based on 2018 Alaska Natural Heritage Program (ANHP) mapping (Flagstad et al. 2018). Of the approximate 3,494-acre Eareckson AS, 125 acres (or 4%) are considered wetlands per the 2018 (Table H-4 and Figure H-7).

Table H-4. Eareckson AS Wetland Types Based on 2018 ANHP Data

Wetland Type	2018 ANHP*	
	Area (acres)	Proportion
Lake	62.8	1.8%
Estuarine and Marine Deepwater	61.9	1.8%
Wetlands Total	**124.7**	**3.6%**
Upland	3,369.4	96.4%
Site Total	**3,494.1**	

Notes: *See Figure H-7.
Source: Flagstad et al. 2018.

Figure H-7. Eareckson AS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

Wetlands at Eareckson AS are associated primarily with palustrine and marine intertidal features and with lacustrine and riverine habitats. Along the coast, regularly and irregularly flooded unconsolidated and rocky shores are common. Many wetlands at Eareckson AS have evidence of past and/or current human disturbance, which primarily include such activities as excavation, diking, or water impoundments. Common woody shrub species found in Eareckson AS wetlands include *Empitrum nigrum*, *Cornus suecica*, and *Vaccinium uliginosum.* Common emergent plant species occurring in wet, saturated, palustrine areas include *Carex lyngbyaei*, *C. macrochaeta*, *Juncus haenkei*, *Equisetum arvense*, and *Epilobium ciliatum.* Species commonly found in better-drained, but still saturated or seasonally flooded wetlands, include *Calamagrostis nutkaensis*, *C. canadensis*, *Poa macrocalyx*, *Heracleum lanatum*, *Lupinus nootkatensis*, *Lathyrus japonicus*, *Angelica lucida*, and *Cirsium kamtschaticu* (Frost et al. 2005a).

H.1.9.4 Fish and Wildlife

H.1.9.4.1 Fish

A total of 24 fish species have been recorded on and surrounding Shemya Island including marine and freshwater fishes, although freshwater fish are not a significant resource on Shemya Island (Table H-7). Principal marine fishes of the Aleutian Islands include Pacific halibut, Pacific Ocean perch, sculpin (*Cottus* sp.), Bering flounder, Dolly varden/Arctic char, Pacific cod, sablefish, yellowfin sole, Alaska pollock, Pacific sand lance, and Pacific herring (Jacobs Engineering Group, Inc. 1993; Schwitters 2007; Shirley and Schwitters 2010).

Anadromous fishes of the Near Islands primarily include pink and chum salmon, although sockeye and coho salmon occur in some areas. Although Shemya Island has no significant salmon runs, significant numbers of pink salmon spawn on nearby Agattu and Attu islands, as well as a few sockeye, coho, and chum salmon (Jacobs Engineering Group, Inc. 1993).

Dolly varden have been observed in Middle Lake, Lower Lake and in one small stream in the vicinity of Lower Lake (Murray 1985; Jacobs Engineering Group, Inc. 1993; Kenney and von Hippel 2017). In 1984, coho salmon were introduced into Lower and Middle lakes to create a resident sport fishery (Murray 1985). Resident freshwater threespine stickleback have been observed in Upper, Middle, Laundry, and Lower lakes, as well as an unnamed coastal lake northeast of Alcan Harbor and an unnamed lake south of the old airfield and southwest of Laundry Lake (Murray 1985; Kenney and von Hippel 2017). The latter lake also contained the anadromous threespine stickleback. The existence of such sympatric threespine stickleback species pairs in lakes is relatively rare (Kenney and von Hippel 2017). Three-spined stickleback have also been captured in June and Myrtle lakes. They were also observed in small schools along the shorelines of Headquarters, Upper, Middle, and Lower lakes. However, there was no indication as to whether the observed sticklebacks were resident freshwater or anadromous species (Shirley and Schwitters 2010).

H.1.9.4.2 Mammals

<u>Terrestrial Mammals</u>

The only terrestrial mammals on Shemya Island are five introduced species: Arctic fox and four rodents (Table H-8). The Arctic fox was introduced to Shemya in 1911 (Bailey 1993). The island-wide fox population went from 30 in 2002, to 100 in 2010, and declined to 50 in 2012. Since 2012 the population has steadily increased to 104 in 2019 (Spraker and White 2019) (Table H-5).

Table H-5. Arctic Fox Population Estimates, Eareckson AS

Year	Population Estimate	Range
2002	30	
2006	45	40-50
2008	60	55-65
2010	100	≥100
2011	85	80-90
2012	50	
2017	75	75-85
2017	87	
2017	91	
2019	104	91-110

Source: Spraker and White 2019.

Introduced rodents comprise the remainder of the terrestrial mammal population. It was speculated that the brown rat was inadvertently introduced to Eareckson AS during World War II along with cargo and supplies from freighters (Jacobs Engineering Group, Inc. 1993). Later evidence suggests that these may have been roof rats (Meehan and Byrd 1996). Introduced roof rats are now established though in low numbers on Shemya Island. It appears the population has been curtailed by trapping and fox predation. The North American deer mouse is also an introduced and established species (Schwitters and Schwitters 2005a, b; Schwitters et al. 2005; Schwitters and Martinka 2006; Schwitters and Schwitters 2006; Shirley 2015).

Marine Mammals

A total of 15 species of marine mammals have been observed or potentially occur within the waters surrounding Shemya Island: 9 whale species, 2 species of porpoise, 2 species of seals, Steller sea lion, and northern sea otter (Table H-8). Marine mammals are discussed in detail in Section H.1.9.5 (ESA- and MMPA-listed Species).

H.1.9.4.3 Birds

Shemya Island is year-round habitat for seabirds, waterfowl, and raptors. The western Aleutian Islands, of which Shemya Island is a part, are along the migratory pathways or are nesting grounds of many North American shorebirds and waterfowl. A total of 228 species have been recorded, or potentially occur, on Shemya Island or in the adjacent marine waters, with 63 species recorded as breeding on the island (Table H-9). A major seabird colony is located on adjacent Nizki Island. Most islets and rocks surrounding Shemya Island support colonies of breeding pelagic seabirds. Neritic seabirds are those which use the area of relatively shallow coastal waters, while pelagic seabirds live mainly on the open sea. Asiatic species have also been identified near Shemya Island during migration. The north shore bluffs, vegetated with thistle and cow parsnip, provide important resting habitat for migrating Asiatic songbirds. Ruddy turnstones use the northern shoreline during fall migration (Jacobs Engineering Group, Inc. 1993).

Waterfowl and gulls use open water on these lakes for loafing, and dabbling ducks forage in areas where aquatic vegetation is present along shorelines. Shorebirds, including Wilson's snipe, long-billed dowitcher, and various sandpiper species, use the few water bodies with shallow shorelines, such as Upper and Lower lakes (Frost et al. 2005a).

Although coastal habitats are not extensive at Eareckson AS, they are commonly used by glaucous-winged gull, ruddy turnstone, and other migrating shorebirds, particularly along the southern shore of the island. Intertidal areas and coastal rocky habitat surrounding Shemya Island are commonly used by glaucous-

winged gull, common eider, harlequin duck, and pelagic and red-faced cormorants. Additionally, peregrine falcon, common raven, glaucous-winged gull, and migrating raptors use many of the bluff habitats surrounding the island for lift when soaring and hunting (Frost et al. 2005a).

Rocky cliffs of Shemya Island provide ideal habitat for seabird colonies and roost sites for the Peale's peregrine falcon. Glaucous-winged gulls are found throughout the island, feeding along the coast and at the dump and sewage outlets or roosting on beaches and offshore rocks. Large numbers of gulls rest on runways in the fall after the young fledge from offshore islet colonies. Pelagic and red-faced cormorants and tufted puffins nest on offshore islets on the northern side of Shemya, but seabirds have been mostly extirpated from the main island by introduced foxes and rats. The island's tundra supports nesting habitat for waterfowl, including the endemic Aleutian green-winged teal and Aleutian rock sandpiper, but these too have been reduced by foxes and rats (Jacobs Engineering Group, Inc. 1993).

Shemya Island does not support as large a population of waterfowl as could be expected, given the available habitat on the island. Introduced foxes and rats probably prevent more waterfowl from breeding on the island. During winter, a variety of waterfowl feed extensively on tidal benches and in nearshore waters. The Upper-Middle-Lower Lakes complex serves as a feeding and resting area for migrating waterfowl. Emperor geese congregate on the sewage lagoon, east of the runway along the coastal shoreline (Jacobs Engineering Group, Inc. 1993).

The Aleutian cackling goose was previously known as the Aleutian Canada goose and was listed as an endangered species until it was delisted in 2001. The Aleutian cackling goose does not nest on Shemya Island. They use the island throughout the spring (mid-April to early June) and fall (mid-August to early October) as a feeding, staging, and resting area as they conclude spring migration, prior to nesting on adjacent islands, and then after nesting and molting is complete prior to fall migration (Schwitters and Martinka 2006). Typically Aleutian cackling geese do not use the island's lakes; instead, when they are not feeding in upland crowberry habitats, they are found in open habitats, with low vegetation, such as runway aprons, the clover patch, the lawn on front of Building 600, and island roads. Aleutian cackling geese using the runways presents a substantial strike hazard at Eareckson AS and have necessitated hazing measures to protect aircraft and personnel (Schwitters et al. 2005). Due to the high diversity and numbers of birds on Shemya Island, BASH potential is high. Refer to INRMP Section 7.12 (Bird/Wildlife Aircraft Strike Hazard [BASH]) for a detailed discussion.

The airfield is an open area that is attractive to birds. This openness allows certain birds to feel secure and easily detect their primary predator, the Arctic fox. Generally, during late April to mid-June and mid-August through mid- to late October, large numbers of Aleutian cackling geese visit Shemya Island, causing an increased BASH potential. Ravens and glaucous-winged gulls also have an increased presence in summer. Eareckson AS recorded bird strikes in 1997, 1999, 2003, 2007, 2009, and 2014. Most of the strikes were minor and involved gulls. However, a major strike occurred in 2007 when 2 gulls took out the #3 engine of a C-17 aircraft. The times that are of most concern are from 15 April – 31 October. Eareckson AS had no bird strikes in calendar year 2018 (Eareckson AS 2019).

In 2016 and 2017, Fischer and Neipert (2019a, b) conducted a variety of avian surveys (e.g., road surveys, runway surveys, and Bird Exclusion Zone [BEZ] surveys) to determine the abundance and distribution of the three primary species (Aleutian cackling geese, glaucous-winged gulls, and common ravens) of concern with respect to BASH potential and flight safety on Eareckson AS. The highest concentrations of Aleutian cackling geese tended to be in the vicinity of the airfield, with local hotspots between Runway 10 and the western end of the island; on the eastern end of the island, particularly near the Shemya landfill and in the approach to Runway 28; and in the BEZ, especially between the runway and South Beach Road. These

patterns of use were consistent between years even as counts varied between 2016 and 2017. Thousands of geese have been recorded on Shemya Island in the spring and although fewer numbers in the fall, over 500 individuals were recorded. The abundance and distribution estimates for Aleutian cackling geese during both spring and fall were very similar to those reported previously by Schwitters (2010) and Shirley (2015). The numbers of glaucous-winged gulls are typically the less than 100, but are significant nonetheless given their large body size and given the history of aircraft striking gulls at Eareckson AS. Common ravens are not numerous and typically less than 50 may occur on the island, but they too are significant strike hazards due to their large body size (Fischer and Neiper 2019a, b).

Important Bird Areas (IBAs)

The goal of the IBA program is to conserve birds by identifying, monitoring, and protecting critical bird habitats. IBAs are based on an established program that uses standardized criteria to identify essential habitats, which are areas that hold a significant proportion of the population of one or more bird species. BirdLife International, in partnership with the National Audubon Society, developed standardized criteria defining IBAs, establishing a global "currency" for bird conservation. To qualify as a globally significant IBA, a proposed site must hold a significant number of a globally threatened species, or a significant percentage of a global population, as evidenced by documented, repeated observation of substantial congregations in an area (Audubon Alaska 2014).

Shemya Island is also located within the Buldir and Near Islands Marine Important Bird Area IBA (Figure H-8). The Buldir and Near Islands Marine IBA has been designated by Audubon Alaska as a globally important IBA due to the presence of large breeding colonies of the following seabird species: ancient murrelet, glaucous-winged gull, parakeet auklet, whiskered auklet, and red-faced cormorant.

H.1.9.5 ESA- and MMPA-listed Species

A total of 10 ESA-listed species potentially occur in marine waters adjacent to Shemya Island: endangered short-tailed albatross, threatened Steller's and spectacled eiders, threatened northern sea otter, endangered Steller sea lion, and endangered humpback, North Pacific right, sperm, blue, and fin whales (Table H-8 and Table H-9; INRMP Table 6). All marine mammals are also listed under the MMPA.

Short-tailed Albatross. The occurrence of the short-tailed albatross on Shemya Island is unlikely, but it may occasionally occur within 3 miles of the island.

Spectacled Eider. While not expected to occur within the vicinity of Shemya Island during winter, there are records of individual spectacled eiders in waters around Attu from May 1993-June 2002 (611 CES 2007b) and in September 2018 (eBird 2019). Therefore, spectacled eiders may occur very rarely within the vicinity of Shemya.

Steller's Eider. Steller's eiders are observed infrequently during winter in the nearshore waters of Shemya (Gibson 1981; Zeillemaker 1987; Meehan 1997; Meehan and Krom 1997; Meehan et al. 1996; Byrd and Scharf 2003; Schwitters 2008; eBird 2019).

Northern Sea Otter. Sea otters are found in the coastal waters of Shemya Island. They favor the southwest coastline south of the runway due to the presence of kelp beds and suitable habitat for resting and pupping. In 2009, the USFWS designated all contiguous waters from the mean high tide line to the 20-m depth contour as well as waters within 100 m of the mean high tide line adjacent to Shemya Island (Figure H-10) (USFWS 2009).

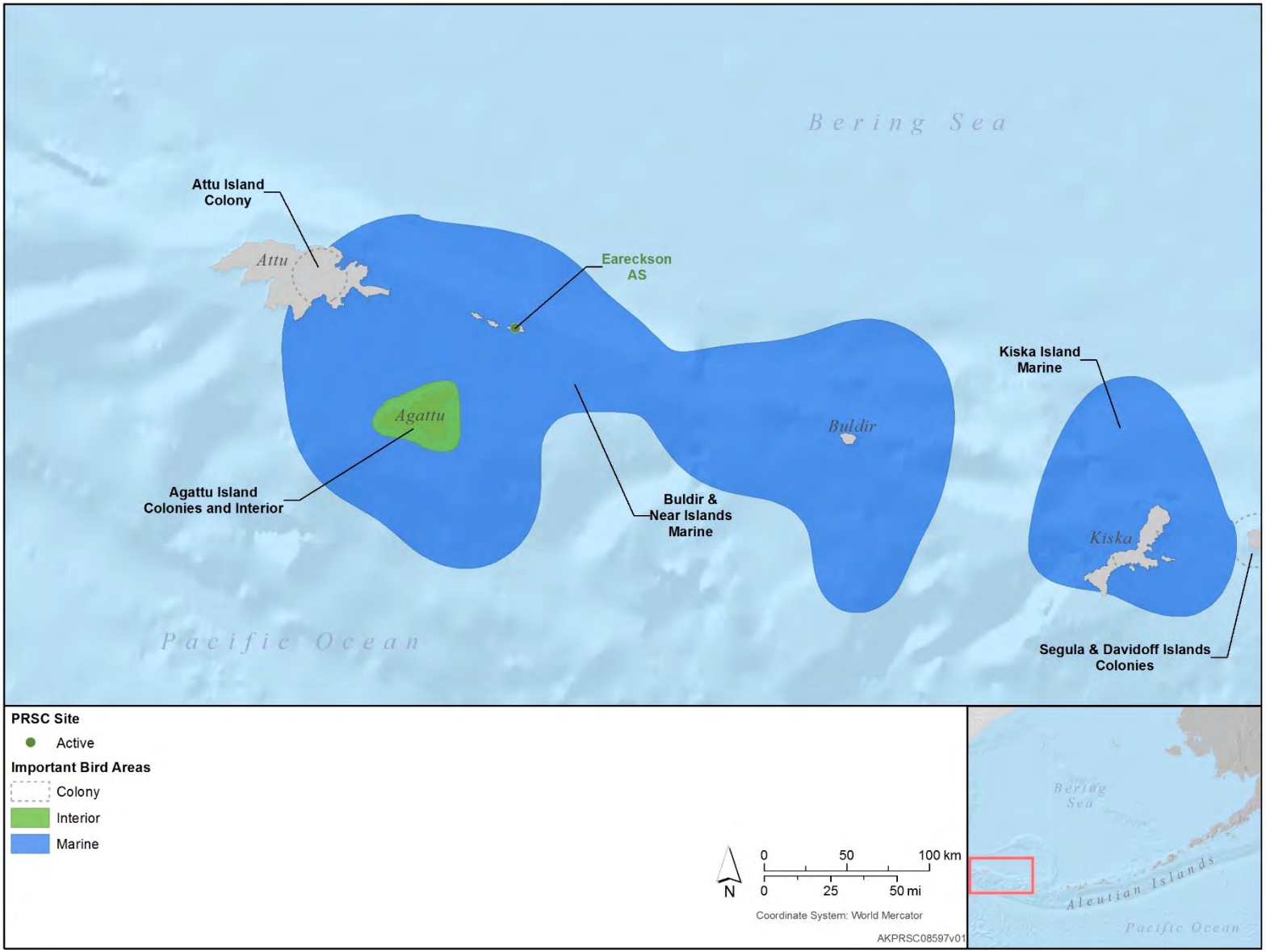

Figure H-8. Important Bird Areas (IBAs) within the Vicinity of Eareckson AS, Shemya Island, Alaska
(*Source*: Audubon Alaska 2014)

During winter surveys conducted between 1988 and 2002, the number of sea otters observed at Shemya Island varied dramatically. Sea otter numbers increased significantly between 1988 and 1992 (peak number was 124 animals in winter 1992/93), but the sharp increase was followed by a significant decline. During a 2-year study of otters of the Semichi Islands (Shemya, Alaid, and Nizki) from June 1995 thru June 1997, sea otter numbers around Shemya Island ranged from highs of 35 and 39 otters in July 1995 and July 1997, respectively, to lows of 20 and 22 in October 1995 and May 1997, respectively. In conjunction with survey results from 1994, when 109 otters were counted, surveys suggested an overall decline in sea otter numbers at Shemya. This negative trend was consistent with sea otter declines reported further east in the Aleutians for which increased mortality due to predation appeared to be the most likely cause (Estes et al. 1999). During winter surveys in 1999-2000 and 2000-2001, peak counts recorded only two otters, and in winter 2001/02 only three otters were recorded. Otters fed primarily in rocky areas along the northern shoreline and were often observed hauled out on offshore rocks and tidal benches in this area (Byrd and Scharf 2003).

There were several years without any otter sightings, then a pair was observed by island staff in 2014 (Fischer and Neipert 2019a) and multiple individuals (exact number not provided) were observed in May along the south side of the island (Shirley 2015). Fischer and Neipert (2019a) observed 6 individuals in May 2016 along the western side of the island; none were observed in 2017 (Fisher and Neipert (2019b).

Lance et al. (2015) conducted spatial analyses of existing aerial survey and sea otter habitat data from the Aleutian archipelago. The objective of these analyses was to identify sea otter concentration areas and important habitat features near USAF facilities in Southwest Alaska. No significant hotspots were identified near Eareckson AS/Shemya Island (Lance et al. 2015). The highest sea otter habitat quality was along the central southern coast of the island and was considered medium quality; all other areas were considered medium-low to low (Figure H-9).

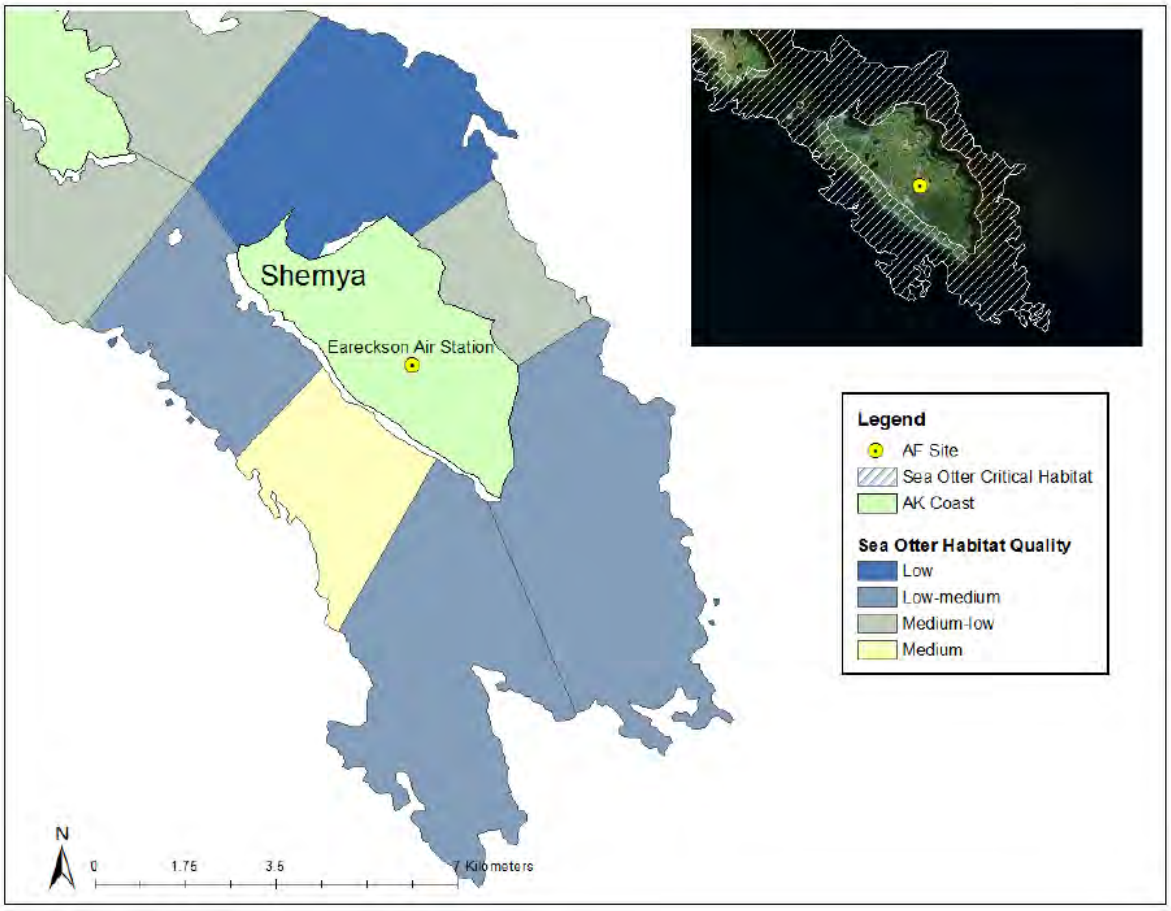

Figure H-9. Habitat Quality Index for Northern Sea Otter near Shemya Island, Alaska
(*Source*: Lance et al. 2015)

Steller Sea Lion. In 1990, the Steller sea lion was listed as threatened range wide. In 1997, NMFS recognized two DPS (Western DPS [west of 144º longitude, which includes Shemya Island] and Eastern DPS [east of 144º longitude]) and listed the Western DPS as endangered; the Eastern DPS was delisted in 2013 (NMFS 1997, 2013). In 1993, NMFS designated critical habitat for the Steller sea lion. Critical habitat includes "aquatic zones" that extend 3,000 ft seaward in State and Federally managed waters from the basepoint of each major rookery and major haulout in Alaska west of 144º longitude. There is one major Steller sea lion haulout site on an offshore islet approximately 0.8 mile northeast of Shemya (NMFS 1993; 50 CFR 226.202). Therefore, the waters surrounding Shemya out to 20 nm are designated Steller sea lion critical habitat (Figure H-11).

The Steller sea lion population on the offshore rocks northeast of Shemya Island have been monitored since 1959. The population was at it highest in 1959 at approx. 2,500 individuals, and then declined sharply in the 1970s and 1980s, reaching a 2018 population level of only 8 individuals (Figure H-12) (Fritz et al. 2015a, b; Sweeney et al. 2016, 2017, 2018).

Steller sea lions are commonly observed off the north side of the island, which is to be expected given the proximity of the offshore rocks to the northeast that are used as a haulout. Individuals have also been observed along the southern coastline, although infrequently (Shirley 2015; Fisher and Neipert 2019a, b).

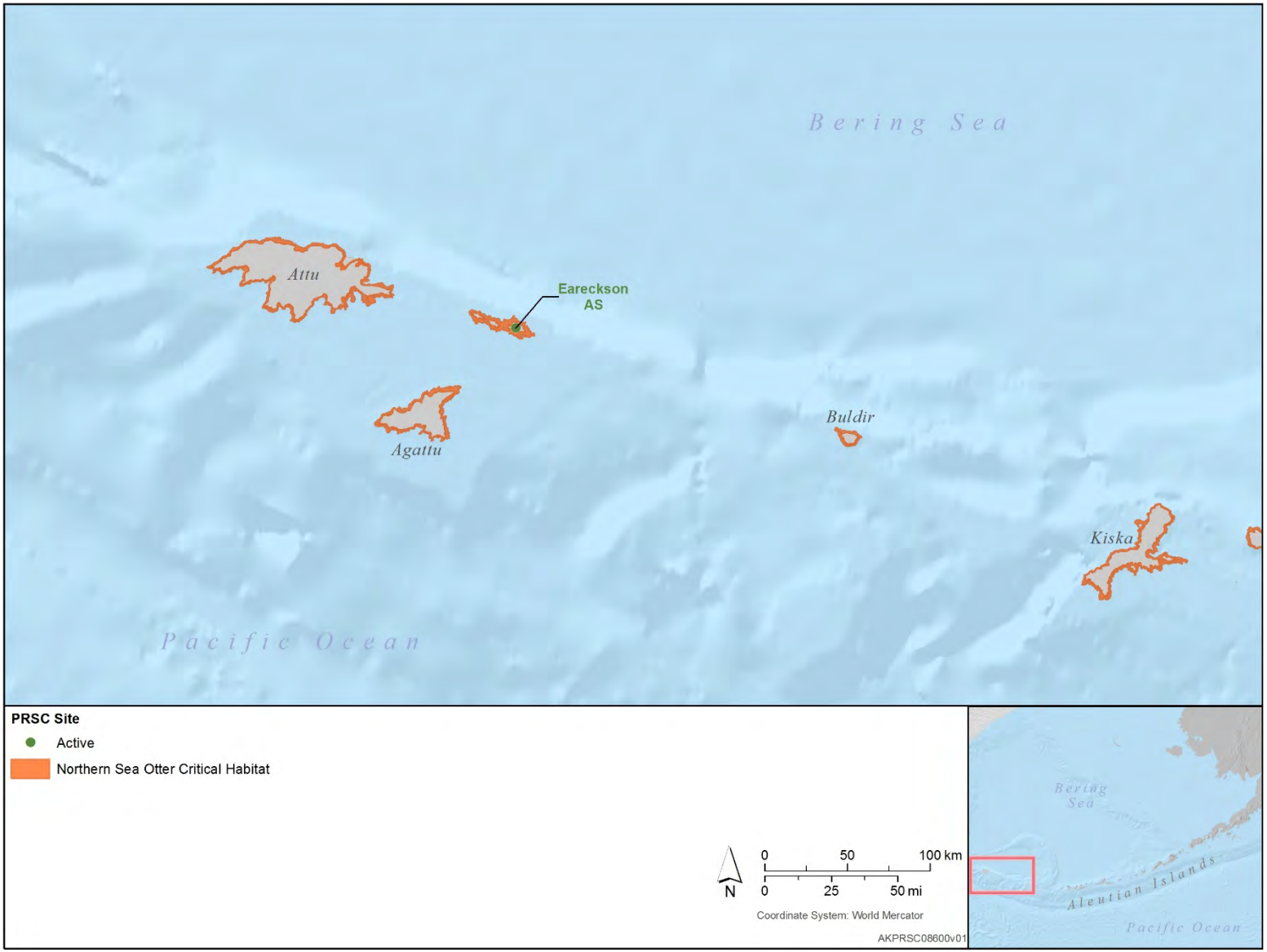

Figure H-10. Northern Sea Otter Critical Habitat – Western Aleutians
(*Source*: USFWS 2009c)

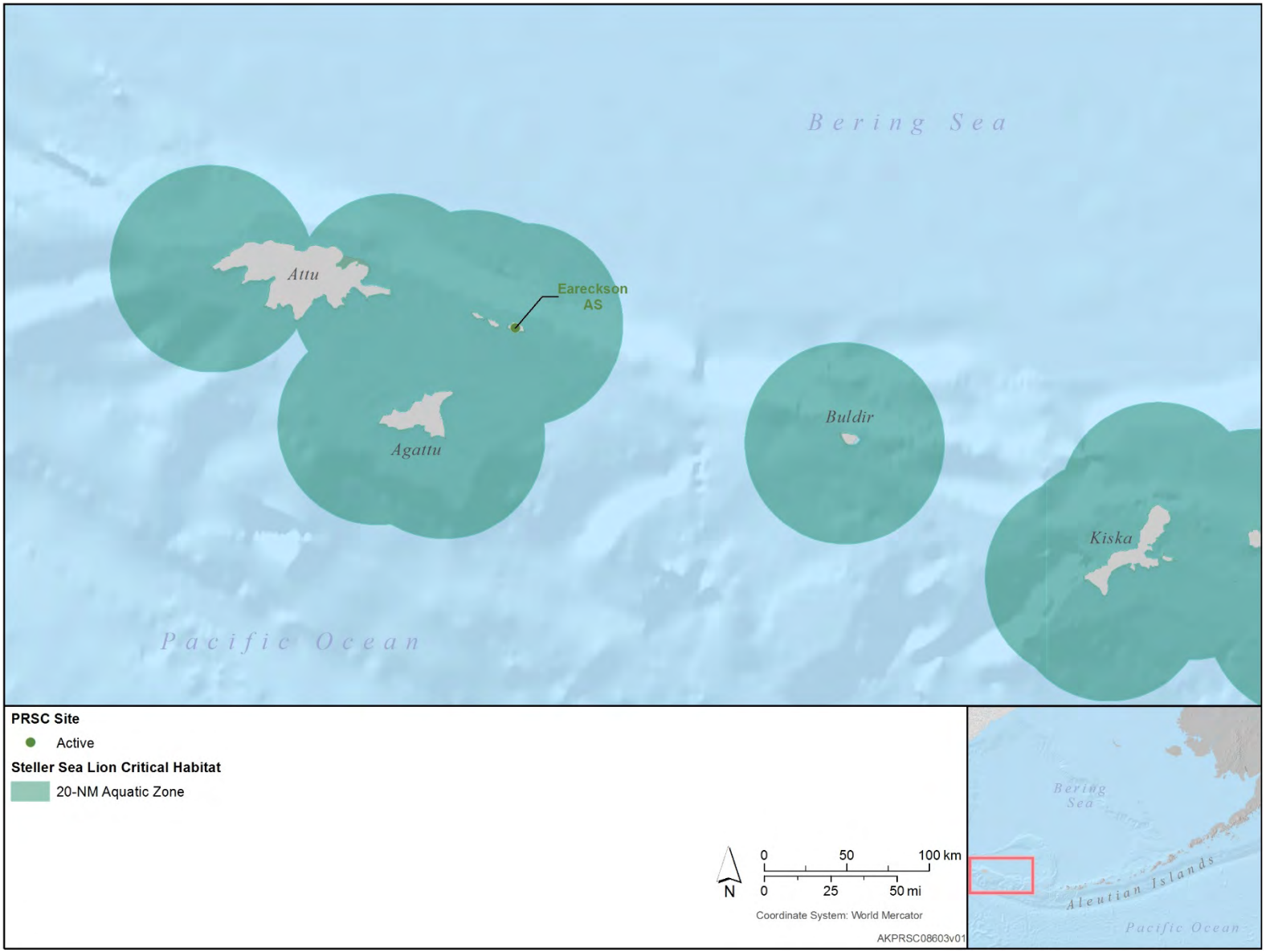

Figure H-11. Steller Sea Lion Critical Habitat – Western Aleutians
(*Source*: NMFS 1993)

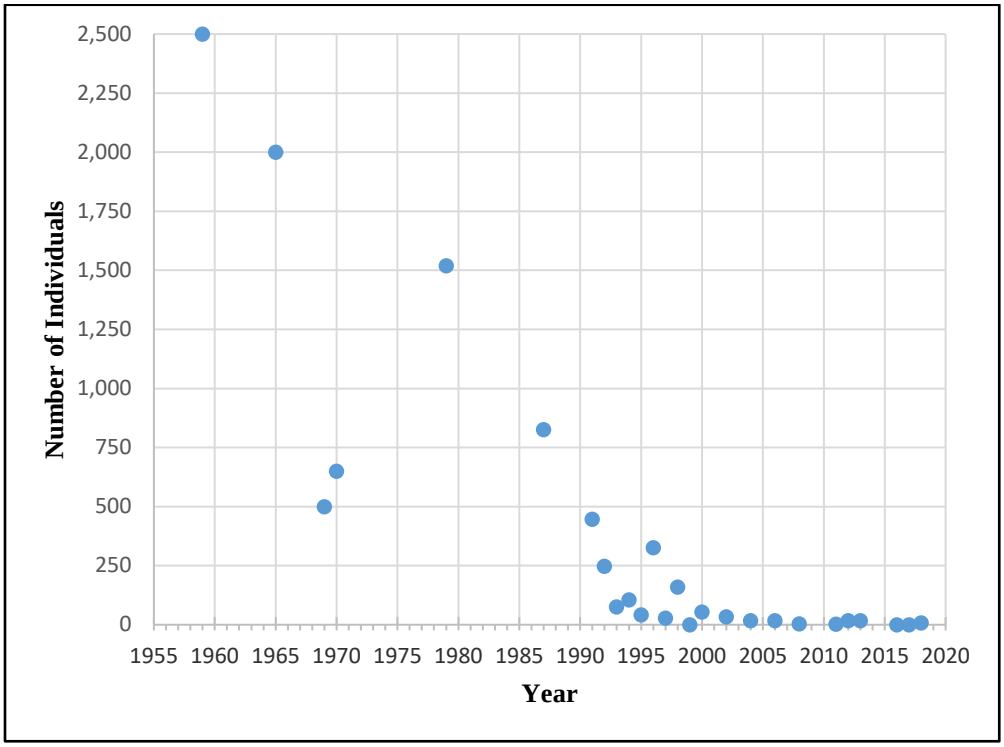

Figure H-12. Number of Steller Sea Lion Adults and Juveniles on Offshore Islands, Shemya Island, Alaska (1959-2018)
(*Source*: Fritz et al. 2015a, 2015b; Sweeney et al. 2016, 2017, 2018)

Humpback, North Pacific Right, Sperm, Blue, and Fin Whales. These whale species are seasonal visitors to the western Aleutian Islands where they feed during the summer months, including the waters surrounding Shemya Island (Muto et al. 2019). A sperm whale has been recorded washing ashore on Shemya Island (Schwitters et al. 2005; Frost et al. 2008).

Other MMPA-listed Species

Seals. Harbor seals are typically observed in nearshore waters around the entire island and are often hauled out on offshore rocks on the northeastern side during low tide (Byrd and Scharf 2003). Northern fur seals are expected to be infrequent visitors to nearshore waters.

Whales and Porpoise. Killer whale, Baird's and Stejneger's beaked whales, common minke whale, and harbor and Dall's porpoise are known to occur in the waters surrounding Shemya Island. A Stejneger's beaked whale has been recorded washing ashore on Shemya Island (Schwitters et al. 2005; Frost et al. 2008).

H.1.10 Other Natural Resources Information

There are no organized outdoor recreation opportunities at Eareckson AS. Since the 1995 drawdown and removal of active military personnel, official recreation requirements ended; non-appropriated funds are not available for morale, welfare, and recreation.

Unorganized outdoor recreation opportunities available at Eareckson AS include jogging, hiking or biking on the road system, wildlife viewing, photography, beachcombing, bonfires, and fishing. Fishing is a primary source of recreation at Eareckson AS. Most saltwater fishing occurs off the dock because it affords

easy access that permits fishermen to reach substantial depths to catch a variety of marine fish. Other fishing opportunities include freshwater fishing in various lakes. Numerous small lakes that dot the island offer several outdoor recreation opportunities. Several attractive beach areas and rocky headlands that rise above surrounding ocean waters provide impressive views and wildlife viewing opportunities.

Personal weapons and hunting are not permitted on Eareckson AS due to security requirements. This prohibition has precedence over the personal weapons policy described in INRMP Section 7.11, *Outdoor Recreation and Related Land Use*. Because of the policy, only activities that do not require weapons (e.g., fishing, berry picking) can occur. Security and airfield personnel are permitted to use firearms and other weapons for wildlife hazing and deterrence.

H.1.11 Mission and Other Impacts on Natural Resources

H.1.11.1 Land Use

Eareckson AS occupies all of Shemya Island. The major land use is by military support facilities, including buildings; roads; a runway; petroleum, oils, and lubricants (POL) tank farms; training areas; and waste disposal areas.

Shemya Island is also managed by the USFWS as part of the Aleutian Islands Unit of the Alaska Maritime NWR. Although the island remains part of the NWR, in 2000 the Defense Appropriations Act (Public Law 106-554, Section 302) transferred primary jurisdiction of Shemya Island from the USFWS to the USAF PRSC. However, the USAF has primary jurisdiction, custody, and control over Shemya Island shall:

- work with the USFWS to protect and conserve the wildlife and habitat on the island, and
- grant access to Shemya Island and its appurtenant waters to the USFWS for the purpose of management of the Alaska Maritime NWR.

In addition, any environmental contamination of Shemya Island caused by a military department shall be the responsibility of that militarydepartment and not the responsibility of the Department of the Interior. In the future, if DoD missions on the island are no longer required, jurisdiction would return to the USFWS.

<u>Open Space</u>

Approximately 2,750 acres, roughly 75%, of Shemya Island is devoted to open space categorized as:

- Safety Areas: Substantial areas of the island are subject to safety restrictions for explosive safety and airfield approach/departure zones. Activity immediately northwest of Cobra Dane is also restricted for safety reasons.
- Buffer Areas: Spatial separation is required between uses that might otherwise conflict due to security concerns, noise, traffic, blocking of views, or other factors.
- Environmental Protection: The watershed serving the collection gallery and portions of the island characterized by steep bluffs, unstable soil, important habitat values (such as the Upper-MiddleLower Lakes system), or subject to coastal flooding are being retained as open spaces to preserve their functions and values.
- Reserve: Areas currently not intensively used or within categories noted above with potential for meeting other demands in the future are reserved. These include areas that formerly supported facilities that have been abandoned (CH2M Hill 1990).

Industrial/Residential

Industrial/Residential land use is one of the broadest land-use categories, supporting facilities that range from supply warehouses to utilities to maintenance shops. Industrial category uses are dispersed throughout almost all areas of Eareckson AS, at least partially as a result of earlier development patterns and the tendency to reuse existing structures (CH2M Hill 1990).

Airfield

The airfield contains runways, taxiways, aprons, various navigational aids, and areas between these active features. Most structural features are congregated along the northern edge of the airfield. It is a relatively well-defined focal point of installation aviation activity that dominates land use in the south-central part of the island. The airfield's generally good condition, the major investment it represents, and the lack of major anticipated changes in operational requirements make it a stable use. The airfield's configuration, combined with erodible soils and southern slope, limit potential land uses in the vicinity of the runways, as do safety clearances in approach/departure areas extending from both ends of Runway 10-28 (CH2M Hill 1990).

ATTACHMENT 1: FLOODPLAINS OF SHEMYA ISLAND

Maps in this attachment are taken from *Flood Plain Identification, Forward Operating Bases, Eareckson Air Station, Galena Airport, King Salmon Airport, Alaska* (U.S. Army Corp of Engineers 1998).

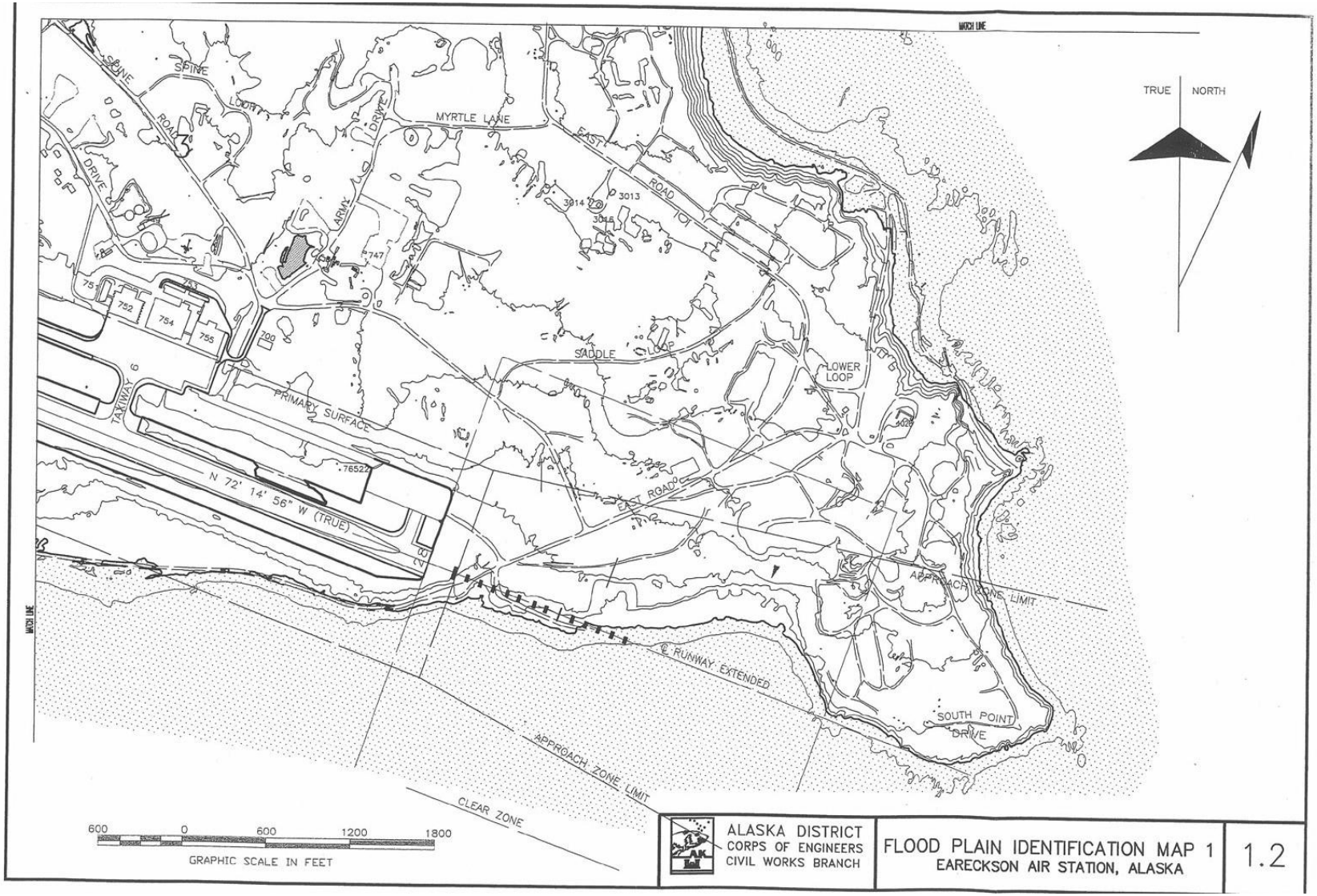

Figure H-13. Floodplains of Eareckson AS, Alaska – Southeastern Area

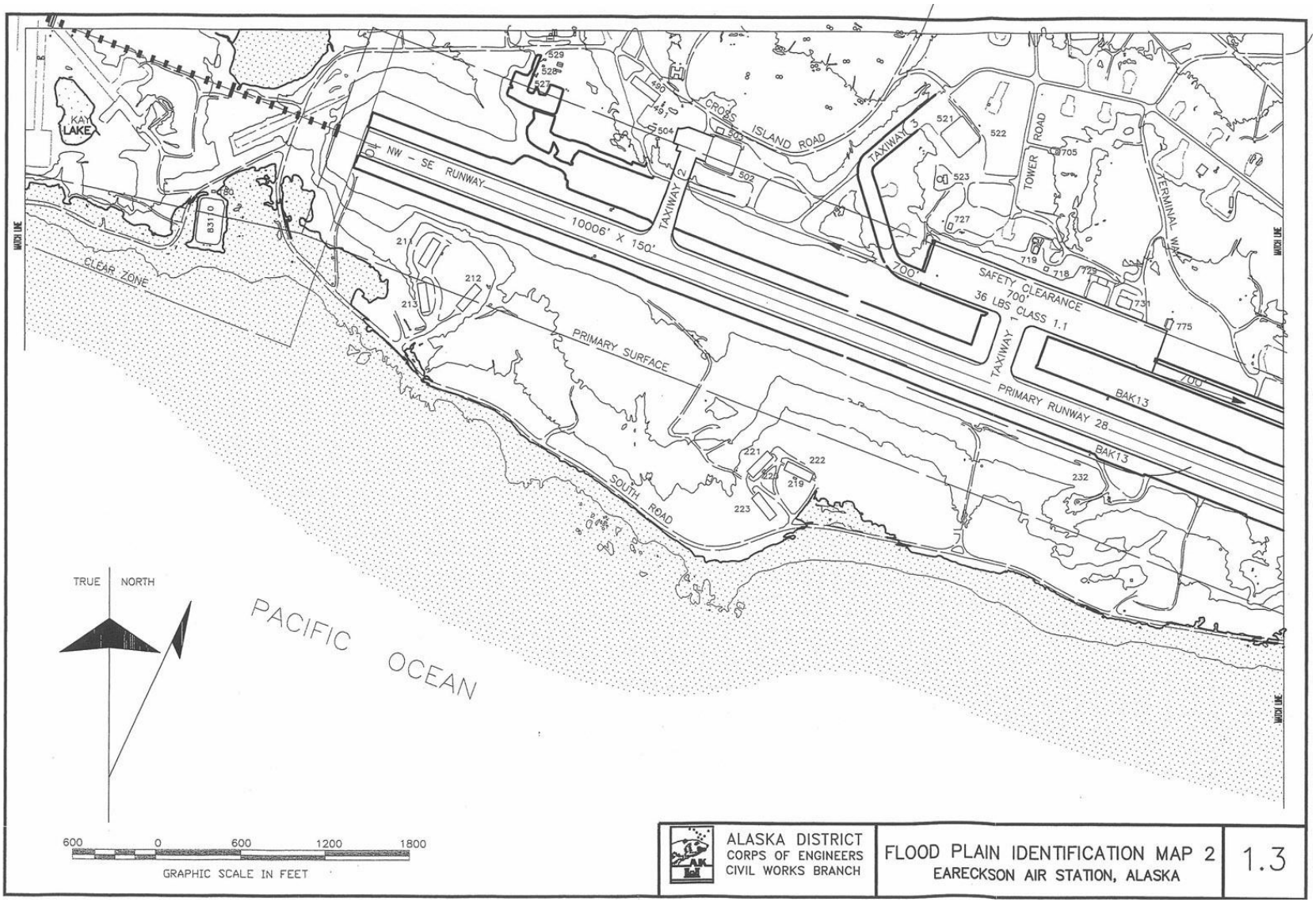

Figure H-14. Floodplains of Eareckson AS, Alaska – South-central Area

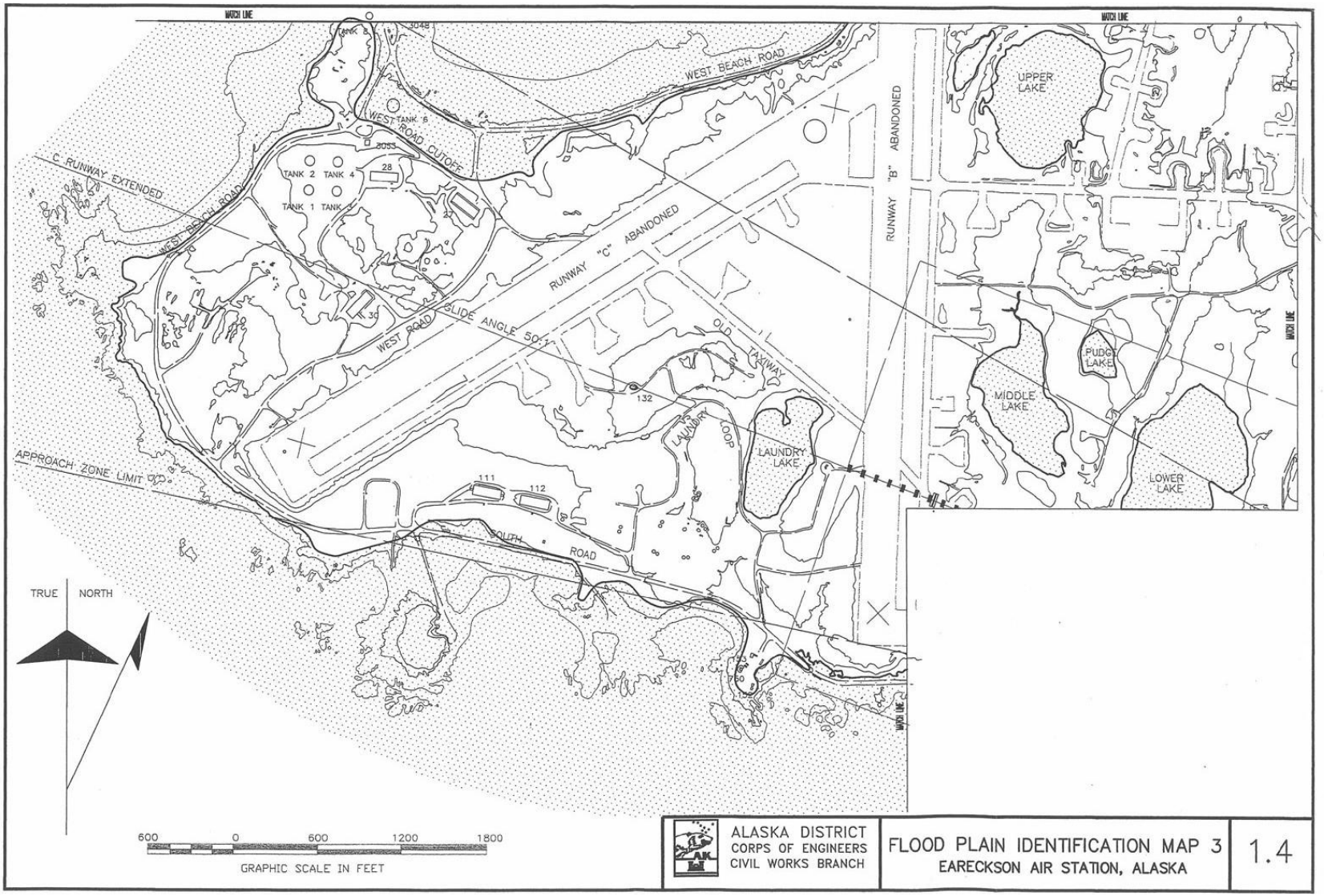

Figure H-15. Floodplains of Eareckson AS, Alaska – Southwestern Area

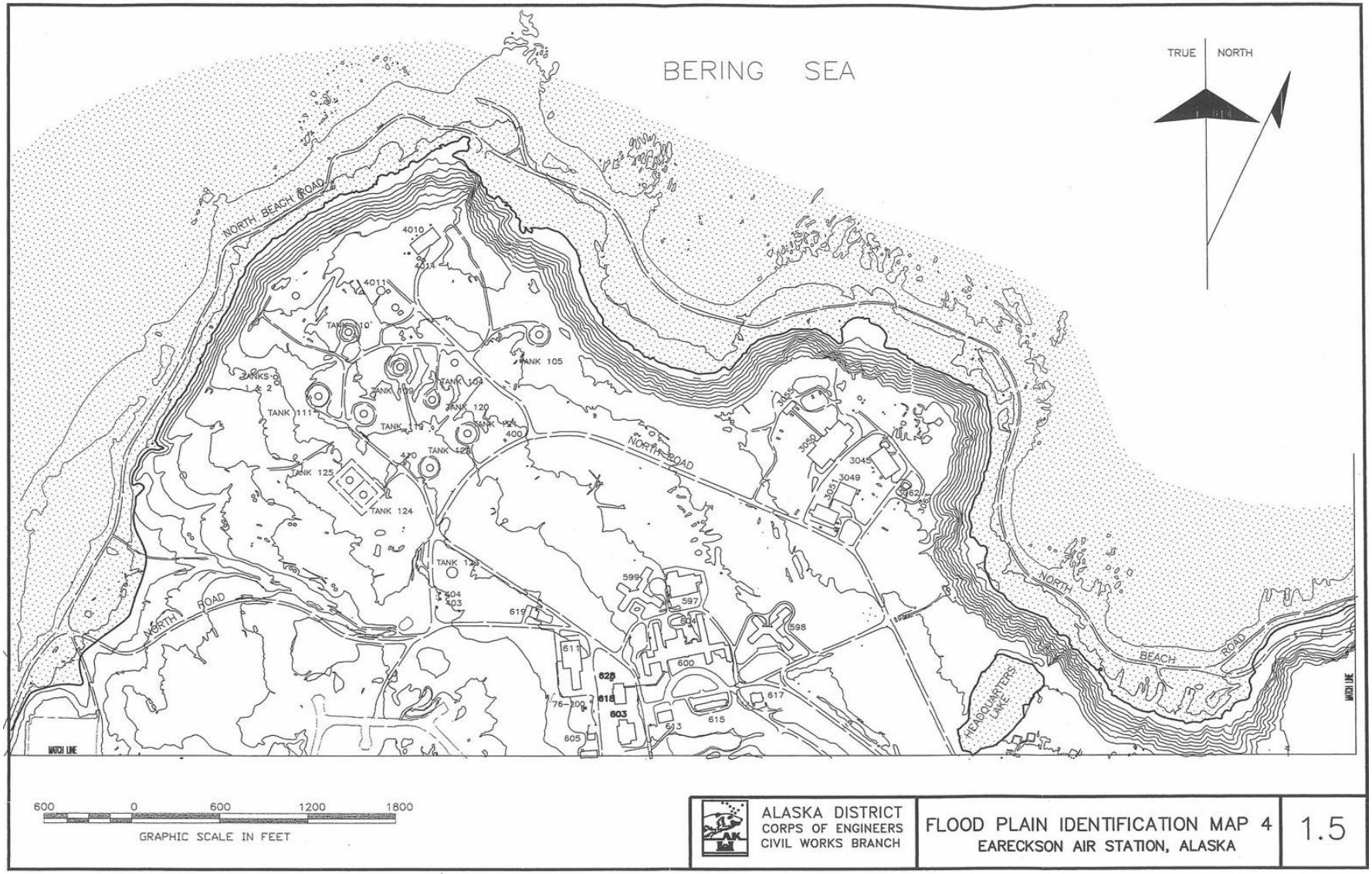

Figure H-16. Floodplains of Eareckson AS, Alaska – Northwestern Area

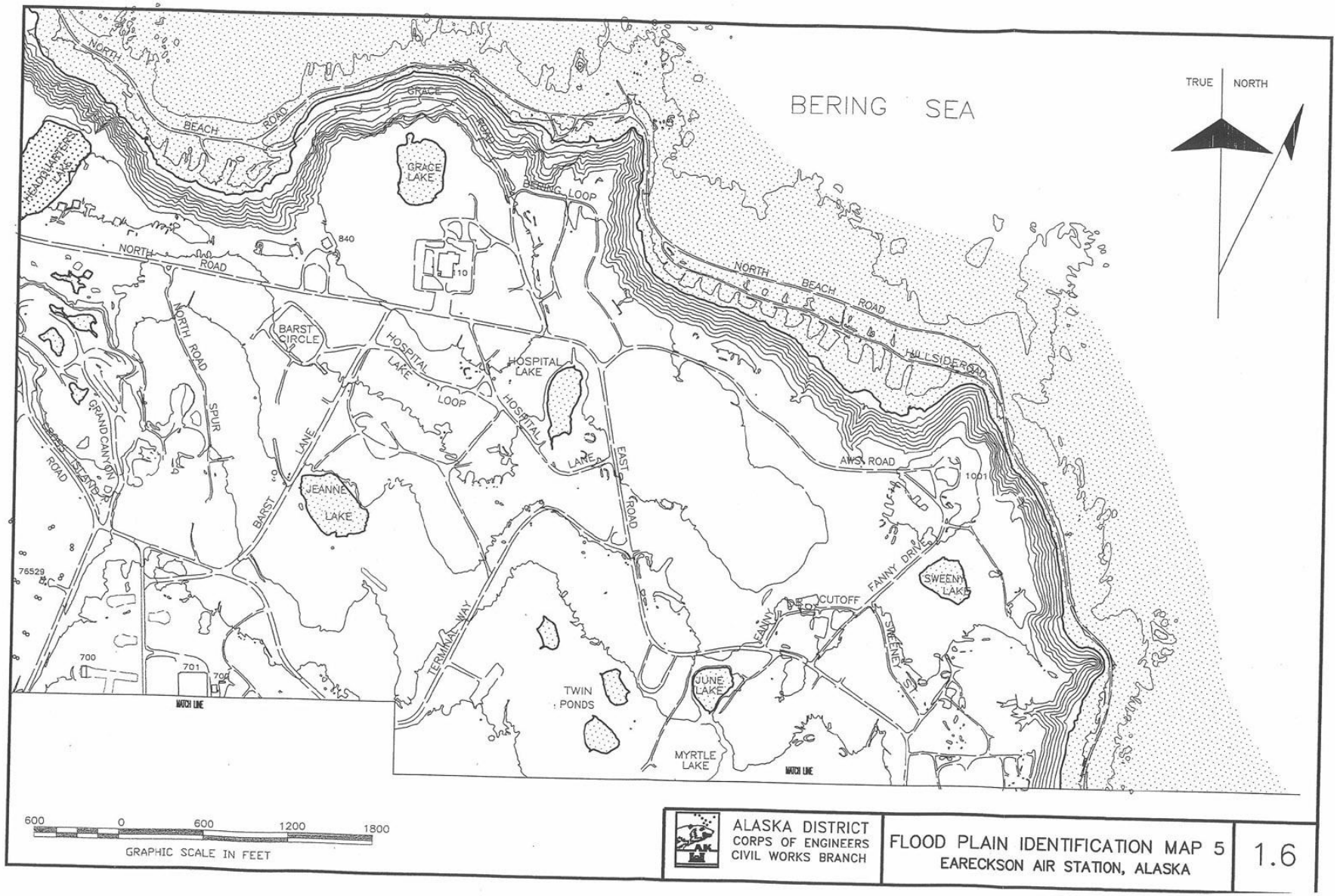

Figure H-17. Floodplains of Eareckson AS, Alaska – Northeastern Area

ATTACHMENT 2: NATURAL RESOURCES OF EARECKSON AS

Table H-6. Vascular Plants, Lichens, and Bryophytes Observed on Eareckson AS

Common Name	Scientific Name	Source
TREES AND SHRUBS		
Lapland cornel	*Cornus suecica*	2, 4
Crowberry	*Empetrum nigrum*	2, 4, 7, 8
Twin-flower	*Linnaea borealis*	2, 3, 4
Alpine-azalea	*Loiseleuria procumbens*	2, 7
Sitka Spruce	*Picea sitchensis*	Introduced, 7, 8
Kamchatka rhododendron	*Rhododendron camtschaticum*	1, 2, 4, 7
Nagoonberry	*Rubus arcticus*	2
Cloudberry	*Rubus chamaemorus*	1-4
Arctic willow	*Salix arctica*	1, 2, 7
Early blueberry	*Vaccinium ovalifolium*	2, 3, 4
Bog blueberry	*Vaccinium uliginosum*	2-4, 7, 8
Mountain cranberry	*Vaccinium vitis-idaea*	2-4, 7, 8
HERBACEOUS PLANTS		
Yarrow	*Achillea borealis*	1, 4, 5, 8
	Achillea millefolium borealis	7
Monkshood	*Aconitium maximum*	1, 3, 4, 7
	Agrostis alaskana	8
	Agrostis borealis	8
Spike bentgrass	*Agrostis exarata*	1, 5, 7
Northern bentgrass	*Agrostis mertensii*	1, 7
Rough bentgrass	*Agrostis scabra*	1, 7
Shortawn foxtail	*Alopecurus aequalis*	1, 7, 8
Boreal foxtail	*Alopecurus alpinus*	1
Meadow foxtail	*Alopecurus pratensis*	1, 7, 8
Pearly everlasting	*Anaphalis margaritacea*	1, 3, 4, 5, 7
Pasque flower	*Anemone drummondii*	1, 3, 4
Narcissus-flower anemone	*Anemone narcissiflora*	1, 3, 4, 7, 8
Yellow anemone	*Anemone richardsonii*	1, 3, 4, 7, 8
Wild celery	*Angelica lucida*	1, 3-5, 7, 8
Lyre-leaf rockcress	*Arabis lyrata*	1, 3, 4, 7
	Arabis lyrata kamchatica	8
Pendent grass	*Arctophila fulva*	1, 3, 4
Alpine arnica	*Arnica alpina*	1, 3, 4
Tall meadow arnica	*Arnica chamissonis*	1, 3, 4
Unalaska arnica (mugwort)	*Arnica unalaschensis*	1, 5, 7
	Artemisia arctica	8
Oldwoman	*Artemisia stelleriana*	1, 7, 8
Common wormwood	*Artemisia tilesii*	1, 3, 4, 7, 8
	Artemisia unalaskensis	8
Arctic wormwood	*Artemisia vulgaris*	1, 4, 7
Bride's feathers	*Aruncus dioicus*	1, 7
Lady fern	*Athyrium filix-femina*	1, 4, 7
Winter cress	*Barbarea orthoceras*	1, 7, 8
Canola	*Brassica juncea*	1, 4, 7, 8
Aleutian brome	*Bromus aleutensis*	1, 7, 8
Bluejoint	*Calamagrostis canadensis*	1, 3-5, 7, 8
Pacific reedgrass	*Calamagrostis nutkaensis*	1, 3, 4, 7, 8
Umbel bittercress	*Cardamine oligosperma*	1, 7

Table H-6. Vascular Plants, Lichens, and Bryophytes Observed on Eareckson AS

Common Name	Scientific Name	Source
	Cardamine umballeta	8
Sedge	*Carex anthoxanthea*	1, 6
Sedge	*Carex glareosa*	1, 6, 7, 8
Sedge	*Carex kelloggii*	7, 8
Sedge	*Carex lenticularis*	1, 6
Sedge	*Carex lyngbyaei*	1, 4, 6-8
Sedge	*Carex macrochaeata*	1, 4-8
Sedge	*Carex pluriflora*	1, 3-8
Sedge	*Carex saxatilis*	1, 3, 4, 6, 7
Fischer's chickweed	*Cerastium fischerianum*	1, 4
Bering Sea chickweed	*Cerastrium beeringianum*	1, 3, 4, 7
Dwarf fireweed	*Chamerion latifolium*	1, 3, 4, 7
Arctic daisy	*Chrysanthemum arcticum*	1, 4, 7, 8
Kamchatcka thistle	*Cirsium kamtschaticum*	1, 7, 8
Siberian springbeauty	*Claytonia sibirica*	1, 4, 7
Scurvy grass	*Cochlearia officinalis*	1, 3, 4, 7, 8
Purple marshlocks	*Comarum palustris*	1, 4, 7
Hemlock parsley	*Conioselinum chinense*	5, 7
Goldthread	*Coptis trifolia*	1, 7
	Cornus suecica	7, 8
Fragile fern	*Cystopteris fragilis*	1, 7, 8
keyflower	*Dactylorhiza aristata*	1, 4, 7
Bering's tufted hairgrass	*Deschampsia beringensis*	1, 4, 7
Tufted hairgrass	*Deschampsia caespitosa*	1, 5, 7
Boreal draba	*Draba borealis*	1, 7
Fringed willowherb	*Epilobium ciliatum*	1, 4, 5, 7, 8
Hornemann's willowherb	*Epilobium hornemannii*	1, 4, 7
	Epilobium latifolium	8
Field horsetail	*Equisetum arvense*	1, 4, 5, 7, 8
Subalpine fleabane	*Erigeron peregrinus*	1, 3, 4, 7
Red cottongrass	*Eriophorum russeolum*	1, 3, 5,7
Subalpine eyebright	*Euphrasia mollis*	1, 7, 8
Fescue grass	*Festuca* sp.	1, 3, 4
Red fescue	*Festuca rubra*	5, 7, 8
Chocolate lily	*Fritillaria camschatcensis*	1, 4, 7
Stickywilly	*Galium aparine*	1, 5, 7
Threepetal bedstraw	*Galium trifidum*	1
	Galium trifidum colunbianum	7
Autumn dwarf gentian	*Gentiana amarella*	1, 7
	Gentiana propinqua propinqua	8
Woolly geranium	*Geranium erianthum*	1, 4, 5, 7, 8
Calthaleaf avens	*Geum calthifolium*	1, 7, 8
Largeleaf avens	*Geum macrophyllum*	1
	Geum macrophyllum macrophyllum	7
Cow parsnip	*Heracleum lanatum*	1, 3-5, 7, 8
Vanilla grass	*Hierochloe odarata*	1, 3, 4, 7, 8
Mare's tail	*Hippuris vulgaris*	1, 7
Sandwort	*Honckenya peploides*	1, 3, 4, 7, 8
	Juncus arcticus sitchensis	8
Toad rush	*Juncus bufonius*	1, 7, 8
Swordleaf rush	*Juncus ensifolius*	1, 5, 7

Table H-6. Vascular Plants, Lichens, and Bryophytes Observed on Eareckson AS

Common Name	Scientific Name	Source
Falcate rush	*Juncus falcatus*	1, 5, 7
Haenke's rush	*Juncus haenkei*	1, 4, 5, 7
Merten's rush	*Juncus mertensianus*	1, 5, 7
Beach pea	*Lathyrus japonicus*	1, 4, 7
	Lathyrus maritimus maritimus	8
Beach wildrye	*Leymus mollis*	5, 7, 8
Beach lovage	*Ligusticum scoticum*	1, 5, 7
	Ligusticum scoticum hultenii	8
	Linnaea borealis	7
Heartleaf twayblade	*Listera cordata*	1, 7
Nootka lupine	*Lupinus nootkatensis*	1, 4, 7, 8
Wideleaf arctic woodrush	*Luzula arctica*	1, 5
Curved woodrush	*Luzula arcuata*	1
	Luzula arcuata unalaschensis	7
	Luzula confusia	8
Common woodrush	*Luzula multiflora*	1, 4, 7, 8
Smallflowered woodrush	*Luzula parviflora*	1, 7
	Luzula piperi	7
Wahlenberg's woodrush	*Luzula wahlenbergii*	1, 3, 4
Stiff clubmoss	*Lycopodium annotinum*	1, 3, 4, 7
Common clubmoss	*Lycopodium clavatum*	1, 7
Fir clubmoss	*Lycopodium selago*	1, 3, 4, 7
False lily-of-the-valley	*Maianthemum dilatatum*	1, 7
Oysterleaf	*Mertensia maritima*	1, 4, 7, 8
Eared Indian plantain	*Parasenecia auriculata*	1, 3, 4, 5, 7
Grass of Parnassus	*Parnassia palustris*	1, 7, 8
Wooly lousewort	*Pedicularis chamissonis*	1, 4, 7
Alpine timothy	*Phleum commutatum* var. *americanum*	1, 4, 5, 7, 8
Seashore plantain	*Plantago macrocarpa*	1, 7, 8
Common plantain	*Plantago major*	1, 3, 4, 7, 8
Kamchatka bog orchid	*Platanthera convallariaefolia*	1, 7
White bog orchid	*Platanthera dilitata*	1, 4, 7, 8
Arctic bluegrass	*Poa arctica*	5, 7, 8
Spear bluegrass	*Poa eminens*	1, 5, 7, 8
Largeglume bluegrass	*Poa macrocalyx*	1, 4, 5, 7, 8
	Poa pratensis	7, 8
Alpine meadow bistort	*Polygonum viviparum*	1, 3-5, 8
	Potentilla palustris	8
Villous cinquefoil	*Potentilla villosa*	1, 7, 8
Alkaligrass	*Puccinellia* sp.	1
Tundra alkaligrass	*Puccinellia tenella*	1, 7
	Puccinellia langeana	8
Tall buttercup	*Ranunculus acris*	1, 4, 7
Greater creeping spearwort	*Ranunculus flammula*	1, 7, 8
	Ranunculus grandis	8
Western buttercup	*Ranunculus occidentalis*	1, 4, 7
Woodland buttercup	*Ranunculus uncinatus*	1, 4
Yellow rattle	*Rhinanthus minor*	1, 8
	Rhinanthus minor borealis	7
	Rubus arcticus	7, 8
	Rubus chamaemorus	7, 8

Table H-6. Vascular Plants, Lichens, and Bryophytes Observed on Eareckson AS

Common Name	Scientific Name	Source
Common sheep sorrel	*Rumex acetosella*	1, 3, 4
Western dock	*Rumex fenestratus*	1
Pearl wort	*Sagina intermedia*	1, 3, 4, 8
Stickystem pearlwort	*Sagina maxima*	1, 7, 8
	Sagina nivalis	7
	Sagina saginoides	8
Heart-leaf saxifrage	*Saxifraga nelsoniana*	1, 7
Seaside ragwort	*Senecio pseudoarnica*	1, 3, 4, 7, 8
Creeping sibbaldia	*Sibbaldia procumbens*	1, 7, 8
Boreal chickweed	*Stellaria borealis*	1, 7, 8
Sitka starwort	*Stellaria sitchana*	1, 3, 4, 7, 8
Twistedstalk	*Streptopus amplexifolius*	1, 7
Awlwort	*Subularia aquatica*	1, 3, 4, 7, 8
Common dandelion	*Taraxacum ceratophorum*	1, 4
Common dandelion	*Taraxacum officinale*	1, 4, 8
	Taraxacum officinale ceratophorum	7
False asphodel	*Tofieldia coccinea*	1, 7
Arctic starflower	*Trientalis europaea*	1
	Trientalis europaea arctica	7
White clover	*Trifolium repens*	1, 7, 8
Spike trisetum	*Trisetum spicatum*	1, 5, 7, 8
Mountain hairgrass	*Vahlodea atropurpurea*	1, 7, 8
American speedwell	*Veronica americana*	1, 4
Thymeleaf speedwell	*Veronica serpyllifolia*	1, 7
Alaska violet	*Viola langsdorffii*	1, 3, 4, 7
LICHENS		
	Cladina portentosa pacifica	8
	Cetraria islandica	8
	Cladina sp.	8
	Cladonia sp.	8
	Stereocaulon sp.	8
	Thammolia vermicularis	8
BRYOPHYTES		
	Hylocomium splendens	8
	Pleurozium schreberi	8
	Ptilidium ciliare	8
	Ptilidium crista-castrensis	8
	Racomitrium lanuginosum	8
	Rhytidiadelphus loreus	8
	Sphagnum sp.	8
	Sphagnum squarrosum	8

Sources: 1. Hulten 1968.
2. Viereck and Little 1972.
3. V. Moran 1993.
4. 611 ASG 1995a.
5. Wright 1997.
6. Tande and Lipkin 2003.
7. Frost et al. 2008.
8. Frost et al. 2010.

Table H-7. Fish Species Found on or around Eareckson AS

Common Name	Scientific Name
Alaska blackfish	*Dallia pectoralis*
Alaska pollock	*Gadus chalcogrammus*
Arctic char	*Salvelinus alpinus*
Arctic grayling	*Thymallus arcticus*
Arctic lamprey	*Lethenteron camtschaticum*
Bering flounder	*Hippoglossoides robustus*
Chinook salmon	*Oncorhynchus tshawytscha*
Chum salmon	*Onchorhynchus keta*
Coho salmon	*Oncorhynchus kisutch*
Dolly varden	*Salvelinus malma*
Fourline snakeblenny	*Eumesogrammus praecisus*
Irish lord	*Hemilepidotus* sp.
Pacific cod	*Gadus macrocephalus*
Pacific halibut	*Hippoglossus stenolepis*
Pacific herring	*Clupea pallasi*
Pacific ocean perch	*Sebastes alutus*
Pacific sand lance	*Ammodytes hexapterus*
Pink salmon	*Oncorhynchus gorbuscha*
Sablefish	*Anoplopoma fimbria*
Slimy sculpin	*Cottus cognatus*
Sockeye salmon	*Oncorhynchus nerka*
Three-spined stickleback	*Gasterosteus aculeatus*
Trout-perch	*Percopsis omiscomaycus*
Yellowfin sole	*Pleuronectes asper*

Sources: Eareckson AS personnel; Murray 1985; Gilbert 1986; Jacobs Engineering Group, Inc. 1993; Schwitters 2007; Shirley and Schwitters 2010; Kenney and von Hippel 2017.

Table H-8. Mammal Species Observed or Potentially Occurring on or near Eareckson AS

Common Name (ESA Status)*	Scientific Name	Observed
Terrestrial		
Arctic fox	*Vulpes lagopus*	X
Brown rat	*Rattus norvegicus*	
House mouse	*Mus musculus*	
North American deer mouse	*Peromyscus maniculatus*	X
Roof rat	*Rattus rattus*	X
Marine†		
Baird's beaked whale	*Berardius bairdii*	X
Blue whale (E)	*Balaenoptera musculus*	X
Common minke whale	*Balaenoptera acutorostrata*	X
Dall's porpoise	*Phocoenoides dalli*	X
Fin whale (E)	*Balaenoptera physalus*	X
Harbor porpoise	*Phocoena phocoena*	X
Harbor seal	*Phoca vitulina*	X
Humpback whale (E)	*Megaptera novaeangliae*	X
Killer whale	*Orcinus orca*	X
North Pacific right whale (E)	*Eubalaena japonica*	X
Northern fur seal	*Callorhinus ursinus*	
Northern sea otter (T)	*Enhydra lutris kenyoni*	X
Sperm whale (E)	*Physeter catadon*	X
Stejneger's beaked whale	*Mesoplodon stejnegeri*	X
Steller sea lion (E)	*Eumetopias jubatus*	X

Notes: *E = endangered; T = threatened. †All marine mammals are listed under the MMPA.
Sources: Schwitters 2007, 2010; NMFS 1993; Shirley and Schwitters 2010; Wynne 1993; Meehan 1997; Meehan and Krom 1997; Meehan et al. 1996; J. Martin, Maritime NWR, 1999; Frost et al. 2008; Frost et al. 2010; USFWS 2010.

Table H-9. Bird Species Observed or Potentially Occurring on Shemya Island or Surrounding Waters

Common Name (Federal Status)	Scientific Name	Spr	Sum	Fal	Win (Obs)	Breeding	Sources
Aleutian cackling goose	*Branta hutchinsii leucopareia*	U	-	C	R		1, 2, 4-9
Aleutian green-winged teal	*Anas crecca nimia*				C-Ab		3
Aleutian tern	*Onychoprion aleuticus*	U	R	U	-	X	1, 2, 4, 7, 9, 10
American pipit	*Anthus rubescens*						1, 4, 7-9
American robin	*Turdus migratorius*						7
American wigeon	*Mareca americana*				R		3, 7, 8
Ancient murrelet	*Synthliboramphus antiquus*	C	C	C	C	X	1, 2-9, 11
Arctic loon	*Gavia arctica*	-	R	-	-		2, 5, 7, 9, 11
Arctic tern	*Sterna paradisaea*	C	U	C	-	X	1, 2, 7-9
Arctic warbler	*Phylloscopus borealis*	U	U	U	-	X	1, 2, 7, 8
Asian rosy-finch	*Leucosticte arctoa*	C	U	C	U-C	X	1, 2, 3
Baikal teal	*Sibirionetta formosa*						4, 5, 7, 8
Baird's sandpiper	*Calidris bairdii*	R	R	U	-		1, 2, 4, 7, 10
Bald eagle (BGEPA)	*Haliaeetus leucocephalus*				R		3, 7, 9
Bank swallow	*Riparia riparia*	-	-	A	-		1, 2, 7, 10
Barn swallow	*Hirundo rustica*	-	A	A	-		1, 2, 7, 10
Barrow's goldeneye	*Bucephala islandica*						7, 10
Bar-tailed godwit	*Limosa lapponica*	C	R	C	-		1, 2, 5, 7, 9, 10
Black oystercatcher	*Haematopus bachmani*						7
Black scoter	*Melanitta americana*	C	C	C	C-Ab	X	1-9
Black-bellied plover	*Pluvialis squatarola*	C	-	C	-		1, 2, 7
Black-crowned night-heron	*Nycticorax nycticorax*						12
Black-footed albatross	*Phoebastria nigripes*						4, 7
Black-headed gull	*Chroicocephalus ridibundus*	R	U	Ax	-		1, 2, 4, 7, 8
Black-legged kittiwake	*Rissa tridactyla*	C	C	C	U	X	1, 2, 4, 5, 7-9, 11
Black-tailed godwit	*Limosa limosa*	A	R	-	-		1, 2, 7, 9
Black-tailed gull	*Larus crassirostris*						7
Black-winged stilt	*Himantopus himantopus*						10
Bluethroat	*Cyanecula svecica*						7
Bohemian waxwing	*Bombycilla garrulus*						8
Brambling	*Fringilla montrifringilla*	R	-	R	-		1, 2, 4, 6-9
Brant	*Branta bernicla*				A		3, 7
Bristle-thighed curlew	*Numenius tahitiensis*	-	A	-	-		1, 2, 7
Broad-billed sandpiper	*Calidris falcinellus*	-	-	A	-		1, 2, 7, 10
Brown shrike	*Lanius cristatus*	-	-	A	-		1, 2, 7, 10
Buff-breasted sandpiper	*Calidris subruficollis*	-	-	A	-		1, 2, 4, 7, 8
Bufflehead	*Bucephala albeola*	C	A	C	U	X	1-7, 9
Canvasback	*Aythya valisineria*	-	A	-	-		1, 2, 7, 10
Cassin's auklet	*Ptychoramphus aleuticus*						12
Common cuckoo	*Cuculus canorus*						7
Common eider	*Somateria mollissima*	C	R	C	Ab	X	1-9, 12
Common goldeneye	*Bucephala clangula*	C	U	C	C	X	1-7, 9
Common greenshank	*Tringa nebularia*	-	A	-	-		1, 2, 7, 9, 10
Common loon	*Gavia immer*	U	U	U	R	X	1, 2-9, 11
Common merganser	*Mergus merganser*	C	C	C	R	X	1-3, 5-7, 9
Common moorhen	*Gallinula chloropus*						8[(c)]
Common murre	*Uria aalge*	C	C	C	R	X	1, 2-9, 11
Common pochard	*Aythya ferina*	R	A	A	-		1, 2, 7, 9, 10
Common raven	*Corvus corax*	C	C	C	C	X	1-9, 11, 12
Common redpoll	*Acanthis flammea*	C	A	C	R	X	1, 2-7, 9, 10
Common ringed plover	*Charadrius hiaticula*	-	A	-	-		2, 7, 10
Common rosefinch	*Carpodacus erythrinus*	R	A	A	-		1, 2, 7-10
Common sandpiper	*Actitis hypoleucos*	R	U	R	-	X	1, 2, 7

Table H-9. Bird Species Observed or Potentially Occurring on Shemya Island or Surrounding Waters

Common Name (Federal Status)	Scientific Name	Spr	Sum	Fal	Win (Obs)	Breeding	Sources
Common tern	*Sterna hirundo*	R	U	A	-		1, 2, 10
Crested auklet	*Aethia cristatella*	C	R	C	C	X	1, 2, 4, 7
Curlew sandpiper	*Calidris ferruginea*	-	-	A	-		1, 2, 10
Dark-eyed junco	*Junco hyemalis*						4, 7
Dark-sided flycatcher	*Muscicapa sibirica*	-	-	A	-		1, 2, 7
Dunlin	*Calidris alpina*	C	C	C	U	X	1, 2, 4, 7, 8
Dusky thrush	*Turdus naumanni*	A	-	A	-		1, 2, 7, 10
Dusky warbler	*Phylloscopus fuscatus*	-	-	A	-		1, 2, 10
Eastern yellow wagtail	*Motacilla tschutschensis*	R	R	R	-		1, 2, 4, 7
Emperor goose	*Anser canagicus*	C	R	C	A	X	1-5, 7-9
Eurasian bullfinch	*Pyrrhula pyrrhula*	-	-	A	-		1, 2, 7, 9
Eurasian dotterel	*Charadrius morinellus*	-	-	A	-		1, 2, 7
Eurasian hobby	*Falco subbuteo*	-	-	A	-		1, 4, 7, 8, 10
Eurasian kestrel	*Falco tinnunculus*	-	-	A	-		1, 2, 7
Eurasian skylark	*Alauda arvensis*	R	R	A	-	X	1, 2, 4-8, 12
Eurasian wigeon	*Mareca penelope*	U	C	Ux	U		1-9
European starling	*Sturnus vulgaris*						7, 10
Eyebrowed thrush	*Turdus obscurus*	R	-	A	-		1, 2, 7-9
Falcated duck	*Mareca falcata*	-	A	-	-		1, 2, 7
Far eastern curlew	*Numenius madagascariensis*						7, 10
Fork-tailed storm-petrel	*Hydrobates furcatus*	C	C	C	R	X	1, 2, 4, 7
Fork-tailed swift	*Apus pacificus*	-	-	A	-		1, 2, 7, 10
Gadwall	*Mareca strepera*	-	R	-	-		1, 2, 7
Garganey	*Spatula querquedula*	R	-	R	-		1, 2, 4, 7, 10
Glaucous gull	*Larus hyperboreus*	U	U	U	R	X	1-4, 7, 9
Glaucous-winged gull	*Larus glaucescens*	C	C	C	Ab	X	1-9, 11, 12
Golden-crowned sparrow	*Zonotrichia atricapilla*						4, 7, 10
Gray bunting	*Emberiza variabilis*	-	A	-	-		1, 2, 7
Gray heron	*Ardea cinerea*						9[(a)]
Gray wagtail	*Motacilla cinerea*	-	R	-	-		1, 2, 7
Gray-capped greenfinch	*Chloris sinica*	-	-	A	-		1, 2, 7, 10
Gray-cheeked thrush	*Catharus minimus*	-	-	A	-		1, 2
Gray-crowned rosy-finch	*Leucosticte tephrocotis*						1, 4-8, 11
Gray-streaked flycatcher	*Muscicapa griseisticta*	R	A	-	-		1, 2, 7
Gray-tailed tattler	*Tringa brevipes*	R	A	R	-		1, 2, 4, 5, 7, 8
Great egret	*Ardea alba*						7
Great grey shrike	*Lanius excubitor*						7
Great knot	*Calidris tenuirostris*	-	A	-	-		1, 2, 10
Great spotted woodpecker	*Dendrocopos major*						7
Greater scaup	*Aythya marila*	C	-	C	R-U	X	1-9, 12
Greater white-fronted goose	*Anser albifrons*				R		3, 6, 7
Greater yellowlegs	*Tringa melanoleuca*	-	A	-	-		1, 2
Green sandpiper	*Tringa ochropus*	-	A	-	-		2, 7, 10
Green-winged teal	*Anas crecca*	C	A	C	R	X	1-8, 9
Gyrfalcon	*Falco rusticolus*	U	U	U	U	X	2
Harlequin duck	*Histrionicus histrionicus*	C	C	C	Ab	X	1-9, 12
Hawfinch	*Coccothraustes coccothraustes*						6, 7, 11
Herring gull (incl. Vega)	*Larus argentatus*	R	-	R	R		1, 2, 4-9
Hoary redpoll	*Acanthis hornemanni*	U	A	U	C		1, 2, 4
Horned grebe	*Podiceps auritus*	C	U	C	R-U	X	1-9
Horned lark	*Eremophila alpestris*	-	-	A	-		1, 2, 7
Horned puffin	*Fratercula corniculata*	C	U	C	U	X	1, 2, 4, 7-9
Intermediate egret	*Ardea intermedia*						8[(b)]

Table H-9. Bird Species Observed or Potentially Occurring on Shemya Island or Surrounding Waters

Common Name (Federal Status)	Scientific Name	Spr	Sum	Fal	Win (Obs)	Breeding	Sources
King eider	*Somateria spectabilis*						7, 10
Kittlitz's murrelet	*Brachyramphus brevirostris*	U	U	U	R		1, 3, 6
Lapland longspur	*Calcarius lapponicus*	C	C	C	A	X	1, 2, 4-10, 12
Laysan albatross	*Phoebastria immutabilis*	C	C	C	R		1-5, 7-9, 11
Leach's storm-petrel	*Hydrobates leucorhous*	U	C	C	-	X	2, 4, 7
Least auklet	*Aethia pusilla*				R		3, 4, 7
Lesser black-backed gull	*Larus fuscus*						7
Lesser sand-plover	*Charadrius mongolus*	R	-	R		X	1, 2, 4, 5, 7-9
Lesser scaup	*Aythya affinis*						5, 6, 7, 9, 10
Lesser yellowlegs	*Tringa flavipes*	-	A	-	-		1, 2, 7
Little bunting	*Emberiza pusilla*	-	-	A	-		1, 2
Little ringed plover	*Charadrius dubius*						12
Little stint	*Calidris minuta*	-	A	-	-		1, 2, 7
Long-billed dowitcher	*Limnodromus scolopaceus*	-	-	A	-		1, 2, 4, 7, 8
Long-tailed duck	*Clangula hyemalis*	C	U	C	C	X	1-3, 5-9
Long-tailed Jaeger	*Stercorarius longicaudus*	U	R	U	-	X	1, 2, 7
Long-toed stint	*Calidris subminuta*	R	A	R	-		1, 2, 4, 7-9, 10
Mallard	*Anas platyrhynchos*	C	C	C	Ab	X	1-9, 12
Marbled murrelet	*Brachyramphus marmoratus*	U	U	U	R		1, 3, 8
Marsh sandpiper	*Tringa stagnatilis*						8
McKay's bunting	*Plectrophenax hyperboreus*						7
Merlin	*Falco columbarius*						12
Mew gull	*Larus canus*	C	A	C	R	X	1-3, 5, 7, 9
Mottled petrel	*Pterodroma inexpectata*						7
Northern fulmar	*Fulmarus glacialis*						7
Northern goshawk	*Accipiter gentilis*						7, 10
Northern harrier	*Circus hudsonius*	-	-	A	A		1-3, 7, 10
Northern lapwing	*Vanellus vanellus*						4, 7
Northern pintail	*Anas acuta*	C	C	C	C	X	1-9
Northern shoveler	*Spatula clypeata*	R	R	R	R		1-4, 6-9
Northern wheatear	*Oenanthe oenanthe*	R	-	R	-		1, 2, 4, 7, 8
Olive-backed Pipit	*Anthus hodgsoni*	A	R	A	-		1, 2, 7-9
Oriental cuckoo	*Cuculus optatus*						7
Pacific golden-plover	*Pluvialis fulva*	U	-	U	-		1, 2, 4-9
Pacific loon	*Gavia pacifica*				R		3, 7, 9, 11
Pacific wren	*Troglodytes pacificus*					X	8, 12
Parakeet auklet	*Aethia psittacula*						4, 7
Parasitic jeager	*Stercorarius parasiticus*	C	C	C	-	X	1, 2, 4, 6-9
Peale's peregrine falcon	*Falco peregrinus pealei*	C	U	C	U	X	1, 2
Pechora pipit	*Anthus gustavi*						7, 10
Pectoral sandpiper	*Calidris melanotos*	R	-	Cx	-		1, 2, 4-8, 10
Pelagic cormorant	*Phalacrocorax pelagicus*	C	C	C	Ab	X	1-9, 12
Peregrine falcon	*Falco peregrinus*				R		3, 4
Pigeon guillemot	*Cepphus columba*	C	U	C	U	X	1-9, 11
Pine grosbeak	*Pinicola enucleator*						6, 7
Pine siskin	*Spinus pinus*				R		3, 7
Pomarine jaeger	*Stercorarius pomarinus*	C	U	C	-		1, 2, 10
Red knot	*Calidris canutus*	A	-	R	-		1, 2, 4, 7, 8
Red phalarope	*Phalaropus fulicarius*	C	U	C	-		1, 2, 4, 5, 7, 8
Red-breasted flycatcher	*Ficedula parva*	-	A	-	-		1, 2
Red-breasted merganser	*Mergus serrator*	C	A	C	R-U	X	1-9
Red-faced cormorant	*Phalacrocorax urile*	C	-	C	U-C	X	1, 2-9, 11, 12
Red-flanked bluetail	*Tarsiger cyanurus*						7

Table H-9. Bird Species Observed or Potentially Occurring on Shemya Island or Surrounding Waters

Common Name (Federal Status)	Scientific Name	Spr	Sum	Fal	Win (Obs)	Breeding	Sources
Redhead	*Aythya americana*						7
Red-legged kittiwake	*Rissa brevirostris*	U	-	U	U	X	1, 2, 7
Red-necked grebe	*Podiceps grisegena*	U	R	U	U	X	1-11
Red-necked phalarope	*Phalaropus lobatus*	C	U	C	-	X	1, 2, 7, 8
Red-necked stint	*Calidris ruficollis*	R	A	R	-		1, 2, 4, 7
Red-throated loon	*Gavia stellata*	C	C	C	U	X	1, 2, 4-9, 11, 12
Red-throated pipit	*Anthus cervinus*	R	-	R	-		1, 2, 7, 10
Reed bunting	*Emberiza schoeniclus*	-	A	-	-		1, 2, 7, 10
Ring-necked duck	*Aythya collaris*						12
Rock ptarmigan	*Lagopus muta*						5, 6
Rock sandpiper	*Calidris ptilocnemis*	C	C	C	Ab	X	1-9, 11, 12
Ross's gull	*Rhodostethia rosea*						10
Rough-legged hawk	*Buteo lagopus*	U	U	U	-	X	1, 2, 7, 9
Ruddy turnstone	*Arenaria interpres*	C	U	C	-		1, 2, 4, 7-9
Ruff	*Calidris pugnax*	R	-	R	-		1, 2, 4, 7, 8, 10
Rustic bunting	*Emberiza rustica*	R	-	R	-		1, 2, 7-10
Sanderling	*Calidris alba*	R	-	U	-		1-3, 7, 8, 11
Sandhill crane	*Antigone canadensis*	C	-	C	-	X	2, 4, 6-8
Savannah sparrow	*Passerculus sandwichensis*	-	-	A	-		1, 2, 7, 8
Semipalmated plover	*Charadrius semipalmatus*	-	-	A	-		1, 2, 7
Semipalmated sandpiper	*Calidris pusilla*	-	-	A	-		1, 2
Sharp-tailed sandpiper	*Calidris acuminata*	A	-	U	-		1, 2, 4, 7, 8
Short-eared owl	*Asio flammeus*	C	U	C	R	X	1-3, 6-8
Short-tailed shearwater	*Ardenna tenuirostris*	C	C	C	A		1, 2, 4, 5, 7-9
Siberian accentor	*Prunella montanella*	-	-	A	-		1, 2
Siberian rubythroat	*Calliope calliope*	R	A	A	-		1, 2, 7-9
Slaty-backed Gull	*Larus schistisagus*	R	R	R	A		1, 2, 4, 7, 9
Smew	*Mergellus albellus*	R	A	R	R		1-3, 5-7, 9
Snow bunting	*Plectrophenax nivalis*	C	-	C	C-Ab	X	1-9, 11, 12
Snow goose	*Anser caerulescens*						7, 10
Snowy owl	*Bubo scandiacus*	R	R	R	R	X	1, 2-9, 11
Song sparrow	*Melospiza melodia*	C	U	C	U	X	2-9, 12
Sooty shearwater	*Adrenna grisea*						12
Spectacled eider (T)	*Somateria fischeri*						13
Spotted redshank	*Tringa erythropus*	A	-	R	-		1, 2, 5, 7, 9, 10
Steller's eider (T)	*Polysticta stelleri*	C	U	C	C		1, 2, 3, 7
Steller's sea eagle	*Haliaeetus pelagicus*						7
Surf scoter	*Melanitta perspicillata*						7, 10, 11
Swainson's thrush	*Catharus ustulatus*						7
Taiga bean-goose	*Anser fabalis*						7
Taiga flycatcher	*Ficedula albicilla*	-	A	-	-		1, 7, 10
Temminck's stint	*Calidris temminckii*	R	A	R	-		1, 2, 4, 7, 10
Terek sandpiper	*Xenus cinereus*	R	A	A	-		1, 2, 7
Thick-billed murre	*Uria lomvia*	C	C	C	R	X	1-3, 7, 11
Townsend's warbler	*Setophaga townsendi*	-	-	A	-		1, 2, 7
Tree swallow	*Tachycineta bicolor*						7, 10
Tufted duck	*Aythya fuligula*	R	C	R	R-U		1-9
Tufted puffin	*Fratercula cirrhata*	C	C	C	U	X	1, 2, 4-9
Tundra bean-goose	*Anser serrirostris*	R	C	-	-		1, 2, 7, 9
Tundra swan	*Cygnus columbianus*						7
Violet-green swallow	*Tachycineta thalassina*	-	-	A	-		1, 2
Wandering tattler	*Tringa incana*	U	A	U	-	X	1, 2, 4, 7, 9
Water pipit	*Anthus spinoletta*	-	-	R	-		1, 2

Table H-9. Bird Species Observed or Potentially Occurring on Shemya Island or Surrounding Waters

Common Name (Federal Status)	Scientific Name	Spr	Sum	Fal	Win (Obs)	Breeding	Sources
Western sandpiper	*Calidris mauri*	-	-	A	-		1, 2, 7
Western yellow wagtail	*Motacilla flava*						12
Whimbrel	*Numenius phaeopus*	C	A	C	-		1, 2, 4, 7
Whiskered auklet	*Aethia pygmaea*						4, 7, 8
White-throated needletail	*Hirundapus caudacutus*	-	A	-	-		2, 10
White wagtail	*Motacilla alba*					X	1, 2, 4, 6-9, 12
White-tailed eagle	*Haliaeetus albicilla*	R	A	R	R	X	2, 7
White-winged scoter	*Melanitta deglandi*	C	C	C	R		1-3, 5, 7-9
Whooper swan	*Cygnus cygnus*	R	-	R	U		2, 3, 6, 7
Wilson's snipe	*Gallinago delicata*	U	U	U	A	X	1, 2, 4, 5, 7, 8, 10
Wilson's warbler	*Cardellina pusilla*						7
Winter wren	*Troglodytes hiemalis*	C	C	C	R	X	1-3, 5-7, 11
Wood sandpiper	*Tringa glareola*	U	R	R	-	X	1, 2, 4, 7-9, 12
Wood warbler	*Phylloscopus sibilatrix*	-	-	A	-		1, 2, 7, 8
Yellow-billed loon	*Gavia adamsii*			R			4, 7, 11
Yellow-rumped warbler	*Setophaga coronata*						4, 7

Notes:

- Federal Status: BGEPA = Bald and Golden Eagle Protection Act; T = ESA-listed threatened.
- All bird species are protected under the MBTA except for ptarmigan.
- Seasons: Spr = spring; Sum = summer; Fal = fall; Win = winter.
- Occurrence Codes: A = Accidental; Ab = Abundant; C = Common; R = Rare; U = Uncommon. When there were discrepancies, winter abundance ratings per Reference 3 were used.
- [a] 4th North American record.
- [b] 1st living North American record.
- [c] 1st Alaska record and perhaps 1st North American record.

Sources:

1. Gibson 1981; Gibson et al. 1999.
2. Zeillemaker 1987.
3. Meehan 1997; Meehan and Krom 1997; Meehan et al. 1996.
4. Schwitters and Martinka 2006.
5. Frost et al. 2008.
6. Frost et al. 2010.
7. Schwitters 2008.
8. Schwitters 2010.
9. Shirley and Schwitters 2010.
10. Gibson and Byrd 2007.
11. Byrd and Scharf 2003.
12. Fischer and Neipert 2019a, b.
13. 611 CES 2007b, eBird 2019.

H.2 KING SALMON AIRPORT

H.2.1 Location and Area

The state-owned airport at King Salmon and the adjacent USAF installation (King Salmon Airport site) are located on the northwestern section of the Alaska Peninsula along the north bank of the Naknek River between Naknek Lake and Kvichak Bay and 290 air miles southwest of Anchorage (Figure H-1 and Figure H-18). King Salmon Airport is accessible only by air or water and is adjacent to Katmai National Park.

King Salmon Airport site includes eight separate parcels totaling 783 acres in the King Salmon area (Figure H-18). The installation does not have a main gate or formal cantonment area and is open to public access/thoroughfare 24 hours a day. Security fencing is in place around most priority assets, and a full time contract staff exists at the installation year round. This includes acreage that is adjacent to the airport, north of the commercial area of King Salmon, and other outlying areas that are leased from the State of Alaska or the U.S. Department of the Interior. The community area is situated on a small plateau that is separated from the industrial area by Eskimo Creek. The base utilizes and maintains the 8,500-ft long and 150-ft wide primary runway 11-29, a Class B facility, but does not operate from the sub-standard crosswind runway 18-36. Bristol Bay Borough uses a former military security police building via a lease arrangement. The installation also has land holdings at two remote areas, Naknek Recreation Annex 1-Rapids Camp and Naknek Recreation Annex 2-Lake Camp. These PRSC sites are discussed separately (see Section H.30).

H.2.2 Installation History

The Civil Aeronautics Authority (CAA) (forerunner of the Federal Aviation Administration [FAA]) constructed an airport and associated facilities at King Salmon in 1931. In 1941, the CAA transferred the facility to the U.S. Army, and the Army constructed new buildings to support its World War II efforts. Construction on what was then called Naknek Army Air Base lasted from July 1942 to September 1943, with improvements continuing into 1944. As a satellite for the main Army Air Base at Elmendorf, Naknek Army Air Base was an advance staging base and refueling stop for aircraft traveling to and from the Aleutian Islands (Argonne National Laboratory [no date]; Argonne National Laboratory and CEMML 2013).

After the war, the base was deactivated and transferred back to the CAA for use as Bristol Bay Airfield. The military returned as a tenant in 1948 when the USAF began to use the airfield as a forward operating base. In 1950, King Salmon became 1 of the original 10 Aircraft Control and Warning (AC&W) radar installations. The radar became operational in November 1951. In 1953, the base was converted into an air defense direction center. The airfield was renamed King Salmon Air Station in 1954 and is now known as King Salmon Airport (Argonne National Laboratory [no date]; Argonne National Laboratory and CEMML 2013).

Additional facilities, including dormitories, alert hangar, fuel storage facility, new taxiways, and a parking apron, were completed in January 1955, and additional improvements were made from 1955 through 1959, including the addition of a WACS in 1957. In 1959, the land was transferred from the CAA to the new State of Alaska. The Air Force retained its lease with the state, and the installation continued to grow. In 1969, King Salmon assumed control responsibility for all AC&W installations in southern Alaska, which resulted in continued use and expansion of the base (Argonne National Laboratory [no date]; Argonne National Laboratory and CEMML 2013).

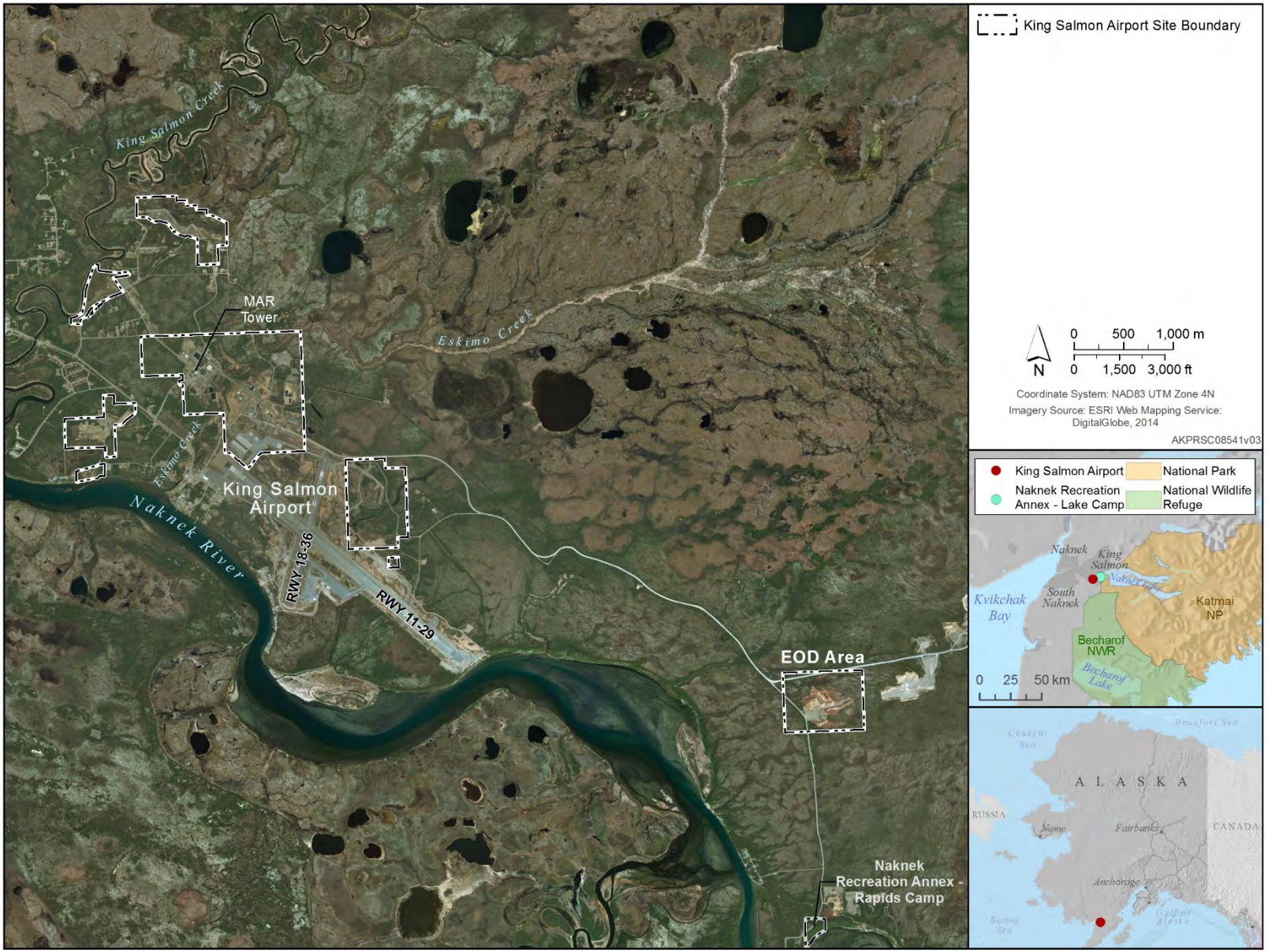

Figure H-18. Overview of King Salmon Airport and Surrounding Area

Beginning in the late 1970s, the Air Force significantly reduced the number of personnel at King Salmon, and most base support functions were transferred to a civilian contractor in 1977. The WACS was deactivated in 1979 and replaced with a commercially operated and owned satellite communications system managed by ALASCOM. In 1983, the site was upgraded to a MAR (Figure H-19), which requires no on-site personnel to operate. In 1994, the USAF withdrew all permanent military personnel and aircraft from King Salmon Airport and converted the installation to a contingency field maintained by a civilian contractor. Responsibility for maintaining the facility was transferred to the 611th Air Support Group (611 ASG) (now the 611th Civil Engineer Squadron [611 CES]). Formerly staffed by 300 military, civil service, and contractor personnel, currently there are no USAF military or civilian personnel permanently stationed at the King Salmon Airport site. The State of Alaska continues to operate the airport today. The USAF has contracts with the State for runway maintenance, while the USAF performs runway surveys and crack sealing. Some USAF installation buildings have been leased to the State of Alaska and other government agencies such as the National Park Service (NPS) and Bristol Bay Borough (Argonne National Laboratory [no date]; Argonne National Laboratory and CEMML 2013).

Figure H-19. MAR Tower, King Salmon Airport Site

H.2.3 Military Mission

The mission of the King Salmon Airport site is to maintain the operation of the MAR system and provide an emergency divert location for aircraft, backup for JBER operations, and a staging base for deployments and USAF operations in the region. Since past missions required a more expansive support facility system than the MAR Tower will require in the future, the 2016 Master Plan outlines six phases that are focused on the disposal of all existing facilities currently under control by the USAF facilities management group. The MAR Tower and any integral support systems needed for its operation will be the only mission-critical facility left at the installation after the full implementation of the master plan (USACE 2016).

H.2.4 Surrounding Communities

The community of King Salmon lies within Bristol Bay Borough, Alaska's first borough, and is known as the *Gateway to Katmai National Park* as well as the *Red Salmon Capital of the World*. Naknek is 15 miles west of King Salmon. King Salmon It is located in southwestern Alaska at the head of Kvichak Bay, an arm of the larger Bristol Bay. Bristol Bay Borough encompasses some 1,200 mi^2 and includes a portion of Kvichak Bay and Naknek Lake.

In 2018, the estimated population of King Salmon and Naknek was 287 and 592, respectively (State of Alaska 2018). The population increases tenfold each summer with the influx of tourists and fishing industry personnel of the (Chugach Development Corporation undated).

Within the Borough are three principal communities: Naknek, South Naknek, and King Salmon. The community of Naknek is the seat of government for Bristol Bay Borough and contains Borough offices, state offices, a U.S. Post Office, a district school office, and emergency service operations and facilities. King Salmon is the regional transportation center as well as site of the USAF facility. It is headquarters for a variety of air services and airlines, a U.S. Post Office, FAA operations/facilities and air traffic control, National Weather Service, USFWS Alaska Peninsula/Becharof NWR Complex and King Salmon Fishery Assistance Office, NPS Katmai National Park and Preserve and Aniakchak National Monument and Preserve, State agency offices/facilities, and the Lake and Peninsula School District office.

State, federal, and local entities that own land in the King Salmon area include the Paug-Vik Native Corporation, Bristol Bay Borough, State of Alaska, USAF, USFWS, NPS, and BLM. The Paug-Vik Native Corporation holds ownership to much of the private land surrounding the base.

The economy of the Borough is based on the salmon industry in Naknek and federal, state, and Borough government activities. The economy is considered stable, with varying seasonal fluctuations depending upon the size of the annual fish harvest. Since the Borough lacks typical state resources (oil, gas, coal, minerals, and timber), it must plan carefully around one primary resource – salmon. The Bristol Bay fishing season is short, with the majority of the salmon being caught in a span of 3 weeks, generally in late June and early July. The employment activity is intense, and most of the labor force comes from outside the Bristol Bay Borough.

Federal government agencies (i.e., FAA, USFWS, NPS, and U.S. Post Office) offer the largest number of year-round employment opportunities and are an important economic source to residents. Tourism is also an important industry for the King Salmon area. Nearby Katmai National Park has experienced a continuing increase in visitation over the years. Park visitors often use King Salmon hotels or transportation services. Many more people visit this area to view and hunt wildlife, fish, raft rivers, and follow other recreational pursuits outside of NPS lands, creating, in total, an industry which rivals the commercial fishery in terms of economic importance. Other employment sources include the State of Alaska, flying services, construction, rental services, guided hunting and fishing, and game trapping.

H.2.5 Regional Land Use

The base is surrounded by native corporation lands, private and state lands, airfield facilities, aviation clear zones, and natural waterways/drainages.

Three of the largest landowners in the King Salmon area are the federal government, State of Alaska, and Paug-vik, Inc. (Naknek's native village corporation). The State of Alaska claimed 156 acres for the King Salmon Airport and 12.5 acres on the Naknek River for use by the Alaska Department of Fish and Game (ADFG). The USFWS owns 5.5 acres on the Naknek River adjacent to the ADFG parcel. The NPS has a King Salmon office situated on 11.4 acres. Much of the land is owned by the federal government for use by the USAF and FAA.

The Alaska Native Claims Settlement Act (ANCSA) of 1971 does not acknowledge the Alaska Native Village of King Salmon as a Tribal entity. Consequently, a native village corporation has not been established for King Salmon. Approximately 24 Alaska Native allotments are near King Salmon Airport. Interim conveyance and patents to land around King Salmon have been provided to PaugA-vik, Inc., an

Alaska Native corporation, which owns the land occupied by the radar installation and leases the property to the USAF.[1]

Local and Regional Natural Areas

Katmai National Park and Preserve, located east of King Salmon (Figure H-18), was originally created as a National Monument in 1918 to preserve the famed Valley of Ten Thousand Smokes, a spectacular 40 mi^2, 100-700 ft deep ash flow deposited by the Novarupta volcano. Katmai was designated a National Park and Preserve in 1980. North-central and northwestern portions of Katmai are commonly termed "the lake region." Naknek Lake is the principal part of the hydrologic system of lakes, ponds, rivers, streams, and marshes formed in valleys dammed by glacial deposits. The southwestern portion of Katmai is part of the Bristol Bay coastal plain, with relatively flat terrain and many poorly drained lakes. Katmai National Park and Preserve is still famous for volcanoes, but also for brown bears (almost 100 bears visit Brooks River), pristine waterways with abundant fish, remote wilderness, and rugged coastline. One of the primary purposes of Katmai is to protect habitats for the populations of fish and wildlife, including, but not limited to, high concentrations of brown bears and their denning areas, and maintain the watersheds and habitat vital to spawning sockeye salmon (NPS 2019).

The 1.1 million-acre Becharof NWR, located south of Katmai National Park (Figure H-18), is a land of contrasts from its rugged coastline to the 4,835-ft summit of the Mount Peulik volcano. The Bristol Bay side of the refuge consists primarily of flat to rolling tundra, lakes, and wetlands. From these coastal lowlands, the land rises to steep glaciated mountains and then plunges to steep cliffs and sandy beaches on the Pacific Ocean side. However, the biological heart of the refuge is Becharof Lake, the second largest lake in Alaska and the largest in the NWR system. It covers 300,000 acres and is 35 miles long, 15 miles wide, and as much as 600 ft deep. Many of the salmon from the world's most valuable sockeye salmon fishery (Bristol Bay) spawn in the streams that originate on Refuge lands. In addition, all five species of Pacific salmon (king, coho, sockeye, pink, and chum) spawn in the streams and lakes on the Refuge (USFWS 2019c).

In 2008, the BLM released the Bay Record of Decision and Approved Resource Management Plan for the Bay planning area in southwest Alaska, which includes King Salmon. The Bay Plan will provide management for 1.9 million acres of BLM-administered public land and resources in the Bristol Bay and Goodnews Bay areas of Alaska (BLM 2008).

H.2.6 Physical Environment

H.2.6.1 Climate

The King Salmon area's climate is predominantly maritime, characterized by cool, humid, and windy weather. Occasional continental climatic influences cause temperature extremes. Average summer temperatures range from 42º to 64º F with highs in the 80s (Table H-10). Average winter temperatures range from 29º to 44º F. Total precipitation averages about 20 in annually, including an average snowfall of 46 in.

[1]Memorandum for Portage, from 611 CES/CEVR (David O. Hertzog), Subject: Review of the Technical Draft King Salmon, Naknek and South Naknek Native Village Site Assessment Report, King Salmon, Alaska. 26 October 1998.

Table H-10. Monthly Climate Averages for King Salmon Airport, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	22.0	25.3	30.4	40.9	52.4	59.8	63.2	62.0	55.1	40.9	29.9	23.3
Avg. Low (ºF)	7.0	9.1	13.3	24.3	34.1	41.6	46.7	46.4	39.6	25.8	15.2	7.8
Avg. Precipitation (inches)	1.0	0.8	0.9	1.0	1.3	1.6	2.3	3.0	3.0	2.1	1.5	1.2
Avg. Snowfall (inches)	8.2	6.7	7.3	4.5	1.0	0	0	0	0	2.9	6.4	8.9

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

Cloud cover averages 76% year-round. Moisture-carrying winds from the southwest create fog, especially during July and August. Winter winds, which blow predominantly from the north, average 9-11 miles per hour (mph), with winds occasionally reaching 80 mph. Summer winds blow from the south/southwest and average 10-11 mph. Calm wind conditions occur only 5% of the time.

H.2.6.2 Topography

The King Salmon area lies on poorly drained lowlands northwest of the Aleutian Range, specifically in the Nusahgak-Bristol Bay lowland section of the Coastal Western Alaska physiographic province. The area exhibits characteristics of past intense glaciation during Pleistocene time. Glaciated zones are bounded by well defined moraines with little gully development along morainal ridges. Details of erosional relief are preserved; kettle holes contain lakes; and most area drainage is not integrated. The area is characterized by low topographic relief with elevations ranging from from 30 ft MSL along banks of Eskimo Creek to 68 ft MSL within the central portion of the site (EMCON Alaska, Inc. 1995a).

H.2.6.3 Geology and Soils

The King Salmon area consists mostly of low moraine hills with many shallow lakes. Natural erosion has drained some lakes, and only the beds remain. A high terrace borders much of the Naknek River and is separated from it by an escarpment ranging from 50 to 100 ft in height. In some places, sand dunes occur above the escarpment; they are generally stable and fully vegetated (Alaska Air Command 1988).

Upland areas bordering or overlooking King Salmon Airport consist of glacial moraine and drift materials; mixed, unsorted, and generally unstratified clay; silt; sand; gravel; cobbles; and boulders arranged in a conspicuous arcuate pattern, usually about large area lakes. The entire King Salmon area is reportedly underlain by at least 315 ft of glacial outwash plain sediments. Sediments include stratified silt, sand, and clay deposits. Marine deposits appear to be interlayered with terrestrial materials near the lower extent of the sequence (Science Applications International Corporation [SAIC] 1993a).

Soils of the King Salmon area generally consist of glacially deposited interbedded sands and gravels overlain by a 3-4 ft layer of volcanic ash and silty sand. The top 2-4 in consist of a tough, fibrous, organic layer. Permafrost is discontinuous and usually only occurs at considerable depth. The area has moderately well-drained to well-drained soils in predominantly flat terrain with some lowgradient slopes (Furbush and Wiedenfeld 1968).

H.2.7 Hydrology

H.2.7.1 General

The area surrounding King Salmon Airport is characterized by glaciated zones bounded by well defined moraines, with some gully development along morainal ridges. Many kettle basins containing lakes are present throughout the area. Most area drainage is not fully integrated.

The Naknek River lies to the south of the installation; Eskimo Creek flows through the central portion; and King Salmon Creek lies to the northwest (Figure H-18). The surface drainage pattern of King Salmon Airport is complex with a 3,600-mile² watershed. Water flowing from the extreme southeastern end of the main runway drains to an unnamed tributary and then to the Naknek River. Runoff flowing from the central airfield area and airfield support facilities is directed to Red Fox Creek and then to the Naknek River. Drainage originating in installation industrial and administrative areas is generally directed to Eskimo Creek and then to the Naknek River. Flooding in the King Salmon area is usually restricted to the river floodplain and does not impact base operations (611 ASG 1995b). The tidal effect extends 6 miles beyond King Salmon Airport (EMCON Alaska 1995a).

Groundwater at King Salmon occurs in three aquifers. A near-surface shallow aquifer is present under unconfined conditions. This aquifer is comprised of moderately well sorted sands and silty sands with discontinuous areas that contain coarse gravel. The thickness of the water-bearing interval typically varies from 5 to 15 ft. Hydraulic conductivity within the unconfined aquifer averages about 350 ft/day with values ranging from 15 to 1,370 ft/day (SAIC 1993a).

A confined intermediate aquifer lies below the upper aquitard at depths ranging from 60 to 80 ft. Data relative to this aquifer are limited, but thickness appears to vary from 15 to 40 ft. The intermediate aquifer is characterized by interbedded sequences of silty sands, sandy gravels, and silty sandy gravels (SAIC 1993a).

A second aquitard is present at the base of the intermediate aquifer. The thickness of this second aquitard is estimated between 10 and 20 ft. Beneath the intermediate aquifer and second aquitard is a third aquifer, approximately 200 ft below ground surface, which is generally referred to as the “deep” aquifer (SAIC 1993a).

King Salmon Airport obtains its water supplies from two 200+-ft deep wells constructed into the glacial outwash of the upper Alaska Peninsula. The glacial outwash (and/or alluvium) is both a shallow aquifer that occurs at or near land surface and an aquifer of regional significance, capable of furnishing large quantities of good quality water to numerous consumers. Groundwater may be contained in these units under both water table and artesian conditions. Several other water wells are used at the installation to furnish local water supplies or for standby fire protection.

H.2.7.2 Floodplains

Lands at King Salmon Airport are above the 100-year floodplain except for the Eskimo Creek valley. Eskimo Creek is not gauged; therefore, there is no record of its flood heights. However, the creek is well incised, and all flood waters would be contained within its banks for that portion of the creek within installation boundaries. Eskimo Creek divides the community from industrial areas. Sewer, water, and power are supplied to the industrial area from the community area, crossing Eskimo Creek in a utilidor, an enclosed bridge-like container for lines. The utilidor restricts the bridge’s capacity at high flows. This would not cause significant upstream flooding, but increased turbulence during flooding would increase the erosion threat to the utilidor and road embankment (Legare 1998). The King Salmon Airport floodplain map is in *Flood Plain Identification, Forward Operating Bases, Eareckson Air Station, Galena Airport, King Salmon Airport, Alaska* (USACE 1998).

H.2.8 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the King Salmon Airport site and the surrounding area. Attachment 3 contains lists of plants (Table H-13),

fish (Table H-14), mammals (Table H-15), and birds (Table H-16). ESA- and MMPA-listed Species that may occur at the King Salmon Airport site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.2.8.1 Ecoregion Classification

The King Slamon site is located in the Bristol Bay Lowlands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.2.8.2 Vegetation/Habitat

A general vegetation map of the King Salmon parcels was prepared in 1995 (611 ASG 1995b). Significant improvements in vegetation mapping at King Salmon Airport were made in 2005 using 2001 digital aerial photography, conducting flora and fauna surveys, and mapping wildlife habitat (Frost et al. 2005b). Wells et al. (2010) updated this mapping and data analysis for King Salmon Airport using 2006 QuickBird aerial photos. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 6 habitat classes were identified (Table H-11 and Figure H-20). Table H-13 provides a list of the vascular plant species observed or potentially occurring on the King Salmon Airport site.

Table H-11. Habitat Classes at the King Salmon Airport Site (2017)

Habitat Class	Acres	Proportion
Developed and Barren Land	250.0	31.9%
Shrub	243.0	31.0%
Forest	227.3	29.0%
Moist Tussock Tundra	30.7	3.9%
Herbaceous Wetland	21.9	2.8%
Wetland	10.2	1.3%
Total	**783.4**	

Source: CEMML 2019a.

The King Salmon area has relatively few trees, and most plants are low-growing and small. The moist tussock tundra community is characterized by a variety of shrubs, herbs, grasses, and sedges, rooted in a continuous mat of lichens and mosses. Grasses and sedges are found in depressions while crowberry, dwarf birch, several willow species, and blueberry are on raised hummocks and hills. Large areas consist of disturbed grassland with scattered willow, dwarf birch, and lupine. Forested areas are primarily white spruce woodland with a thick understory of cranberry and lichen. Large areas of the site are categorized as developed and barren land and are planted with grass or devoid of vegetation and covered with gravel. Few waterbodies occur in the area, but there is a variety of wetland habitats that occur mostly in proximity to streams and river channels where they receive intermittent flooding (Frost et al. 2005b; Wells et al. 2010).

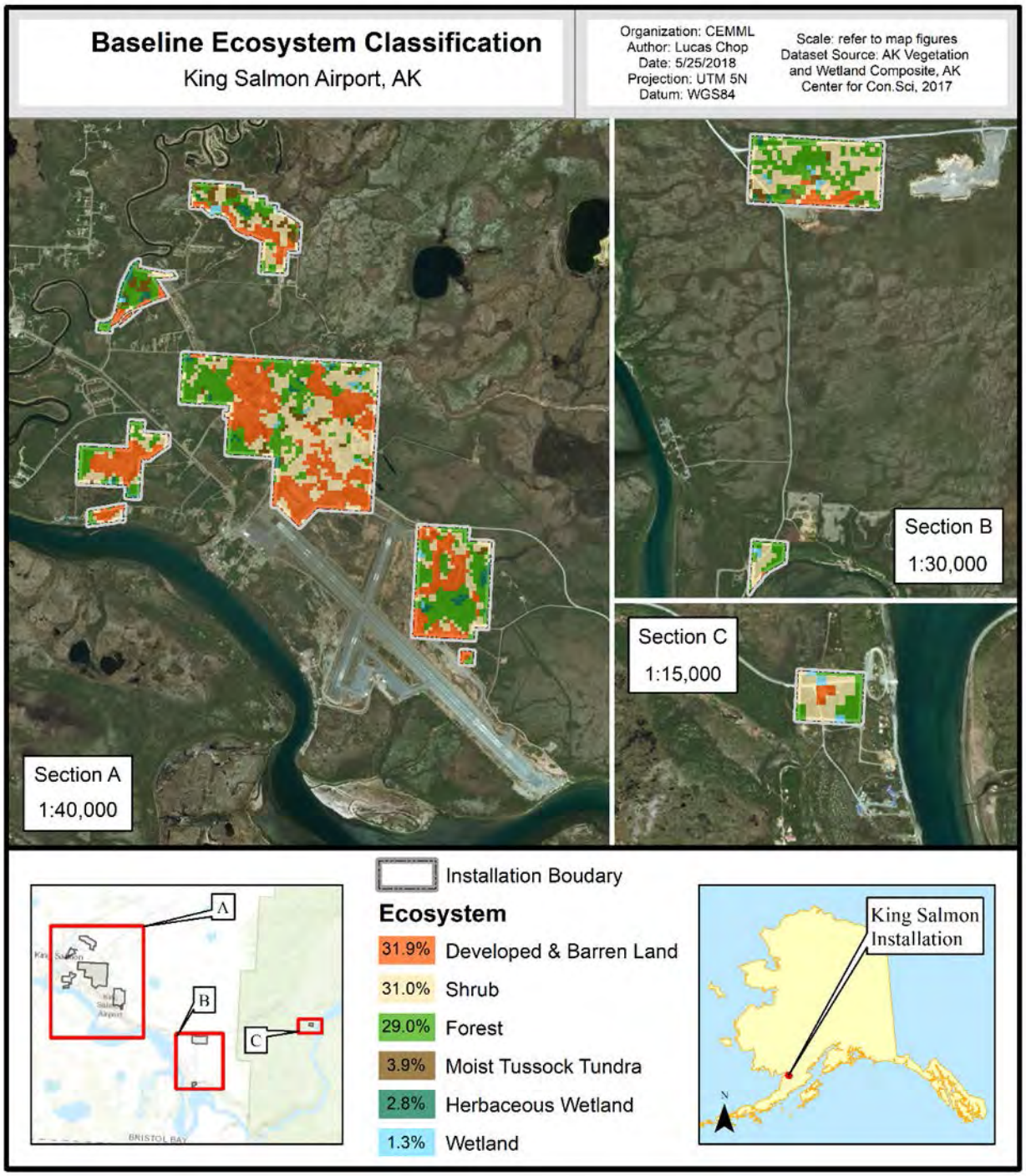

Figure H-20. King Salmon Airport Site Habitat Classes (2017)
(*Source*: CEMML 2017)

H.2.8.3 Wetlands

The current mapping of wetlands at the King Salmon Airport site is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a*

comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.]

Of the 783-acre King Salmon Airport site, 294 acres (or 38%) are considered wetlands per the NWI mapping (Table H-12 and Figure H-21). Freshwater emergent wetlands make up the majority of the wetlands and occur throughout the site.

Table H-12. King Salmon Airport Site Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Forested/Shrub	194.0	24.8%	26.2	3.3%
Freshwater Emergent	94.1	12.0%	20.6	2.6%
Riverine	4.0	0.5%	3.1	0.4%
Freshwater Pond	1.6	0.2%	0	0
Wetlands Total	**293.7**	**37.5%**	**49.9**	**6.4%**
Upland	489.7	62.5%	733.5	93.6%
Site Total	**783.4**		**783.4**	

Notes: *See Figure H-21. †See Figure H-22.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

Wetlands at King Salmon Airport are associated with active and abandoned floodplain features. Less well-drained areas are characterized by wet, seasonally flooded substrates. The most common wetland types are seasonally flooded or saturated scrub shrub types. Other common types with more dominant emergent vegetation tend to occur in active floodplain channels at the lowest elevations. Common shrub species found in King Salmon area wetlands include *Myrica gale*, *Salix pulchra*, *Betula nana*, *Vaccinium uliginosum*, *Ledum decumbens*, and *Alnus tenuifolia*. Common emergent plant species occurring in wet, seasonally flooded active floodplain channels are *Carex lyngbyei*, *Comarum palustre*, *Equisetum fluviatile* and *Eriophorum vaginatum* (Frost et al. 2005b).

H.2.8.4 Fish and Wildlife

H.2.8.4.1 Fish

The Naknek River is the most prominent water body in the vicinity of King Salmon Airport. A total of 27 fish species have been recorded from the Naknek River in the vicinity of King Salmon, including all five species of salmon (chum, coho, chinook, pink, and sockeye), as well as Arctic char, dolly varden, rainbow smelt, and Pacific lamprey (Johnson and Blossom 2019a) (Table H-14). Approximately 1 million sockeye salmon move up the Naknek River in June and July each year and are a major contributor to the Bristol Bay sockeye salmon harvest, the world's largest. In addition to the commercial fishery, the Naknek River provides excellent recreational fishing opportunities for tourists and local residents.

Chinook and coho salmon are known to rear in Eskimo Creek, which traverses Air Force property before emptying into the Naknek River (Figure H-21). Chinook, chum, and coho salmon are present in King Salmon Creek, and pink salmon and Pacific lamprey use King Salmon Creek for spawning (Johnson and Blossom 2019a).

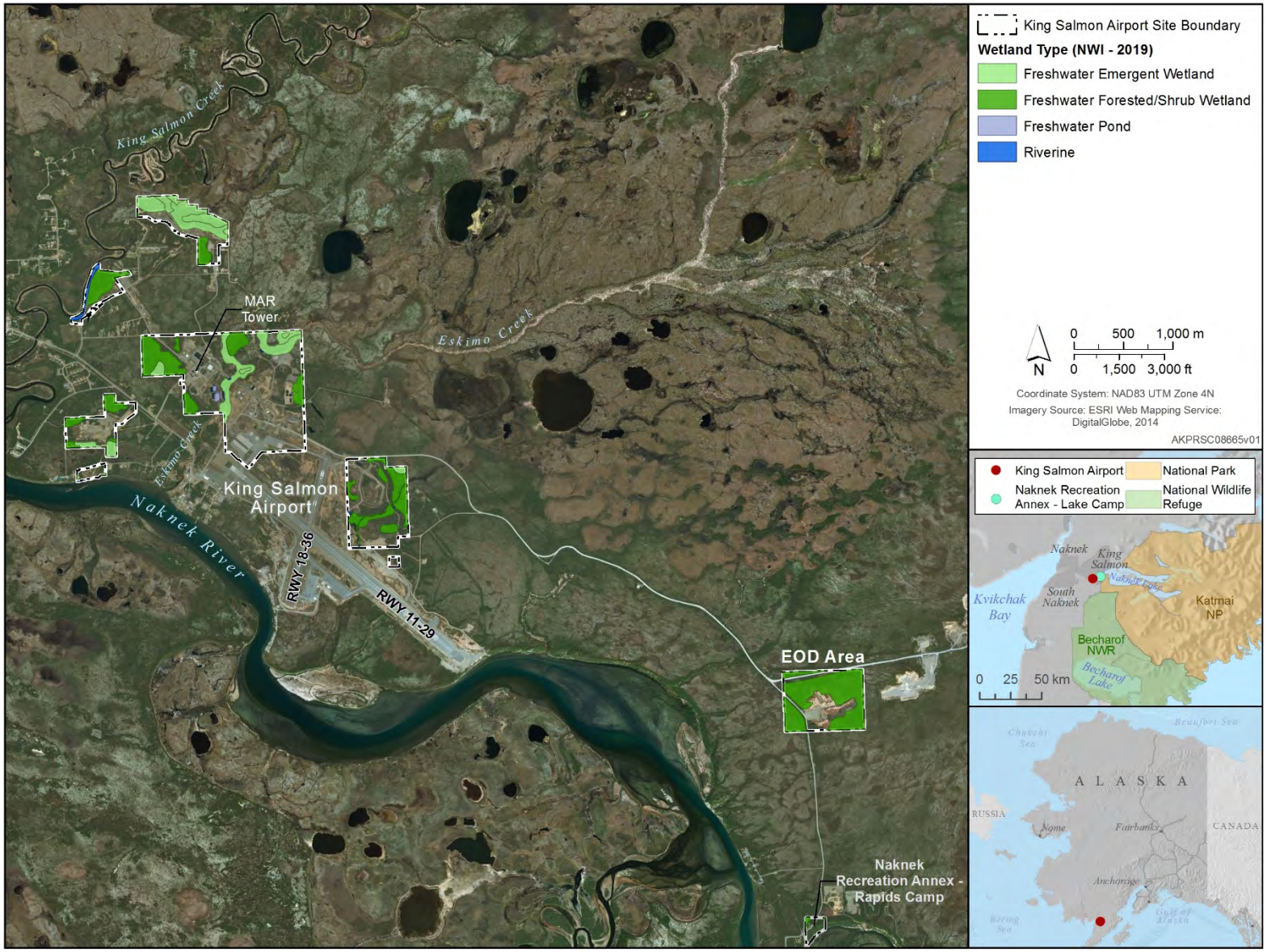

Figure H-21. King Salmon Airport Site Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

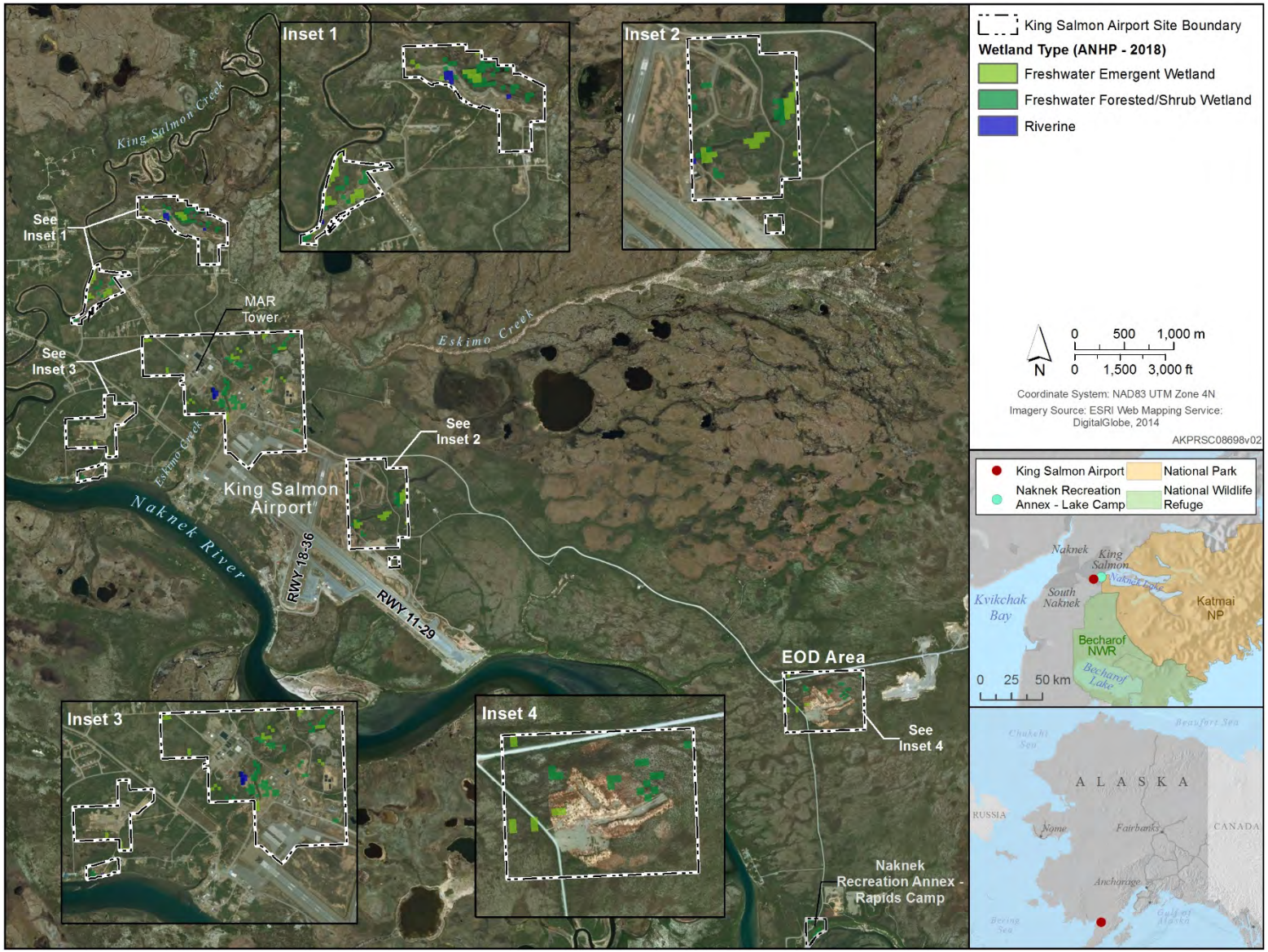

Figure H-22. King Salmon Airport Site Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.2.8.4.2 Mammals

A total of 32 mammal species (30 terrestrial and 2 marine) have been observed or potentiallly occur in the King Salmon Airport area (Table H-15).

Terrestrial Mammals

The most conspicuous terrestrial species are moose and caribor. Moose are residents of the King Salmon area, commonly occurring in wetland areas and early successional forest stands northeast and south of King Salmon. The Northern Alaska Peninsula caribou herd ranges south of Iliamna Lake throughout the King Salmon area. The herd is well dispersed during late summer and mid-winter. In late July, the herd begins moving north to wintering grounds between Egegik and the south shore of Iliamna Lake, north of King Salmon. The Northern Alaska Peninsula caribou herd wintering grounds include a large area north of the Naknek River, including the vicinity of King Salmon Airport. Additionally, bands of caribou from the Mulchatna herd roam southward in the winter, intermingling with the Northern Alaska Peninsula herd (Harper 2011).

Brown bears are resident in the area during spring and summer where they concentrate along salmon streams. They return to the higher altitudes for berries in late summer. Red fox, porcupine, snowshoe hare, and ermine prefer brushy areas in broken terrain. Open areas attract least weasel, lemmings, shrews, voles, Arctic ground squirrel, and tundra hare. American mink, beaver, muskrat, and river otter are found in or near water. Red squirrel and wolverines are found throughout the area. Wolves are not abundant, but they do range throughout the Alaska Peninsula, and have been observed on and near the installation. Coyote and lynx are present in low numbers.

Marine Mammals

See Section H.2.8.5, ESA- and MMPA-listed Species.

H.2.8.4.3 Birds

A total of 169 species of birds have been observed or potentially occur within the King Salmon area (Table H-16). There have been considerable efforts to obtain quality information regarding the seasonal occurrence of birds in the King Salmon area, including regular surveys by Becharof NWR biologists, Christmas bird counts since 1986, banding studies, and local volunteer efforts. In addition, since 1993, a Breeding Bird Survey (BBS) route has been conducted in the King Salmon area just east of the USAF property (Pardieck et al. 2018). The USFWS, Alaska Peninsula and Becharof NWR, provides a bird list for the region including King Salmon (USFWS 2010b).

Abundant forest and tall shrub habitats are used by a variety of passerine species for nesting and foraging, including boreal and black-capped chickadees; white-crowned and American tree sparrows; American robin; yellow-rumped, blackpoll, and Wilson's warblers; and gray-cheeked thrush. One of the most abundant passerines is the tree swallow, which forages over the Naknek River. Swallows and common raven use many man-made structures for nesting, and these species forage in open areas near these structures (Frost et al. 2005b; Pardieck et al. 2018).

Hundreds of thousands of waterfowl and millions of shorebirds on their way to and from northern nesting areas stop to feed and rest on tundra lakes, rivers, and intertidal areas of Bristol Bay. The Naknek River is a significant spring staging area for waterfowl, shorebirds, and terns. Since the 1970s, spring staging has been surveyed by biologists with the Becharof NWR. High waterfowl concentrations are typically found in three shallow lagoons along the upper Naknek River within the vicinity of the King Salmon Airport site. They are observable from Paradise Point beyond the southeast end of the airfield (Runway 29), from Big

Creek Outlook about 5 miles upstream of the installation, and from the Rapids Camp (Naknek Recreation Annex 1), another 3 miles upstream (Russell 1993; USFWS 1993a).

Results from the USFWS surveys of the King Salmon area indicate high use of the Naknek River by numerous waterfowl species including ring-necked duck, harlequin duck, Steller's eider, trumpeter swan, tundra swan, Canada geese, Eurasian wigeon, canvasback, northern pintail, mallard, gadwall, green-winged teal, American wigeon, greater scaup, goldeneyes, bufflehead, and mergansers. Other birds that frequent the area include sandhill crane and loons (Cook 1992; Scharf 1993; MacGowan 1994; 611 ASG 1995b; Moore 1996; Ruhl and Moore 1996; Ruhl 1997; Spies 1998; Kirk 1999; Oligschlaeger and Schuster 2004; Schuster 2004; Lapinski and Williamson 2005; Savage and Murray 2007; Savage 2008; Pardieck et al. 2018).

Shorebird species common to the area include rock, least, and western sandpipers; ruddy turnstone; Hudsonian and bar-tailed godwits; bristle-thighed curlew; short-billed dowitcher; golden, semipalmated, and black-bellied plovers; dunlin; and phalaropes. Glaucous-winged and mew gulls, Arctic tern, and black-legged kittiwake are also common (USFWS 1993a; Pardieck et al. 2018).

Bald eagle, osprey, northern goshawk, rough legged hawk, merlin, peregrine falcon, and great horned, boreal, and short-eared owls are present in the area. Bald eagle nesting has been confirmed in the area (611 ASG 1999b).

Important Bird Area (IBA)

Immediately south of the airport and extending along both sides of the Naknek River for approximately 6 miles to the southeast, is the Upper Naknek River IBA (Figure H-23). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The Upper Naknek River IBA has been designated by Audubon Alaska as a globally important IBA due to the occurrence of large numbers of tundra swans that stage within the area of the Naknek River during migration (Audubon Alaska 2014).

H.2.8.5 ESA- and MMPA-listed Species

ESA-listed Species

No threatened or endangered species are known to occur on the King Salmon Airport site. However, Steller's and spectacled eiders may be rare visitors to the area during the non-breeding season (winter and migration).

MMPA-listed Species

Marine mammals that may use the Naknek River in the King Salmon Airport vicinity include beluga and harbor seal. Beluga are present from late March through late April and again in the fall (October). Harbor seals are common. A gray whale was documented in this area about 1990.

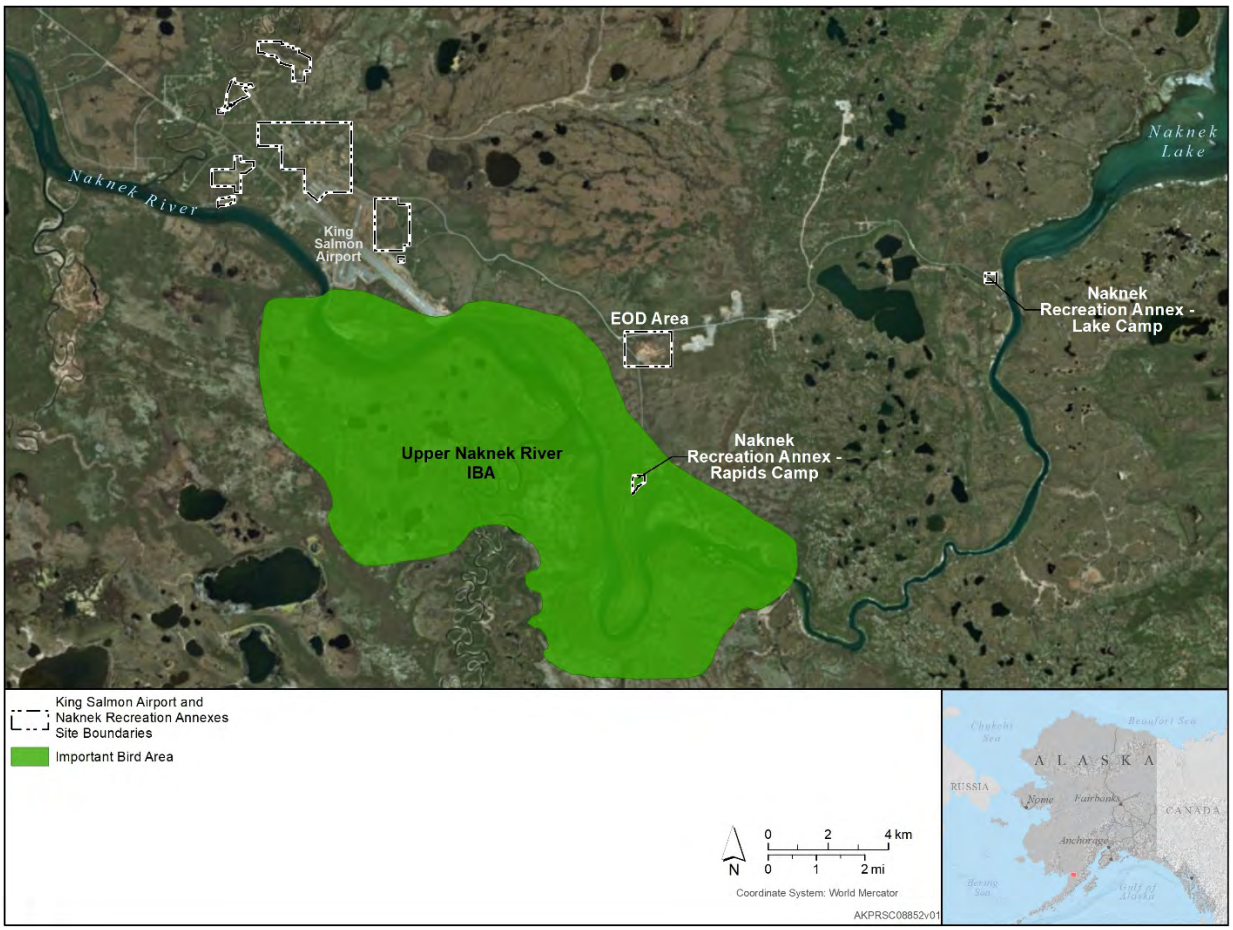

Figure H-23. Important Bird Area (IBA) within the Vicinity of the King Salmon Airport Site and Naknek Recreation Annex (Rapids Camp)
(*Source*: Audubon Alaska 2014)

H.2.9 Other Natural Resources Information

H.2.9.1 Subsistence

Subsistence resources are relied upon by King Salmon residents. Cultural preferences and the relatively high cost of imported food foster the continued use of subsistence resources. The importance of subsistence to King Salmon residents is reflected in the high participation rates (88%) of households that harvest subsistence resources. The annual subsistence round at King Salmon is defined by the seasonal salmon runs in local streams. Residents also rely heavily on land mammals. Fish account for 54% and land mammals for 46% of the annual subsistence harvest in terms of total pounds. The importance of subsistence resources is even more significant to residents of Naknek and South Naknek due to the mixed economy of Naknek and the seasonality of wage work at South Naknek (Braund and Associates 2004).

H.2.9.2 Outdoor Recreation

There are no organized outdoor recreation opportunities at King Salmon Airport. It is solely operated by a relatively small contract force. Since the 1994 drawdown and removal of active military personnel, official recreation requirements ended, and non-appropriated funds are not available for morale, welfare, and recreation.

King Salmon is a recreational terminus for military personnel from Alaska and the western U.S. Outdoor recreation opportunities available in the King Salmon Airport area include fishing, big and small game hunting, trapping, wildlife viewing, ATV riding, hiking, nature study and photography, and boating opportunities provided by local guides on the Naknek River. King Salmon Airport has billeting and dining facilities available to military and military-related personnel visiting the area.

Several ATV trails occur on King Salmon Airport as well as in the surrounding community. Due to significant impacts from ATVs and 4-wheel drive vehicles along the King Salmon Creek corridor, the ADFG created a Naknek Controlled Use Area (the Naknek River drainage upstream from and including the King Salmon Creek drainage). This area is closed to the use of any motorized vehicle, except an aircraft, boat, or snowmachine, for hunting gear and or parts of game from August 1 through November 30; however, this does not apply to a motorized vehicle on the Naknek-King Salmon, Lake Camp, and Rapids Camp roads, King Salmon Creek trails, and on frozen surfaces of the Naknek River and Big Creek.

Wildlife viewing opportunities are available throughout the King Salmon area. Large concentrations of waterfowl and shorebirds during migration, as well as moose, caribou, and bear on or near the installation provide excellent viewing opportunities.

H.2.10 Mission and Other Impacts on Natural Resources

H.2.10.1 Land Use

Land management at King Salmon Airport is coordinated through applicable jurisdictions, plans, and policies for the area, including Borough subdivision, zoning, and planning ordinances; ADFG regulations; and local/regional native corporation federal mandates. The Bristol Bay Borough administers a zoning ordinance and a comprehensive plan and cooperates with the USAF through mutual agreements. The Bristol Bay Borough Police Department has a lease for shared use of Building 150 with the USAF for law enforcement.

Portions of King Salmon Airport are held in fee simple. A significant portion was a Public Land Order withdrawal from the public domain while areas immediately surrounding the airport were deeded to the state under the Statehood Omnibus Act. On these lands, the deed contains a reserve clause for free use by the United States of those lands currently occupied. The King Salmon withdrawal is currently authorized under a Federal Land Policy and Management Act right-of-way (AA-93928).

The USAF leases space to the following organizations for storage and/or administrative space: NPS, University of Alaska at Fairbanks, Bristol Bay Police Department, Bristol Bay State Troopers, and Civil Air Patrol. In addition, the University of Alaska has a lease for 6.6 acres of land for operation and maintenance of the Super DARN antenna array. Bristol Bay Housing Authority leases Building 647 for the Southwest Alaska Vocational Education Center (SAVEC). There are easements to private parties providing for access to their parcels across USAF-owned land from the public (right-of-way for private use of the road adjacent to Barrel Bluff on King Salmon Airport) (611 CES/CEI 2020a).

Industrial facilities in the community area include the Base Supply Warehouse, vehicle operations/ maintenance, MAR tower, Base Civil Engineering shops, utilities plant, billeting facilities, and diesel storage tanks. Billeting facilities are adjacent to Building 603 (Composite Facility). Building relationships are characteristic of the compact arrangement of the community area and are sited to reduce walking distances, enhance the community atmosphere, and improve efficiency of utilities distribution and operation. The installation is connected to the Bristol Bay Borough sewage system, and the historical sewage lagoons on the site are planned for removal in FY23 (611 CES/CEI 2020b).

ATTACHMENT 3: NATURAL RESOURCES OF KING SALMON AIRPORT

Table H-13. Plant Species Observed or Potentially Occurring on or near King Salmon Airport

Common Name	Scientific Name	Observed	Source(s)
TREES AND SHRUBS			
American green alder	*Alnus crispa*		1, 2
Sitka alder	*Alnus sinuata*	X	1, 2
Thinleaf alder	*Alnus tenuifolia*	X	1, 2, 4
Pacific serviceberry	*Amelanchier florida*		1, 2
Bog rosemary	*Andromeda polifolia*	X	1, 2, 3
Alpine bearberry	*Arctostaphylos alpina*	X	1, 2, 4
Bearberry (kinikinik)	*Arctostaphylos uva-ursi*	X	1, 2, 4
Shrub birch	*Betula glandulosa*	X	1, 2
Dwarf arctic birch	*Betula nana*	X	1, 2
Alaska paper birch	*Betula papyrifera v. humilis*		1, 2
Kenai birch	*Betula papyrifera v. Kenaica*	X	1, 2, 4
Alaska cassiope	*Cassiope lycopodiodes*		1, 2
Starry cassiope	*Cassiope stelleriana*		1, 2, 3
Leatherleaf	*Chamaedaphne calyculata*	X	1, 2, 4
Bunchberry	*Cornus canadensis*	X	1, 2, 3
Lapland cornel	*Cornus suecica*		1,2
Pincushion plant	*Diapensia lapponica*		1, 2, 3
Yellow mountain-avens	*Dryas drummondii*		3
White mountain-avens	*Dryas integrifolia*	X	1, 2, 3, 4
Eight-petal mountain-avens	*Dryas octopetala*	X	1, 2, 3, 4
Crowberry	*Empetrum nigrum*	X	1, 2, 4
Narrowleaf Labador tea	*Ledum decumbens*	X	1, 2, 4
Twin-flower	*Linnaea borealis*		1, 2
Alpine-azalea	*Loiseleuria procumbens*		1, 2, 3
Partridgefoot	*Luetkea pectinata*		1, 2, 3
Sweet gale	*Myrica gale*	X	1, 2
Aleutian mountain-heath	*Phyllodoce aleutica*		1, 2
White spruce	*Picea glauca*	X	1, 2, 4
Black spruce	*Picea mariana*	X	1, 2, 4
Balsam poplar	*Populus balsamifera*	X	1, 2, 4
Shrubby cinquefoil	*Potentilla fruticosa*	X	1, 2, 4
Kamchatka rhododendron	*Rhododendron camtschaticum*		1, 2, 3
Skunk currant	*Ribes glandulosum*		1, 2
Swamp gooseberry	*Ribes lacustre*		1, 2
American red current	*Ribes triste*	X	1, 2
Prickly rose	*Rosa acicularis*	X	1, 2, 3, 4
Nagoonberry	*Rubus arcticus*	X	1, 2
Cloudberry	*Rubus chamaemorus*	X	1, 2
Feltleaf willow	*Salix alaxensis*	X	1, 2
Littetree willow	*Salix arbusculoides*	X	1, 2
Arctic willow	*Salix arctica*	X	1, 2
Barclay willow	*Salix barclayi*	X	1, 2
Bebb's willow	*Salix bebbiana*	X	1, 2
Undergreen willow	*Salix commutate*		1, 2
Alaska bog willow	*Salix fuscescens*	X	1, 2
Grayleaf willow	*Salix glauca*	X	1, 2
Low blueberry willow	*Salix myrtillifolia*	X	1, 2

Table H-13. Plant Species Observed or Potentially Occurring on or near King Salmon Airport

Common Name	Scientific Name	Observed	Source(s)
Skeletonleaf willow	*Salix phlebophylla*		1, 2
Diamondleaf willow	*Salix pulchra*	X	1, 2
Netleaf willow	*Salix reticulate*		1, 2
Richardson's willow	*Salix richardsonii*	X	2
Least willow	*Salix rotundifolia*	X	1, 2
Scouler willow	*Salix scouleriana*	X	1, 2
Sprouting willow	*Salix stolonifera*		1, 2
Pacific red-elder	*Sambucus callicarpa*		1, 2
Green mountain ash	*Sorbus scopulina*		1, 2
Sitka mountain ash	*Sorbus sitchensis*		1, 2
Beauverd spirea	*Spiraea beauverdiana*	X	1, 2
Small cranberry	*Vaccinium oxycoccos*	X	1, 4
Bog blueberry	*Vaccinium uliginosum*	X	1, 3, 4
Mountain cranberry	*Vaccinium vitis-idaea*	X	1, 4
Highland cranberry	*Viburnum edule*	X	1, 4
HERBACEOUS PLANTS			
Red baneberry	*Acatea rubra*		1
Common yarrow	*Achillea millefolium*	X	1, 3
Monkshood	*Aconitium delphiniifolium*	X	1, 3
Wild chives	*Allium schoenoprasum*		1, 3
Meadow foxtail	*Alopecurus aequalis*	X	1, 3
Northern jasmine	*Androsace sepientrionalis*		1
Narcissus-flower anemone	*Anemone narcissiflora*		1, 3
Pasque flower	*Anemone drummondii*		1, 3
Yellow anemone	*Anemone richardsonii*		1, 3
Wild celery	*Angelica lucida*		1
Cats paws	*Antennaria monocephala*		1
Lyre-leaf rockcree	*Arabis lyrata*	X	4
Broad-leaf arctic-bent grass	*Arctagrostis latifolia*	X	1, 4
Pendent grass	*Arctophila fulva*	X	1, 4
Pacific silverweed	*Argentina egedii*		1, 3
Sea thrift	*Armeria maritima*	X	1, 3
Narrowleaf leopardbane	*Arnica angustifolia*	X	1, 3
Frigid arnica	*Arnica frigida*		1, 3
Lessing's arnica	*Arnica lessingii*		1
Northern wormwood	*Artemisia borealis*		1
Common wormwood	*Artemisia tilesii*	X	1
Arctic wormwood	*Artemisia arctica*		1
Purple wormwood	*Artemisia globularia*		1, 3
Goatsbeard	*Aruncus sylvester*		1, 3
Siberian aster	*Aster sibiricus*		1, 3
Wintercress	*Barbarea orthoceras*		1
Broomrape	*Boschniakia rossica*		1, 3
Moonwort	*Botrychium boreale*		1
Moonwort	*Botrychium lunaria*		1
Bluejoint grass	*Calamagrostis canadensis*	X	1, 4
Reed bent grass	*Calamagrostis stricta*	X	1, 4
Marsh marigold	*Caltha palustris*	X	1, 3
Alaska bellflower	*Campanula lasiocarpa*		1, 3
Cuckoo flower	*Cardamine pratensis*	X	1, 4

Table H-13. Plant Species Observed or Potentially Occurring on or near King Salmon Airport

Common Name	Scientific Name	Observed	Source(s)
Water sedge	*Carex aquatilis*	X	1, 4
Sedge	*Carex bigelowii*	X	1, 4
Sedge	*Carex chordorrhiza*	X	1, 5
Sedge	*Carex lyngbyei*	X	1, 4, 5
Sedge	*Carex microchaeta*	X	1, 5
Sedge	*Carex rariflora*	X	1, 5
Sedge	*Carex rotundata*	X	1, 5
Sedge	*Carex saxatilis*	X	1, 5
Paintbrush	*Castilleja* sp.	X	1
Coastal paintbrush	*Castilleja unalaschcensis*		1, 3
Fischer's mouse-ear chickweed	*Cerastium fischerianum*	X	1
Bering Sea chickweed	*Cerastium beeringianum*	X	1
Fireweed	*Chamerion angustifolium*	X	1, 3
Dwarf fireweed	*Chamerion latifolium*	X	1, 3
Arctic daisy	*Chrysanthemum arcticum*		1, 3
Mackenzie's water hemlock	*Cicuta virosa*	X	1, 3
Alaska spring beauty	*Claytonia sarmentosa*		1, 3
Marsh five-finger	*Comarum palustre*	X	1, 3
Coral root	*Corallorrhiza trifida*		1, 3
Pink lady's slipper	*Cypripedium guttatum*		1, 3
Keyflower	*Dactylorhiza aristata*		1, 3
Long leaved sundew	*Drosera angelica*		1, 3
Round-leaf sundew	*Drosera rotundifolia*	X	1, 3
Spreading woodfern	*Dryopteris expansa*	X	1, 3
Pale spike-rush	*Eleocharis palustris*	X	1, 3
Fringed willowherb	*Epilobium ciliatum*	X	1, 3
Marsh willowherb	*Epilobium palustre*	X	1, 3
Field horsetail	*Equisetum arvense*	X	1
Swamp horsetail	*Equisetum fluviatile*	X	1
Meadow horsetail	*Equisetum pratense*	X	1
Dwarf scouring-rush	*Equisetum scirpoides*	X	1
Woodland horsetail	*Equisetum sylvaticum*	X	1
Blue fleabane	*Erigeron acris*		1
Arctic alpine fleabane	*Erigeron humilis*		1, 3
Tall cottongrass	*Eriophorum angustifolium*	X	1, 3
Russett-bristle cotton-grass	*Eriophorum russeolum*	X	1
White cotton-grass	*Eriophorum scheuchzeri*		1
Tussock cotton-grass	*Eriophorum vaginatum*	X	1, 3
Worm-seed wallflower	*Erysimum cheiranthoides*	X	1, 3
Rough fescue	*Festuca altaica*	X	1, 4
Baffin fescue	*Festuca baffinensis*	X	1
Chocolate lily	*Fritillaria camschatcensis*		1, 3
Northern bedstraw	*Galium boreale*	X	1, 3
White gentian	*Gentiana frigida*		1, 3
Wild geranium	*Geranium erianthum*	X	1, 3
Ross avens	*Geum rossii*		1, 3
Oak fern	*Gymnocarpium dryopteris*	X	1, 3
Cow parsnip	*Heracleum lanatum*		1, 3
Common mare's tail	*Hippuris vulgaris*	X	1, 3
Wild iris	*Iris setosa*		1, 3

Table H-13. Plant Species Observed or Potentially Occurring on or near King Salmon Airport

Common Name	Scientific Name	Observed	Source(s)
Chestnut rush	*Juncus castaneus*	X	1, 3
Drummond's rush	*Juncus drummondii*	X	1, 3
Moor rush	*Juncus stygius*	X	1, 3
Poverty rush	*Juncus tenuis*	X	1, 3
Glaucous weaselsnout	*Lagotis glauca*		1, 3
Vetching	*Lathyrus palustris*	X	1, 4
Common duckweed	*Lemna minor*	X	1, 3
American lyme grass	*Leymus mollis*	X	1, 3
Scot's lovage	*Ligusticum scoticum*	X	1, 3
Alp lily	*Lloydia serotina*		1, 3
Nootka lupine	*Lupinus nootkatensis*	X	1, 3
Common wood-rush	*Luzula multiflora*	X	1, 3
Alpine club moss	*Lycopodium alpinum*		1
Bladder campion	*Melandrium apetalum*		1
Bogbean	*Menyanthes trifoliata*		1
Chiming bells	*Mertensia paniculata*	X	1
Seep monkeyflower	*Mimulus guttatus*		1, 3
Arctic sandwort	*Minuartia arctica*		1
Grove sandwort	*Moehringia lateriflora*	X	1
Shy maiden	*Moneses uniflora*	X	1, 3
Chamisso's candy-flower	*Montia chamissoi*	X	1, 3
Alpine forget-me-not	*Myosotis alpestris*		1, 3
Yellow pond lily	*Nuphar polysepalum*		1, 3
Sidebells	*Orthilia secunda*	X	1, 3
Black locoweed	*Oxytropis nigrescens*		1, 3
Arctic poppy	*Papaver lapponicum*		1, 3
Grass of parnassus	*Parnassia palustris*	X	1, 3
Nakedstem wallflower	*Parrya nudicaulis*		1, 3
Capitate lousewort	*Pedicularis capitata*		1, 3
Labrador lousewort	*Pedicularis labradorica*	X	1, 3
Woolly lousewort	*Pedicularis lanata*	X	1, 3
Oeder's lousewort	*Pedicularis oederi*		1, 3
Sudetic lousewort	*Pedicularis sudetica*	X	1, 3
Bumblebee flower	*Pedicularis verticillata*		1, 3
Arctic coltsfoot	*Petasites frigidus*	X	1, 3
Bog violet	*Pinguicula vulgaris*		1, 3
Small northern bog orchid	*Platanthera obtusata*	X	1, 3
Annual blue grass	*Poa annua*	X	1, 4
Tall Jacob's ladder	*Polemonium acutiflorum*	X	1, 3
Meadow bistort	*Polygonum bistorta*		1, 3
Alpine meadow bistort	*Polygonum viviparum*		1
Norwegian cinquefoil	*Potentilla norvegica*	X	1, 3
Pixie eyes	*Primula cuneifolia*		1, 3
Pink pyrola	*Pyrola asarifolia*		1, 3
Far-northern buttercup	*Ranunculus hyperboreus*	X	1, 3
Little yellow-rattle	*Rhinanthus minor*	X	1, 3
Roseroot	*Rhodiola rosea*		1, 3
Arctic dock	*Rumex arcticus*	X	1
Grassleaf sorel	*Rumex graminifolius*	X	1, 4
Bering Sea dock	*Rumex beringensis*		

Table H-13. Plant Species Observed or Potentially Occurring on or near King Salmon Airport

Common Name	Scientific Name	Observed	Source(s)
Canadian burnet	*Sanguisorba canadensis*	X	1, 3
Brook saxifrage	*Saxifraga punctata*		1, 3
Spotted saxifrage	*Saxifraga bronchialis*		1, 3
Yellow marsh saxifrage	*Saxifraga hirculis*		1, 3
Heart-leaf saxifrage	*Saxifraga punctata*		1, 3
Thyme-leaved saxifrage	*Saxifraga serpyllifolia*		1, 3
Mastodon flower	*Senecio congestus*	X	1, 3
Black-tipped groundsel	*Senecio lugens*	X	1, 3
Moss campion	*Silene acaulis*		1, 3
Arctic goldenrod	*Solidago multiradiata*	X	3
Bur-reed	*Sparganium augustifolium*		1
Ladies' tresses	*Spiranthes romanzoffiana*		1, 3
Dandelion	*Taraxacum* sp.	X	1, 3, 4
False asphodel	*Tofieldia coccinea*	X	1, 3
Star flower	*Trientalis europaea*	X	1, 3
Seaside arrow-grass	*Triglochin maritima*		1
Marsh arrow-grass	*Triglochin palustris*	X	1
Narrow false oat	*Trisetum spicatum*	X	1
Clustered valerian	*Valeriana capitata*	X	1, 3
False hellebore	*Veratrum eschscholtzii*		1, 3
American brook lime	*Veronica americana*		1, 3
Two-flowered violet	*Viola biflora*		1, 3
Alaska violet	*Viola langsdorffii*		1, 3
Great spurred violet	*Viola selkirkii*		1, 3

Note: Observed includes species collected and identified during 2005 site visit (Boisvert and Frost, ABR, Inc.).

Sources:

1. Hulten 1968
2. Viereck and Little 1972
3. White 1974
4. 611 ASG 1995b
5. Tande and Lipkin 2003

Table H-14. Fish Species Found in the Naknek River Drainage in the Vicinity of King Salmon

Common Name	Scientific Name
Alaska blackfish	*Dallia pectoralis*
Arctic char	*Salvelinus alpinus*
Arctic grayling	*Thymallus arcticus*
Arctic lamprey	*Lethenteron camtschaticum*
Burbot	*Lota lota*
Chinook salmon	*Oncorhynchus tshawytscha*
Chum salmon	*Oncorhynchus keta*
Coastrange sculpin	*Cottus aleuticus*
Coho salmon	*Oncorhynchus kisutch*
Dolly varden	*Salvelinus malma*
Green sturgeon	*Acipenser medirostris*
Humpback whitefish	*Coregonus pidschian*
Lake trout	*Salvelinus namaycush*
Longnose sucker	*Catostomus catostomus*
Ninespine stickleback	*Pungitius pungitius*
Northern pike	*Esox lucius*
Pink salmon	*Oncorhynchus gorbuscha*
Pond smelt	*Hypomesus olidus*
Pygmy whitefish	*Prosopium coulterii*
Rainbow smelt	*Osmerus mordax*
Rainbow Trout	*Oncorhynchus mykiss*
Round whitefish	*Prosopium cylindraceum*
Sardine cisco	*Coregonus sardinella*
Slimy sculpin	*Cottus cognatus*
Sockeye salmon	*Oncorhynchus nerka*
Starry flounder	*Platichthys stellatus*
Three-spined stickleback	*Gasterosteus aculeatus*

Sources: Morrow 1980; Robins et al. 1991; Russell 1993; 611 ASG 1995b; Johnson and Blossom 2019a.

Table H-15. Mammal Species Observed or Potentially Occurring in the King Salmon Airport Area

Common Name	Scientific Name	Observed
TERRESTRIAL		
Alaskan hare	*Lepus othus*	X
American beaver	*Castor canadensis*	X
American mink	*Neovison vison*	X
Arctic fox	*Alopex lagopus*	
Arctic ground squirrel	*Spermophilus parryii*	X
Brown bear	*Ursus arctos*	X
Canadian lynx	*Lynx canadensis*	X
Caribou	*Rangifer tarandus*	X
Cinereus shrew	*Sorex cinereus*	
Common muskrat	*Ondatra zibethicus*	X
Coyote	*Canis latrans*	X
Ermine	*Mustela erminea*	X
Least weasel	*Mustela nivalis*	X
Little brown myotis	*Myotis lucifugus*	X
Meadow jumping mouse	*Zapus hudsonius*	
Meadow vole	*Microtus pennsylvanicus*	
Moose	*Alces americanus*	X
Nearctic brown lemming	*Lemmus trimucronatus*	
North American orcupine	*Erethizon dorsata*	X
North American river otter	*Lontra canadensis*	X
Northern bog lemming	*Synaptomys borealis*	X
Northern red-backed vole	*Myodes rutilus*	X
Palearctic collared lemming	*Dicrostonyx torquatus*	
Red fox	*Vulpes vulpes*	X
Red squirrel	*Tamiasciurus hudsonicus*	X
Root vole	*Microtus oeconomus*	
Snowshoe hare	*Lepus americanus*	X
Vagrant shrew	*Sorex vagrans*	
Wolf	*Canis lupus*	X
Wolverine	*Gulo gulo*	X
MARINE*		
Beluga	*Delphinapterus leucas*	X
Harbor seal	*Phoca vitulina*	X

Note: *All marine mammals are listed under the MMPA.
Sources: Observed by R. Russell (ADFG King Salmon 1971-1993) reported in 611 ASG (1995b); and by Boisvert and Frost (ABR, Inc.) during 2005 site visit.

Table H-16. Bird Species Observed on or Potentially Occurring in the King Salmon Airport Area

Common Name (Federal Status)*	Scientific Name	Spr	Sum	Fal	Win	Br	Obs	Source(s)
Alder flycatcher	*Empidonax alnorum*	U	U	U	-	X	X	1, 2, 9, 10, 11
Aleutian cackling goose	*Branta hutchinsii leucopareia*	A	-	-	-	-	X	
Aleutian tern	*Onychoprion aleuticus*	U	U	U	-	X	-	1, 2, 11
American dipper	*Cinclus mexicanus*	C	C	C	C	X	X	1, 2, 9
American golden-plover	*Pluvialis dominica*	C	-	C	-		X	1, 2, 11
American kestrel	*Falco sparverius*	R	R	R	R	-	-	2
American pipit	*Anthus rubescens*	C	C	C	A	X	X	1, 2, 9
American robin	*Turdus migratorius*	C	C	C	-	X	X	1, 2, 9, 10, 11
American three-toed woodpecker	*Picoides dorsalis*	U	U	U	U	X	X	1, 2, 8
American tree sparrow	*Spizelloides arborea*	U	U	U	R	X	X	1, 2, 9, 10, 11
American wigeon	*Mareca americana*	C	C	C	R	X	X	1-7, 11
Arctic tern	*Sterna paradisaea*	C	U	C	-	X	X	1, 2, 9, 11
Baird's sandpiper	*Calidris bairdii*	R	-	U	-	-	-	1, 2
Bald eagle (BGEPA)	*Haliaeetus leucocephalus*	C	C	C	C	X	X	1, 2, 8, 10, 11
Bank swallow	*Riparia riparia*	U	U	U	-	X	X	1, 2, 9, 10, 11
Barrow's goldeneye	*Bucephala islandica*	C	U	C	C	X	X	1-7
Bar-tailed godwit	*Limosa lapponica*	C	U	C	-	-	-	1, 2
Belted kingfisher	*Megaceryle alcyon*	U	U	U	U	X	X	1, 2, 9, 11
Black scoter	*Melanitta americana*	C	C	C	C	X	X	1-7, 11
Black turnstone	*Arenaria melanocephala*	C	U	C	R	X	X	1, 2, 9
Black-bellied plover	*Pluvialis squatarola*	C	-	C	-		X	1, 2, 11
Black-billed magpie	*Pica hudsonia*	C	C	C	C	X	X	1, 2, 8-11
Black-capped chickadee	*Poecile atricapillus*	U	U	U	U	X	X	1, 2, 8, 9, 11
Black-legged kittiwake	*Rissa tridactyle*	C	C	C	U	X	-	1, 2
Blackpoll warbler	*Setophaga striata*	C	C	C	-	X	X	1, 2, 9, 10, 11
Bohemian waxwing	*Bombycilla garrulus*	R	R	R	-	-	X	1, 2, 8
Bonaparte's gull	*Chroicocephalus philadelphia*	U	U	U	-	X	X	1, 2, 9, 11
Boreal chickadee	*Poecile hudsonicus*	-	-	-	C	-	X	8-10, 11
Boreal owl	*Aegolius funereus*	U	U	U	U	X	X	1, 2, 8
Brant	*Branta bernicla*	C	R	C	R	-	X	1-7
Bristle-thighed curlew	*Numenius tahitiensis*	R	A	R	-	-	-	1, 2
Brown creeper	*Certhia americana*	U	U	U	U	X	X	1, 2, 9
Bufflehead	*Bucephala albeola*	C	U	C	C	X	X	1-7
Canada goose	*Branta canadensis*	U	R	C	A	X	X	1-7
Canada jay	*Perisoreus canadensis*	U	U	U	U	X	X	1, 2, 8, 10, 11
Canvasback	*Aythya valisineria*	R	A	R	R	-	X	1-7
Chipping sparrow	*Spizella passerina*	R	-	-	-	-	X	9
Cliff swallow	*Petrochelidon pyrrhonota*	U	U	U	-	X	-	1, 2
Common eider	*Somateria mollissima*	C	C	C	C	X	-	1-4
Common goldeneye	*Bucephala clangula*	C	U	C	U	X	X	1-8, 11
Common loon	*Gavia immer*	U	U	U	U	X	X	1, 2, 11
Common merganser	*Mergus merganser*	C	C	C	C	X	X	1-8
Common murre	*Uria aalge*	C	C	C	C	X	-	1, 2
Common raven	*Corvus corax*	C	C	C	C	X	X	1, 2, 8, 10, 11
Common redpoll	*Acanthis flammea*	C	C	C	C	X	X	1, 2, 8-10, 11
Dark-eyed junco	*Junco hyemalis*	U	U	U	R	X	X	1, 2, 9, 10, 11
Double-crested cormorant	*Phalacrocorax auritus*	C	C	C	U	X	-	1, 2
Downy woodpecker	*Dryobates pubescens*	R	R	R	R	X	X	1, 2, 8, 9
Dunlin	*Calidris alpina*	C	C	C	U	X	X	1, 2, 11
Eastern yellow wagtail	*Motacilla tschutschensis*	A	A	A	-	-	-	1, 2
Emperor goose	*Anser canagicus*	C	U	C	C	X	-	1, 2, 4-7
Eurasian wigeon	*Mareca penelope*	U	R	U	R	-	X	1-7
Fork-tailed storm-petrel	*Hydrobates furcatus*	R	R	R	R	X	-	1, 2

Table H-16. Bird Species Observed on or Potentially Occurring in the King Salmon Airport Area

Common Name (Federal Status)*	Scientific Name	Spr	Sum	Fal	Win	Br	Obs	Source(s)
Fox sparrow	*Passerella iliaca*	C	C	C	-	X	X	1, 2, 9, 10, 11
Gadwall	*Mareca strepera*	U	U	U	U	X	X	1-7
Glaucous gull	*Larus hyperboreus*	U	U	U	U	X	-	1, 2
Glaucous-winged gull	*Larus glaucescens*	C	C	C	C	X	X	1, 2, 8-11
Golden eagle	*Aquila chrysaetos*	U	U	U	R	X	-	1, 2
Golden-crowned kinglet	*Regulus satrapa*	U	U	U	U	X	X	1, 2, 9
Golden-crowned sparrow	*Zonotrichia atricapilla*	C	C	C	-	X	X	1, 2, 8, 9, 11
Gray-cheeked thrush	*Catharus minimus*	C	C	C	-	X	X	1, 2, 9, 10, 11
Great horned owl	*Bubo virginianus*	U	U	U	U	X	X	1, 2
Greater scaup	*Aythya marila*	C	C	C	C	X	X	1-8, 11
Greater white-fronted goose	*Anser albiforns*	C	C	C	A	X	X	1-7, 11
Greater yellowlegs	*Tringa melanoleuca*	C	C	C	-	X	X	1, 2, 10, 11
Green-winged teal	*Anas crecca*	C	C	C	U	X	X	1-7, 10, 11
Gyrfalcon	*Falco rusticolus*	U	U	U	U	X	X	1, 2
Hairy woodpecker	*Dryobates villosus*	R	R	R	R	-	-	1, 2
Harlequin duck	*Histrioncus histrioncus*	C	C	C	C	X	X	1-7
Hermit thrush	*Catharus guttatus*	C	C	C	-	X	X	1, 2, 9, 11
Herring gull	*Larus argentatus*	R	R	R	R	-	-	1, 2, 11
Hoary redpoll	*Acanthis hornemanni*	U	-	U	C	-	X	1, 2, 8, 9
Hooded merganser	*Lophodytes cucullatus*	A	A	A	A	-	-	1, 2
Horned grebe	*Podiceps auritus*	C	U	C	C	X	X	1, 2
Hudsonian godwit	*Limosa haemastica*	A	R	R	-	X	X	1, 2, 11
Ivory gull	*Pagophila eburnea*	R	-	R	U	-	-	1, 2
King eider	*Somateria spectabilis*	C	R	C	C	-	-	1-8
Kittlitz's murrelet	*Brachyramphus brevirostris*	U	U	U	R	X	-	1, 2
Lapland longspur	*Calcarius lapponicus*	C	C	C	A	X	X	1, 2, 9, 11
Leach's storm-petrel	*Hydrobates leucorhous*	U	C	C	-	X	-	1, 2
Least auklet	*Aethia pusilla*	C	C	C	C	X	-	1, 2
Least sandpiper	*Calidris minutilla*	C	C	C	-	X	X	1, 2, 9, 11
Lesser scaup	*Aythya affinis*							11
Lesser yellowlegs	*Tringa flavipes*							11
Lincoln's sparrow	*Melospiza lincolnii*	U	U	U	-	X	X	1, 9, 10, 11
Long-billed dowitcher	*Limnodromus scolopaceus*	U	-	U	-		X	1, 2
Long-tailed duck	*Clangula hyemalis*	C	U	C	C	X	X	1-8, 11
Long-tailed jaeger	*Stercorarius longicaudus*	U	U	U	-	X	X	1, 2, 11
Mallard	*Anas platyrhynchos*	C	C	C	C	X	X	1-7, 10, 11
Marbled godwit	*Limosa fedoa*	R	R	R	-	X	X	1, 2, 9
Marbled murrelet	*Brachyramphus marmoratus*	U	U	U	U	X	-	1, 2
McKay's bunting	*Plectrophenax hyperboreus*	-	-	-	R	-	X	8
Merlin	*Falco columbarius*	U	U	U	A	X	X	1, 2, 10, 11
Mew gull	*Larus canus*	C	C	C	C	X	X	1, 2, 8, 9, 11
Mottled petrel	*Pterodroma inexpectata*	U	U	U	-	-	-	1
Northern goshawk	*Accipiter gentilis*	U	U	U	U	X	X	1, 2, 8
Northern harrier	*Circus hudsonius*	U	U	U	R	X	X	1, 2, 10, 11
Northern hawk owl	*Surnia ulula*	R	R	R	U	X	X	1, 2, 8
Northern pintail	*Anas acuta*	C	C	C	U	X	X	1-7, 11
Northern shoveler	*Spatula clypeata*	R	R	R	A		X	1-7
Northern shrike	*Lanius borealis*	U	U	U	U	X	X	1, 2, 8, 9, 11
Northern waterthrush	*Parkesia noveboracensis*	C	C	C	-	X	-	1, 2, 11
Northern wheatear	*Oenanthe oenanthe*	A	A	A	-	X	-	1, 2
Olive-sided flycatcher	*Contopus cooperi*	R	R	R	-	X	X	1, 2, 9
Orange-crowned warbler	*Leiothlypis celata*	C	C	C	-	X	X	1, 2, 9, 10, 11
Osprey	*Pandion haliaetus*	R	R	R	-	X	X	1, 2, 10

Table H-16. Bird Species Observed on or Potentially Occurring in the King Salmon Airport Area

Common Name (Federal Status)*	Scientific Name	Spr	Sum	Fal	Win	Br	Obs	Source(s)
Pacific golden-plover	*Pluvialis fulva*							11
Pacific loon	*Gavia pacifica*	C	C	C	R	X	-	1, 2, 11
Parasitic jeager	*Stercorarius parasisticus*	C	C	C	-	X	X	1, 2, 11
Pectoral sandpiper	*Calidris melanotos*	R	R	C	-	-	-	1, 2
Pelagic cormorant	*Phalacrocorax pelagicus*	C	C	C	C	X	-	1, 2
Peregrine falcon	*Falco peregrinus*	C	U	C	U	X	X	1, 2, 8, 11
Pine grosbeak	*Pinicola enucleator*	U	U	U	U	X	X	1, 2, 8, 9, 11
Pomarine jaeger	*Stercorarius pomarinus*	C	U	C	-	-	-	1, 2
Red crossbill	*Loxia curvirostra*	-	R	A	-	-	-	1, 2
Red phalarope	*Phalaropus fulicarius*	C	U	C	-	-	-	1, 2
Red-breasted merganser	*Mergus serrator*	C	C	C	C	X	X	1-8, 11
Red-breasted nuthatch	*Sitta canadensis*	-	-	-	R	-	X	8, 9
Red-faced cormorant	*Phalacrocorax urile*	C	C	C	C	X	-	1, 2
Redhead	*Aythya americana*	A	A	A	-	-	X	1-7
Red-necked grebe	*Podiceps grisegena*	U	R	U	U	X	-	1, 2, 11
Red-necked phalarope	*Phalaropus lobatus*	C	C	C	-	X	X	1, 2, 11
Red-throated loon	*Gavia stellata*	C	C	C	U	X	X	1, 2, 11
Ring-necked duck	*Aythya collaris*	A	A	A	-	-	X	1-7
Rock dove	*Columba livia*	-	-	-	R	-	X	8
Rock ptarmigan	*Lagopus muta*	U	U	U	U	X	-	1, 2
Rock sandpiper	*Calidris ptilocnemis*	C	C	C	C	X	X	1, 2, 9
Rosy finch	*Leucosticte arctoa*	C	C	C	C	X	-	1, 2
Rough-legged hawk	*Buteo lagopus*	U	C	U	-	X	X	1, 2
Ruby-crowned kinglet	*Regulus calendula*	R	R	R	-	X	X	1, 2, 9
Ruddy turnstone	*Arenaria interpres*	C	U	C	-		X	1, 2
Rusty blackbird	*Euphagus carolinus*	U	U	U	-	X	X	1, 2, 9, 10, 11
Sabine's gull	*Xema sabini*	U	U	U	-	X	X	1, 2
Sanderling	*Calidris alba*	U	-	U	R	-	-	1, 2
Sandhill crane	*Antigone canadensis*	C	C	C	-	X	X	1, 2, 10, 11
Savannah sparrow	*Passerculus sandwichensis*	C	C	C	A	X	X	1, 2, 9, 10, 11
Semipalmated plover	*Charadrius semipalmatus*	C	C	C	-	X	X	1, 2, 9, 10, 11
Semipalmated sandpiper	*Calidris pusilla*	R	-	R	-	-	-	1, 2
Sharp-shinned hawk	*Accipter striatus*	R	R	R	R	-	-	2
Sharp-tailed sandpiper	*Calidris acuminata*	A	-	U	-	-	-	1, 2
Short-billed dowitcher	*Limnodromus griseus*	C	C	C	-	X	X	1, 2, 11
Short-eared owl	*Asio flammeus*	C	C	C	R	X	X	1, 2
Short-tailed shearwater	*Ardenna tenuirostris*	R	R	R	A	-	-	1, 2
Snow bunting	*Plectrophenaxnivalis*	C	C	C	C	X	X	1, 2, 8
Snow goose	*Anser caerulescens*	C	-	C	-		-	1, 2
Snowy owl	*Bubo scandiacus*	R	R	R	U	X	-	1, 2
Solitary sandpiper	*Tringa solitaria*	A	R	-	-	X	-	1, 2
Song sparrow	*Melospiza melodia*	C	C	C	C	X	X	1, 2, 9
Sooty shearwater	*Ardenna griseus*	R	R	R	A	-	-	1, 2
Spectacled eider (T)	*Somateria fischeri*	-	-	-	A	-	-	1, 2
Spotted sandpiper	*Actitis macularius*	R	R	R	-	X	X	1, 2, 9, 11
Spruce grouse	*Falcipennis canadensis*	R	R	R	R	X	X	1, 2, 8, 11
Steller's eider (T)	*Polysticta stelleri*	R	-	R	R	-	-	1-7
Surf scoter	*Melanitta perspicillata*	C	U	C	C	-	-	1-7
Surfbird	*Calidris virgata*	R	R	R	R	X	X	1, 2, 9
Swainson's thrush	*Catharus ustalatus*	U	U	U	-	X	X	1, 2, 9, 11
Thick-billed murre	*Uria lomvia*	C	C	C	C	X	-	1, 2
Tree swallow	*Tachycineta bicolor*	C	C	C	-	X	X	1, 2, 9, 10, 11
Trumpeter swan	*Cygnus buccinator*							11

Table H-16. Bird Species Observed on or Potentially Occurring in the King Salmon Airport Area

Common Name (Federal Status)*	Scientific Name	Spr	Sum	Fal	Win	Br	Obs	Source(s)
Tufted duck	*Aythya fuligula*	A	A	A	A	-	-	1, 2, 7
Tundra swan	*Cygnus columbianus*	C	C	C	R	X	X	1-7, 10, 11
Varied thrush	*Ixoreus naevius*	C	C	C	R	X	X	1, 2, 9, 10, 11
Violet-green swallow	*Tachycineta thalassina*	U	U	U	-	X	X	1, 2, 9
Wandering tattler	*Heteroscelus incanus*	U	R	U	-	X	X	1, 2, 9
Western sandpiper	*Calidris mauri*	C	R	C	-	-	X	1, 2, 11
Whimbrel	*Numenius phaeopus*	C	C	C	-	-	X	1, 2, 11
Whiskered auklet	*Aethia pygmaea*	U	U	U	A	X	-	1, 2
White-crowned sparrow	*Zonotrichia leuophrys*	C	C	C	-	X	X	1, 2, 8-10, 11
White-winged crossbill	*Loxia leucoptera*	U	U	U	U	X	X	1, 2, 8, 9, 11
White-winged scoter	*Melanitta deglandi*	C	C	C	C	-	X	1-7, 11
Whooper swan	*Cygnus cygnus*	R	R	R	U	-	-	1
Willow ptarmigan	*Lagopus lagopus*	C	C	C	C	X	X	1, 2, 8, 11
Wilson's snipe	*Gallinago gallinago*	C	C	C	A	X	X	1, 2, 9, 10, 11
Wilson's warbler	*Cardellina pusilla*	C	C	C	-	X	X	1, 2, 9, 10, 11
Winter wren	*Troglodytes hiemalis*	C	C	C	C	X	X	1, 2, 9
Yellow warbler	*Setophaga petechia*	C	C	C	-	X	X	1, 2, 9, 10, 11
Yellow-rumped warbler	*Setophaga coronata*	U	U	U	-	X	X	1, 2, 9, 10, 11

Notes: *BGEPA = Bald and Golden Eagle Protection Act; T = threatened; all bird species are protected under the MBTA except for ptarmigan and grouse.
Seasons: Spr = spring, Sum = summer, Fal = fall, Win = winter.
Seasonal occurrence codes: A = Accidental; C = common; R = rare; U = uncommon.
Br = breeding; Obs = observed.

Sources:
1. Armstrong 1991.
2. USFWS 1993a.
3. Scharf 1993.
4. MacGowan 1994.
5. Moore 1996.
6. Ruhl and Moore 1996.
7. Ruhl 1997.
8. Anonymous undated (a).
9. Anonymous undated (b).
10. ABR, Inc., (Boisvert and Frost) site visit 2005.
11. Pardieck et al. 2018

H.3 BARTER ISLAND LRRS

H.3.1 Location and Area

The 592-acre Barter Island site is located on the northern coast of Alaska near the Canadian border, 646 miles north of Anchorage, 385 miles north of Fairbanks, and 310 miles east of Point Barrow (Figure H-1, Figure H-24, and Figure H-25). The facility is sited on low-lying coastal tundra within the Arctic NWR. Barter Island is accessible year-round by air, and can be accessed by sea during the summer.

Figure H-24. Aerial View of Barter Island LRRS from the 1990s, Looking East
(*Note*: The old runway is in the upper left corner and the village of Kaktovik is in the center background)

H.3.2 Installation History

The original gravel runway was built by the military in 1947 on the spit of land to the northest of the village of Kaktovik. The USAF assumed control of Barter Island in 1951 and extended the runway in 1953 to support the Distant Early Warning (DEW) Line radar station at Barter Island. The Barter Island DEW Line station was operated by civilian contract workers. The radar station was upgraded with a MAR in 1990 and re-designated part of the North Warning System (NWS) as an LRRS, being controlled by the Pacific Air Forces 611 ASG (now 611 CES), based at JBER (Denfeld 1993).

Clean Sweep activities were completed in 2007 and inactive structures, towers, buildings, tanks, pipelines, pads, etc. were removed. In 2016, the village of Kaktovik opened a new civilian airport south of the LRRS (Figure H-25), removing the need for the LRRS's runway; the site's hangar was demolished in 2017. The airport supports the settlement at Kaktovik and provides contractor access to the LRRS (611 CES 2019).

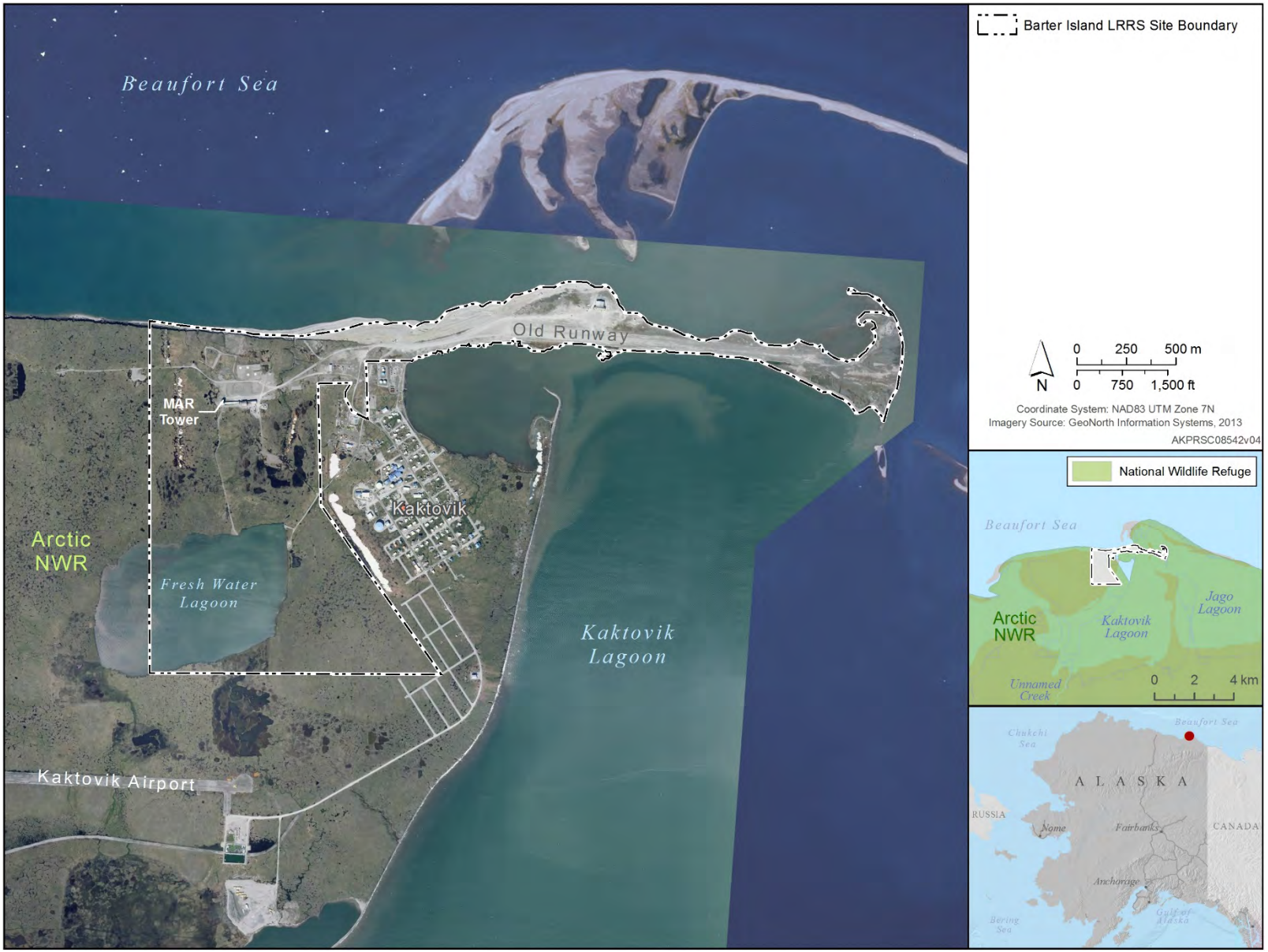

Figure H-25. Barter Island LRRS

H.3.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. Two contractor personnel are responsible for the operation, maintenance, and support of the LRRS year-round (611 CES 2019).

H.3.4 Surrounding Communities

The native village of Kaktovik is immediately east of the LRRS (Figure H-25). The estimated 2018 population was 238 (State of Alaska 2018). The village dates back to 1923 when a trading station was established during the height of the fur trade. The community relocated in 1947, 1952, and 1964 to accommodate the establishment and expansion of the Barter Island LRRS (ICF Technology, Inc. 1996a). Kaktovik was incorporated in 1971. Due to Kaktovik's isolation, the village has maintained its Inupiat Eskimo traditions. More than 88% of residents are Iñupiat. Approximately 66% of the working residents are employed by the North Slope Borough, and another 25% work for the School District. Almost 33% of the work force is employed in the private sector, primarily by Native corporations and their affiliates. Like other communities in the region, subsistence hunting, fishing and whaling play a major role in the local economy. Transportation to the village is provided by scheduled airlines and air taxi service from Barrow and Fairbanks. Freight arrives by cargo plane and barge (North Slope Borough 2019a).

H.3.5 Regional Land Use

Barter Island LRRS is located on the Arctic NWR (Figure H-25) which is owned and managed by the U.S. Department of Interior through the USFWS, NWR System. The Arctic National Wildlife Range was established in 1960 to preserve unique wildlife, wilderness and recreational values. In 1980, under ANILCA, the Range was re-designated as part of the Arctic NWR, and provided four purposes that guide management of the entire Refuge: 1) to conserve animals and plants in their natural diversity, 2) ensure a place for hunting and gathering activities, 3) protect water quality and quantity, and 4) fulfill international wildlife treaty obligations.

Barter Island LRRS property is withdrawn from public domain by public land order for military purposes. Barter Island's location within the Arctic NWR requires coordination between the USFWS and USAF to conduct the military mission of the LRRS while protecting natural resources of the refuge. The USFWS retains the authority to manage fish and wildlife habitat on the Arctic NWR.

H.3.6 Local and Regional Natural Areas

The 19.6 million-acre Arctic NWR encompasses Barter Island LRRS. Renowned for its wildlife, the Arctic NWR is inhabited by 45 species of land and marine mammals, ranging from the pygmy shrew to the bowhead. A total of 36 species of fish occur in refuge waters, and more than 200 species of birds have been observed on the refuge. Three rivers (Sheenjek, Wind, and Ivishak) are designated Wild Rivers and 8 million acres of the Arctic NWR are designated wilderness. Two areas are designated Research Natural Areas, and several rivers, canyons, lakes, and rock mesa have been recommended as national Natural Landmarks. The refuge encompasses the traditional homelands and subsistence areas of Inupiaq Eskimos of the arctic coast and the Athabascan Indians of the interior (USFWS 2017a).

H.3.7 Physical Environment

H.3.7.1 Climate

The climate of Barter Island is determined by the surrounding Beaufort Sea. There are no elevations of consequence closer than the Brooks Range, 65 miles to the south, and no local topographic features to affect winds, temperatures, and precipitation.

Temperatures remain below freezing most of the year with the daily maximum temperature higher than freezing only 116 days annually. The daily minimum temperature drops below freezing 313 days of the year, and freezing temperatures have been noted in every month. February is generally the coldest month with an average low of -26 °F, and July is the warmest with an average high of 45 °F (Table H-17). Strong winter winds can cause the wind chill factor to reach below -100° F (CH2M Hill 1981).

Table H-17. Monthly Climate Averages for Barter Island, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Avg. High (ºF)	-7.7	-13.9	-8.8	6.7	26.3	38.4	45.4	43.8	35.4	20.3	5.1	-5.8	
Avg. Low (ºF)	-20.3	-26.3	-22.5	-9.3	15.7	30.4	34.8	34.4	27.9	10.1	-6.7	-18.3	
Avg. Precipitation (inches)	0.5	0.2	0.2	0.2	0.3	0.5	1.0	1.1	0.7	0.8	0.4	0.3	6.2
Avg. Snowfall (inches)	5.0	2.7	2.6	2.4	3.0	1.6	0.5	1.5	4.9	9.2	5.0	3.4	41.8

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

Precipitation is light, year-round, averaging 6 inches annually, mostly occurring as rain in July and August. Snowfall occurs all months of the year and averages 42 inches annually (Table H-17). Prevailing winds are easterly and average nearly 13 mph with very little annual variation; however, winds are strongest in October, November, and January. Steady winds of 38 mph have been reported every month of the year, and an extreme steady speed of 81 mph with gusts to 91 mph was reported in January 1974 (CH2M Hill 1981).

H.3.7.2 Topography

The Barter Island site is situated in the Arctic Coastal Plain physiographic region. The Coastal Plain shows little relief, sloping downward to the north from the foothills of the Brooks Range. Due to the flat terrain and the continuous occurrence of permafrost, marshes and lakes are abundant. The coastline is characterized by low coastal banks with narrow gravel beaches. Coastal erosion occurs as thermal undercutting of the frozen bank and slumping into the sea (CH2M Hill 1981).

The LRRS is located on the northeastern shore of Barter Island, a tundra-remnant island formed by the sea's thermal erosion of its ice-rich soils. Northeastern and northwestern ends of the island are sand and gravel spits formed by long shore drift processes. The island is nearly flat; local features include a few small incised stream channels, small thaw lakes and ponds, and tundra polygons. The island reaches an elevation of 55 ft MSL, but the installation sits at a somewhat lower elevation (CH2M Hill 1981).

H.3.7.3 Geology and Soils

Except for gravel spits on its ends, Barter Island is composed of permanently frozen sediments of the Quaternary Gubik Formation - mixtures and lenses of marine and alluvial clay, silt, sand, and gravel that mantle most of the Arctic Coastal Plain. The upper foot or so of the soil is composed of windblown silts topped by a thin, peaty tundra mat, which supports a variety of tundra vegetation (CH2M Hill 1981).

Permafrost is continuous at Barter Island and is probably hundreds of feet deep. Summer thaw depths in the active layer range from about 18 in in the tundra soils to 4 ft or more beneath larger lakes that do not

freeze to the bottom in winter. Polygonal ground exists throughout most of the island, indicating that ice lenses extend downward several feet into the frozen silts. The water content of these permafrost soils is high, making them unstable when thawed and resulting in considerable slumping and subsidence (CH2M Hill 1981).

H.3.8 Hydrology

H.3.8.1 General

Surface runoff occurs as sheet flow and ephemeral streams and may drain into larger streams or directly to the ocean. Infiltration to shallow depths occurs during summer when active layers thaw. Several large and small lakes are located in the vicinity of the LRRS. They are generally less than 10 ft deep, and many freeze to the bottom during winter. The fresh water lake in the southwestern part of the property is about 9 ft deep and freezes to about 6 ft in winter.

H.3.8.2 Floodplains

Primary facilities are at 34 ft MSL (611 CES 2019). The 5.8-ft MSL elevation of the 1964 storm represents the 100-year flood level (Legare 1998). The village of Kaktovik and Barter Island LRRS are exposed to significant risk from flooding, coastal erosion (see Section 3.7.3), and severe winter storms. Mitigation strategies for these and other hazards can be found in the North Slope Borough Local All-Hazard Mitigation Plan (North Slope Borough 2015).

H.3.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Barter Island LRRS and the surrounding area. Attachment 4 contains lists of vascular plants (Table H-20), fish (Table H-21), mammals (Table H-22), and birds (Table H-23) known to occur or potentially occurring in the Barter Island area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Barter Island site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.3.9.1 Ecoregion Classification

The Barter Island site is located in the Beaufort Coastal Plain ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.3.9.2 Vegetation/Habitat

A general vegetation map of Barter Island LRRS was prepared by 611 ASG (1995c). Schick et al. (2004) made significant improvements in vegetation mapping at Barter Island using 2000 digital aerial photography, by conducting flora and fauna surveys, and mapping wildlife habitat. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Barter Island LRRS. CEMML used the most recent imagery found on Google Earth for the site and, if available, 2009-2010 SPOT-5 satellite imagery.

The most recent vegetation or habitat mapping for Barter Island LRRS was prepared using high-resolution satellite imagery acquired in 2014, and then supplemented by field visits conducted in July-September 2015 (611 CES/CEIE 2016). A total of 18 habitat classes were identified (Table H-18 and Figure H-26) (descriptions of the habitat classes and their constituent land-cover types can be found in Appendix 1 of 611 CES/CEIE [2016]). See Table H-20 for a list of vascular plant species on or in the vicinity of the Barter Island site.

Table H-18. Barter Island LRRS Habitat Classes (2014)

Habitat Class	Area (acres)	Percent
Lowland Moist Sedge-Shrub Tundra	168.7	28.6%
Deep Water	104.6	17.7%
Developed/Disturbed*	90.9	15.4%
Coastal Barrens	74.8	12.7%
Lowland Wet-Moist Patterned Tundra Complex	49.3	8.4%
Old Basin Wetland Complex (Ice-rich)	43.2	7.3%
Coastal Salt Marsh	13.9	2.4%
Lowland Patterned Wet Tundra	8.1	1.4%
Coastal Brackish Water	6.9	1.2%
Lowland Dwarf Scrub	6.1	1.0%
Lowland Aquatic Grass Marsh	5.9	1.0%
Marine Water	5.7	1.0%
Shallow Water	5.2	0.9%
Lowland Aquatic Sedge Marsh	4.1	0.7%
Shallow Water w/ Islands or Polygonized Margins†	1.1	0.2%
Coastal Dry Meadow†	0.6	0.1%
Lowland Non-patterned Wet Tundra†	0.3	<0.1%
Total	**589.4**	

Notes: †Refer to Figure H-26. Due to the scale of the figure, habitat classes that comprise ≤0.2% of the site are not shown on Figure H-26.
*The original Artificial Barrens (87.0 acres) and Artificial Partially Vegetated (3.9 acres) classes have been combined into Developed/Disturbed.
Source: 611 CES/CEIE 2016.

Wildlife habitats at the LRRS are primarily lacustrine and lowland tundra types with no riverine and or upland habitat types present. The four most extensive habitat classes (other than Deep Water of the freshwater lake in the southwestern portion of the site) are Lowland Moist Sedge-Shrub Tundra, Developed/Disturbed, Coastal Barrens, and Lowland Wet-Moist Patterned Tundra Complex. Small shallow coastal brackish ponds are located along the spit, and several small marshes are scattered in the central portion and along the southern boundary of the site, sometimes with emergent vegetation (e.g., *Arctophila fulva* and *Carex aquatilis*) growing in permanently flooded shallow margins. Shallow freshwater lakes and ponds with islands and/or polygonized margins, which provide preferred habitat for nesting and brood-rearing water birds, occur at Barter Island LRRS but they are not common (1.1 acres) (Table H-18) (Schick et al. 2004) (see Section H.3.9.3, *Wetlands*).

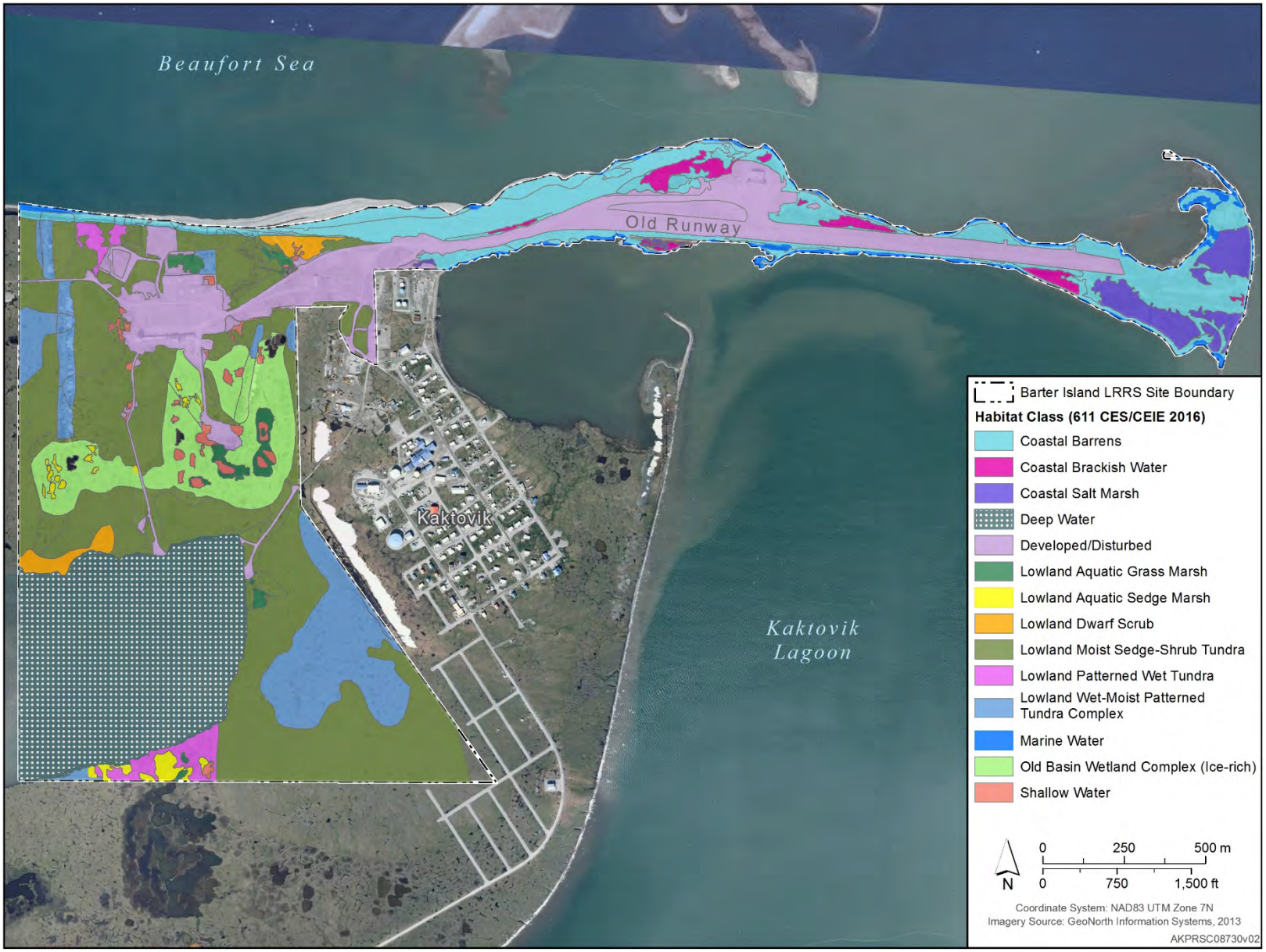

Figure H-26. Barter Island LRRS Habitat Classes (2014)

Old Basin Wetland Complex, which also provides quality nesting habitat for waterbirds, constitute 43 acres of the site. Of note is the are of Lowland Aquatic Sedge Marsh in the southern portion of the property, which surrounds a set of interconnected shallow ponds with both islands and polygonized margins. This mixture of habitats is ideal nesting habitat for waterbirds. Coastal Salt Marsh, a habitat often used by brood-rearing waterfowl, occurs along the spit in the northeastern section of the LRRS, constitutes 14 acres of the area. Of remaining habitats, freshwater marsh and lowland tundra habitats are the primary wildlife habitats at the LRRS and cover 1.7% (10 acres) and 38% (226 acres) of the land area, respectively. Of the tundra habitats, Lowland Moist Sedge–Shrub Tundra is by far the most common (169 acres), followed by Lowland Wet-Moist Patterned Tundra Complex (49 acres) and Lowland Patterned Wet Tundra (8 acres) (Table H-18). Artificial habitats including gravel roads, fill, structures, and drainage impoundments occupy 91 acres (15%) of the LRRS.

H.3.9.3 Wetlands

The current mapping of wetlands at Barter Island LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 592-acre Barter Island site, 456 acres (or 77%) are considered wetlands per the NWI mapping (Table H-19 and Figure H-27). Freshwater emergent wetlands make up the majority of the wetlands on the site. These areas are typically moist and wet tundra and are either saturated or seasonally flooded, depending on microtopography and landscape position. Some lower, wetter, and seasonally flooded areas lack the shrub component. Wetlands in the vicinity of the Old Runway are mostly irregularly flooded estuarine intertidal areas with emergent vegetation (Schick et al. 2004).

Table H-19. Barter Island LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	304.8	51.5%	245.1	41.5%
Lake	93.3	15.8%	110.7	18.7%
Estuarine and Marine Deepwater	16.9	2.9%	77.9	13.2%
Estuarine and Marine	38.9	6.6%	64.4	10.9%
Riverine	0	0	51.1	8.6%
Freshwater Forested/Shrub	0	0	5.3	0.9%
Freshwater Pond	2.3	0.4%	7.3	1.2%
Wetlands Total	**456.2**		**561.9**	
Upland	135.4	22.9%	29.1	4.9%
Site Total	**591.6**		**591.0**	

Notes: *See Figure H-27. †See Figure H-28.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

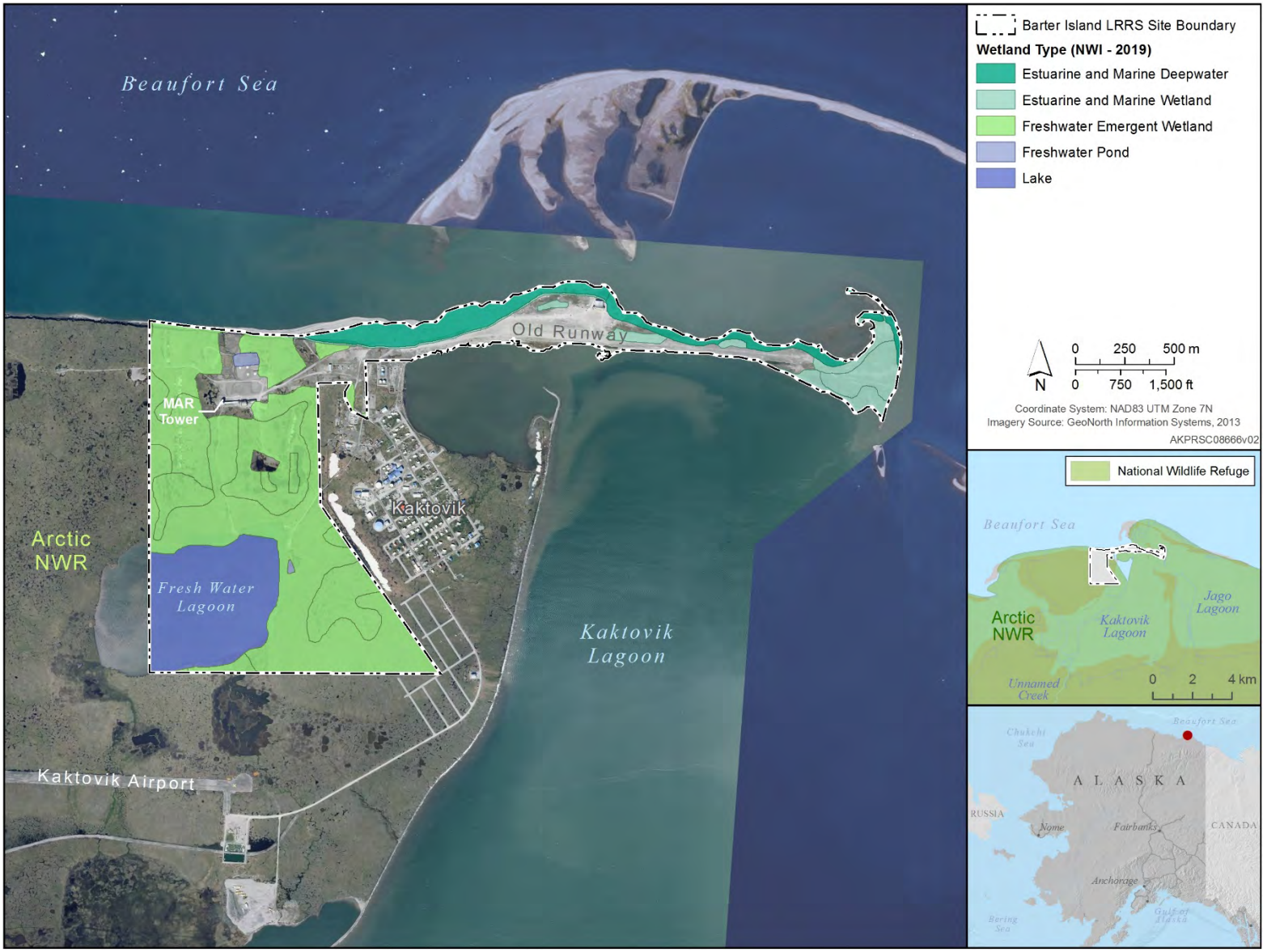

Figure H-27. Barter Island LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

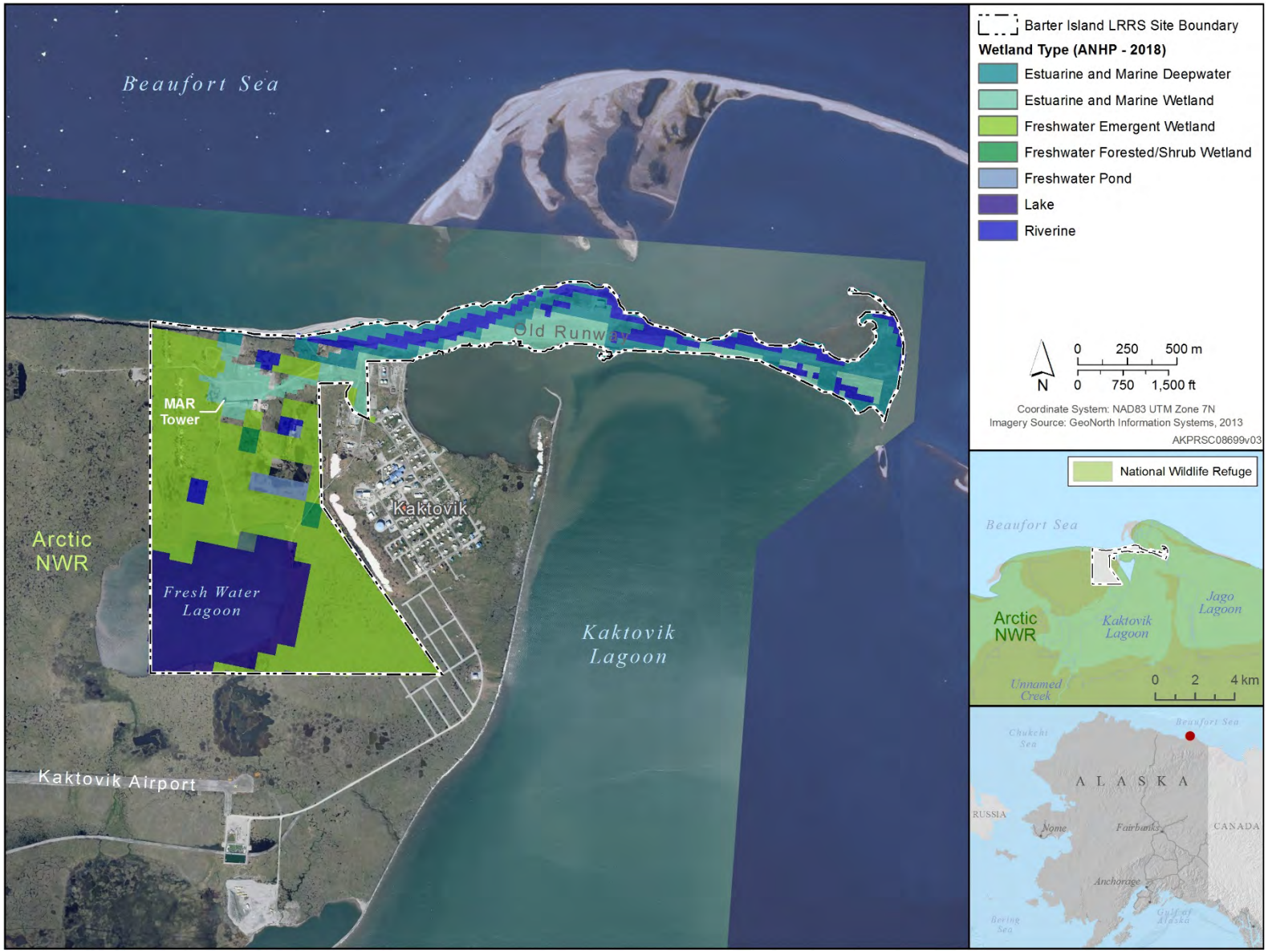

Figure H-28. Barter Island LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.3.9.4 Fish and Wildlife

H.3.9.4.1 Fish

A total of 14 fish species are known to occur or potentially occur near Barter Island including broad and humpback whitefish, Arctic and sardine cisco, Arctic char, and pink and chum salmon (Table H-21). Arctic char is the most commonly targeted species for subsistence and recreational fishing in the northern Arctic and are the most numerous fish species in the Kaktovik Lagoon area (611 ASG 1995c; ICF Technology, Inc. 1996a). The unnamed stream that empties into the southern end of Kaktovik Lagoon is used by Dolly Varden for rearing (Figure H-25) (Johnson and Blossom 2019b).

H.3.9.4.2 Mammals

Terrestrial Mammals

Of the 19 mammal species known to occur or are expected to occur on or in the vicinity of the Barter Island site, 11 are terrestrial (Table H-22). The most common small mammals on the Arctic Coastal Plain are brown and collared lemmings, Arctic ground squirrel, and red-backed vole. Caribou are abundant on the Arctic Coastal Plain, but are uncommon and only occur in small numbers in the vicinity of Barter Island (ICF Technology, Inc. 1996a). In 1969 and 1970, 51 muskox were released on Barter Island (ADFG 2019a). The muskox population in northeastern Alaska (Colville River east to the Canadian border) declined from 700 animals in 1995 to approx. 216 in 2006 and they virtually disappeared by 2006 between the Canning River and the Canadian border (Pearce et al. 2018). Current population numbers are unknown for the Barter Island region, but muskox are expected to be uncommon.

Marine Mammals

Eight marine mammal species occur in the Barter Island area: four cetaceans, three pinnipeds, and the polar bear (Table H-22). Marine mammals are discussed in Section H.3.9.5 (ESA- and MMPA-listed Species).

H.3.9.4.3 Birds

The wet tundra and nearshore waters of the coastal zone provide nesting and foraging habitat for a wide variety of bird species and 71 species have been observed on or in the vicinity of the Barter Island site (Table H-23). Waterfowl species include white-fronted goose, tundra swan, mallard, northern shoveler, northern pintail, common eider, longtail duck, and red-throated and Pacific loons. Shorebird species include American golden-plover; black-bellied plover; semipalmated, Baird's, and pectoral sandpipers; and long-billed dowitcher. Other species include sandhill crane, glaucous gull, common raven, Lapland longspur, and snow bunting. Predatory birds that use the coastal zone include snowy and short-eared owls, peregrine falcon, and pomarine, long-tailed, and parasitic jaegers. Common ravens have nested on the radar towers on the property and peregrine falcon have nested on the tundra bluff facing the Beaufort Sea of the LRRS (611 ASG 1995c).

Important Bird Areas (IBAs)

The Barter Island site is adjacent to two IBAs: Beaufort Sea Nearshore and Northeast Arctic Coastal Plain (Figure H-29). See Section H.1.9.4.3 for a discussion of the IBA program. The Beaufort Sea Nearshore IBA occupies 6,800 mi^2 of pelagic open water habitat in the Beaufort-Chukchi Coastal-Shelf ecoregion within the Beaufort Sea-continental coast and shelf. The Beaufort Sea Nearshore IBA supports large breeding populations of glaucous gull and long-tailed duck. Immediately south of Barter Island, the 2,800-mi^2 Northeast Arctic Coastal Plain IBA is used by 12,000-300,000 post-breeding snow geese for foraging prior to their fall migration (USFWS 2013; Audubon Alaska 2014.

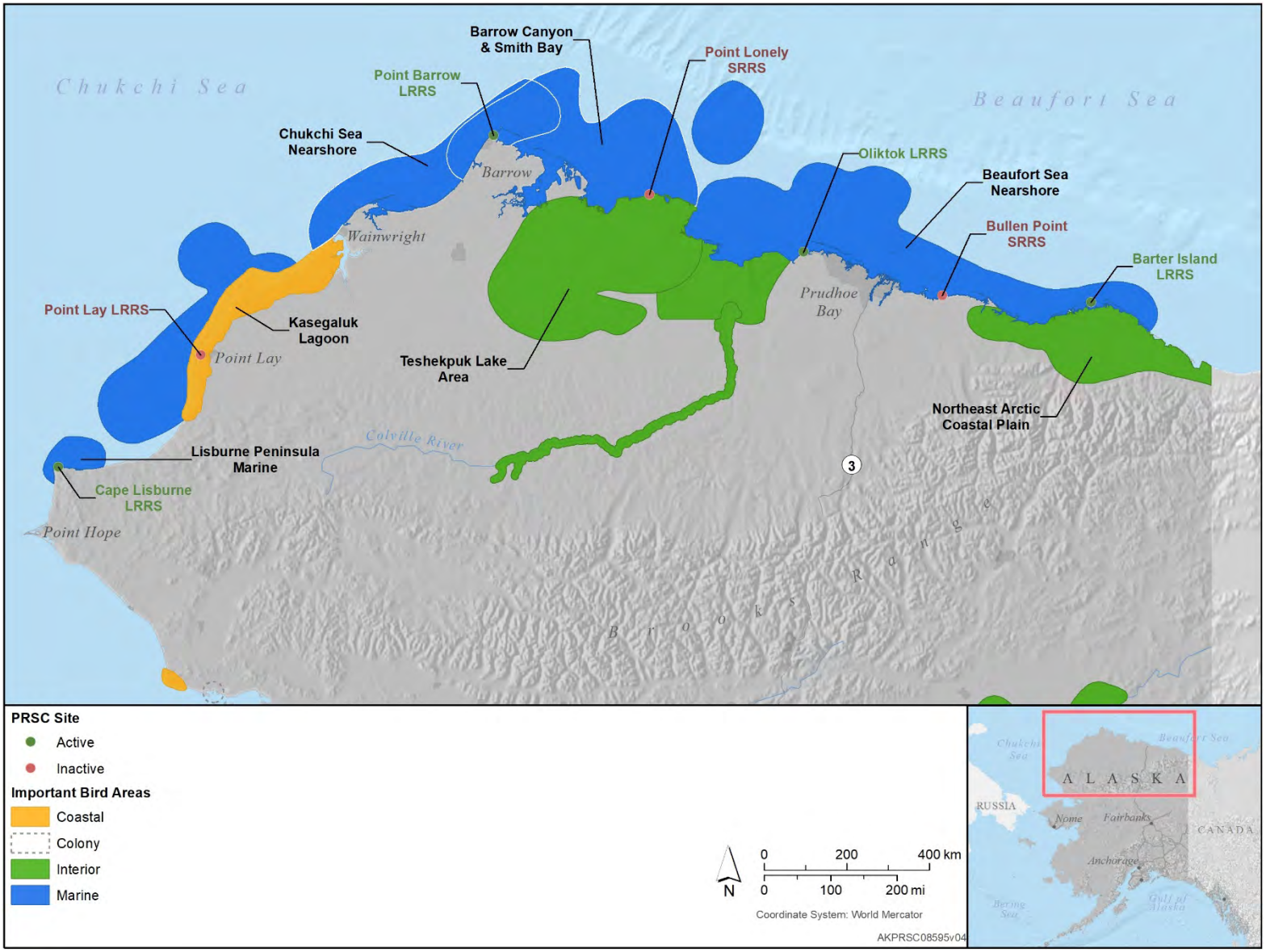

Figure H-29. Important Bird Areas (IBAs) within the Vicinity of Northern Coastal Alaska PRSC Sites
(*Source*: Audubon Alaska 2014)

H.3.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Five ESA-listed species are known to or potentially occur on or within the vicinity of Barter Island: the threatened spectacled eider, polar bear, ringed seal, and bearded seal, and endangered bowhead (Table H-22 and Table H-23).

Spectacled Eider. Day et al. (1995) surveyed for spectacled eider and did not detect the species at Barter Island LRRS. The site was identified as having little potential for nesting spectacled eiders and they are uncommon in offshore waters.

Polar Bear. The Barter Island site is the primary PRSC site with known potential polar bear concerns and potential for human-bear interactions. During fall and winter, polar bears have been observed hunting on coastal and shorefast ice off the coast of Kaktovik and may also occur on Barter Island. In addition, natives of Kaktovik conduct annual bowhead hunts in the fall and whales may be butchered near the Barter Island LRRS. If a whale carcass is present, polar bears tend to aggregate on the carcass to feed and often rest along the coastal bluff near the LRRS, creating a potential human safety risk (PRSC 2020).

Although the Barter Island LRRS has been excluded from polar bear critical habitat designation (USFWS 2010), the surrounding terrestrial area is within denning critical habitat and the nearby barrier islands are considered barrier island critical habitat that also includes a 1-mile no disturbance zone (Figure H-30 and Figure H-31). In addition, the adjacent marine waters are considered sea ice critical habitat (Figure H-32).

Bearded and Ringed Seals. Both seals occur on Barter Island on a regular basis and are harvested by native hunters (Harcharek et al. 2018). In 2014, the marine waters adjacent to the Barter Island site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bowhead. Bowhead occur in offshore waters on a regular basis and are harvested by native hunters (Harcharek et al. 2018).

Other MMPA-listed Species

Beluga and spotted seals occur in the area on a regular basis and are harvested by native hunters (Harcharek et al. 2018). Gray whale and killer whale are infrequent visitors to the area (611 ASG 1995c).

H.3.10 Other Natural Resource Information

H.3.10.1 Subsistence

Kaktovik lies within the Arctic NWR, and residents use those lands for much of their subsistence activity. The Kaktovik subsistence use area extends from Prudhoe Bay to the Canadian/Alaskan border (Braund and Associates 2004). Caribou and bowhead are staple subsistence items, and seals (bearded, ringed, and spotted) are also important, as are ducks, geese, and several fish species. Kaktovik is one of 10 Alaska Eskimo Whaling Commission communities and whaling is the basis for much of the social organization in the region. The bowhead quota for Kaktovik is three per year. Polar bear are in high abundance in the Kaktovik area, especially in the fall, but not many are harvested (Harcharek et al. 2018).

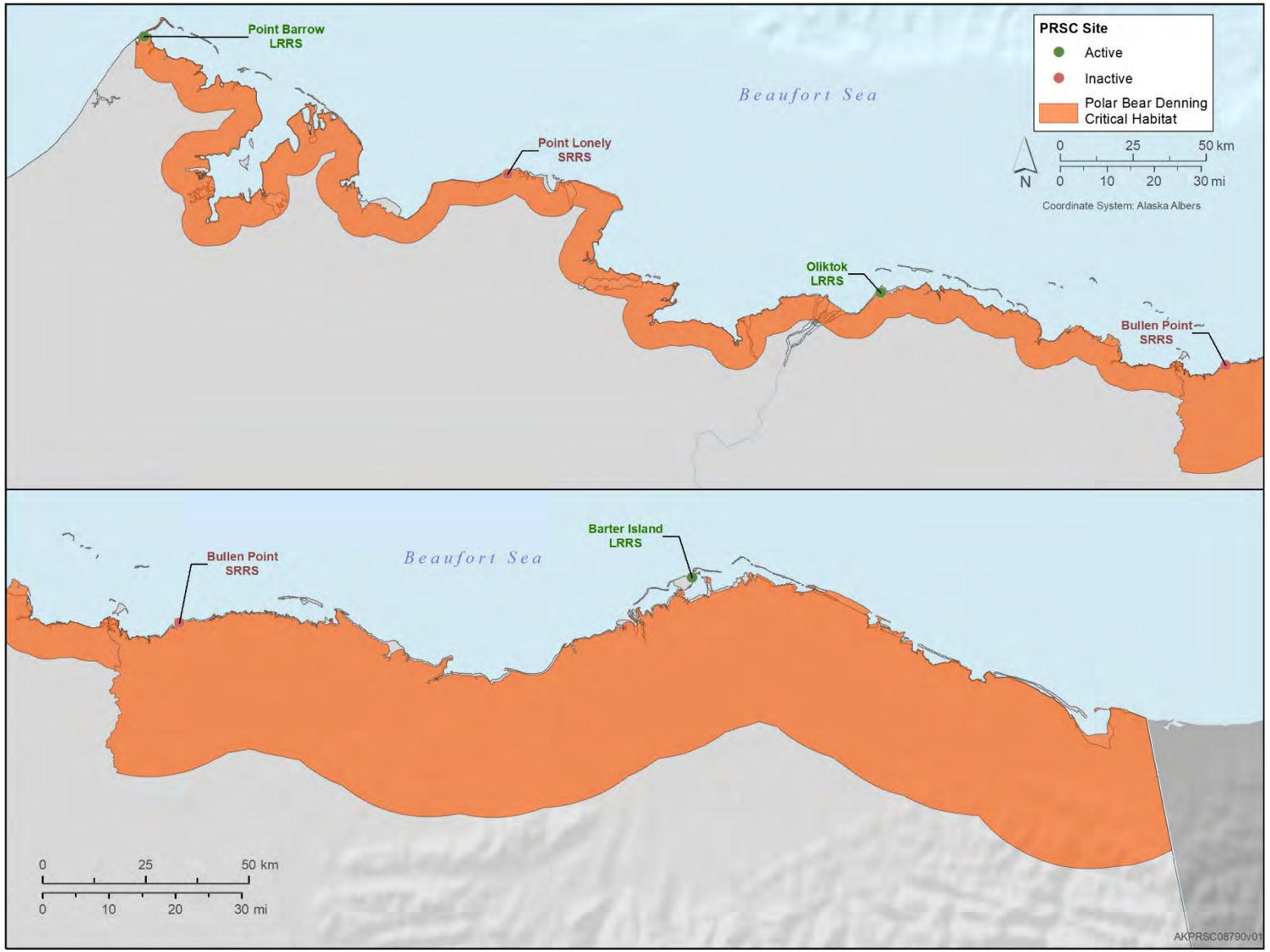

Figure H-30. Polar Bear Denning Critical Habitat along the Northern Coast of Alaska
(Source: USFWS 2010)

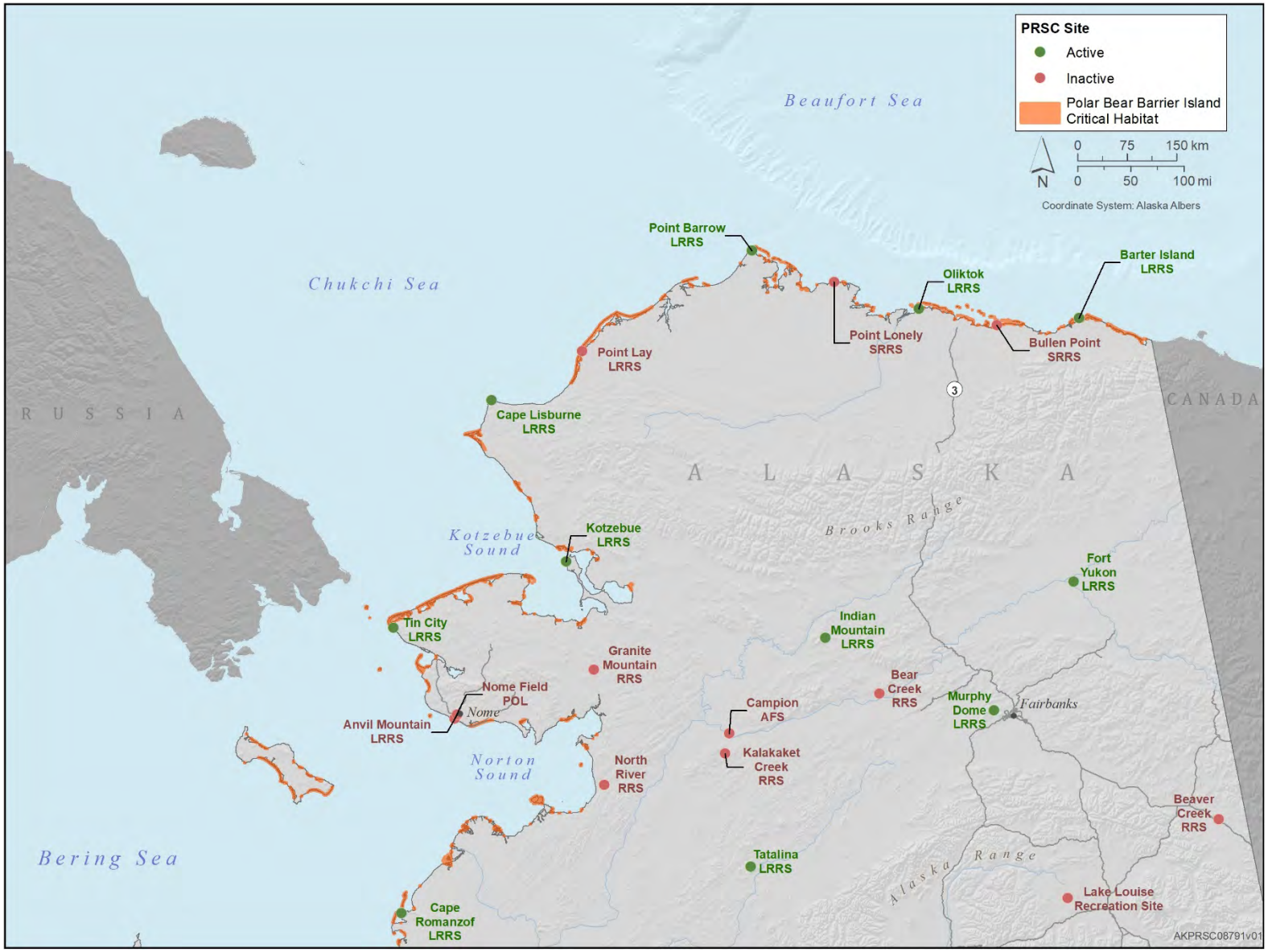

Figure H-31. Polar Bear Barrier Island Critical Habitat along the Northern and Western Coasts of Alaska
(Source: USFWS 2010)

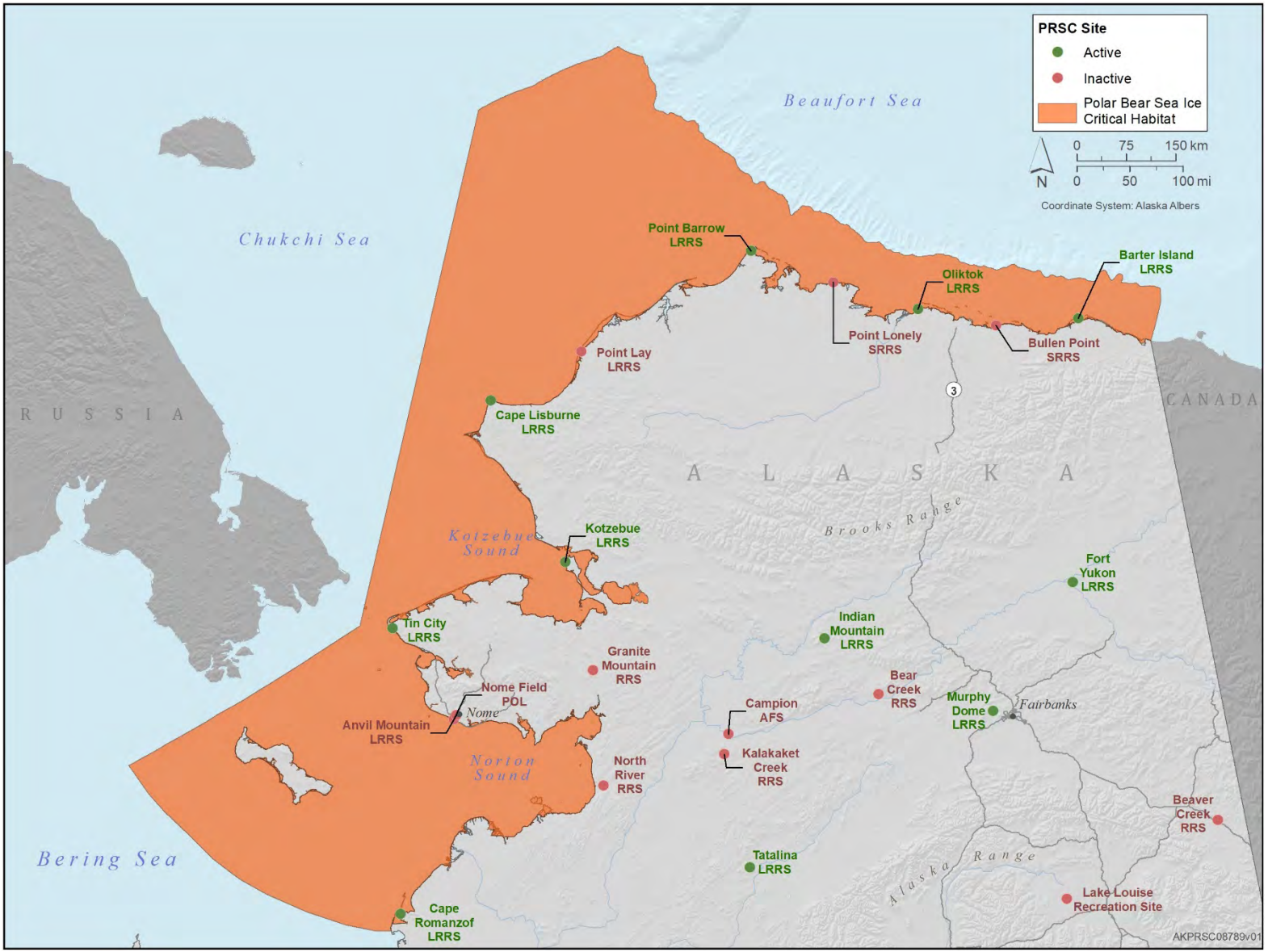

Figure H-32. Polar Bear Sea Ice Critical Habitat along the Northern and Western Coasts of Alaska
(Source: USFWS 2010)

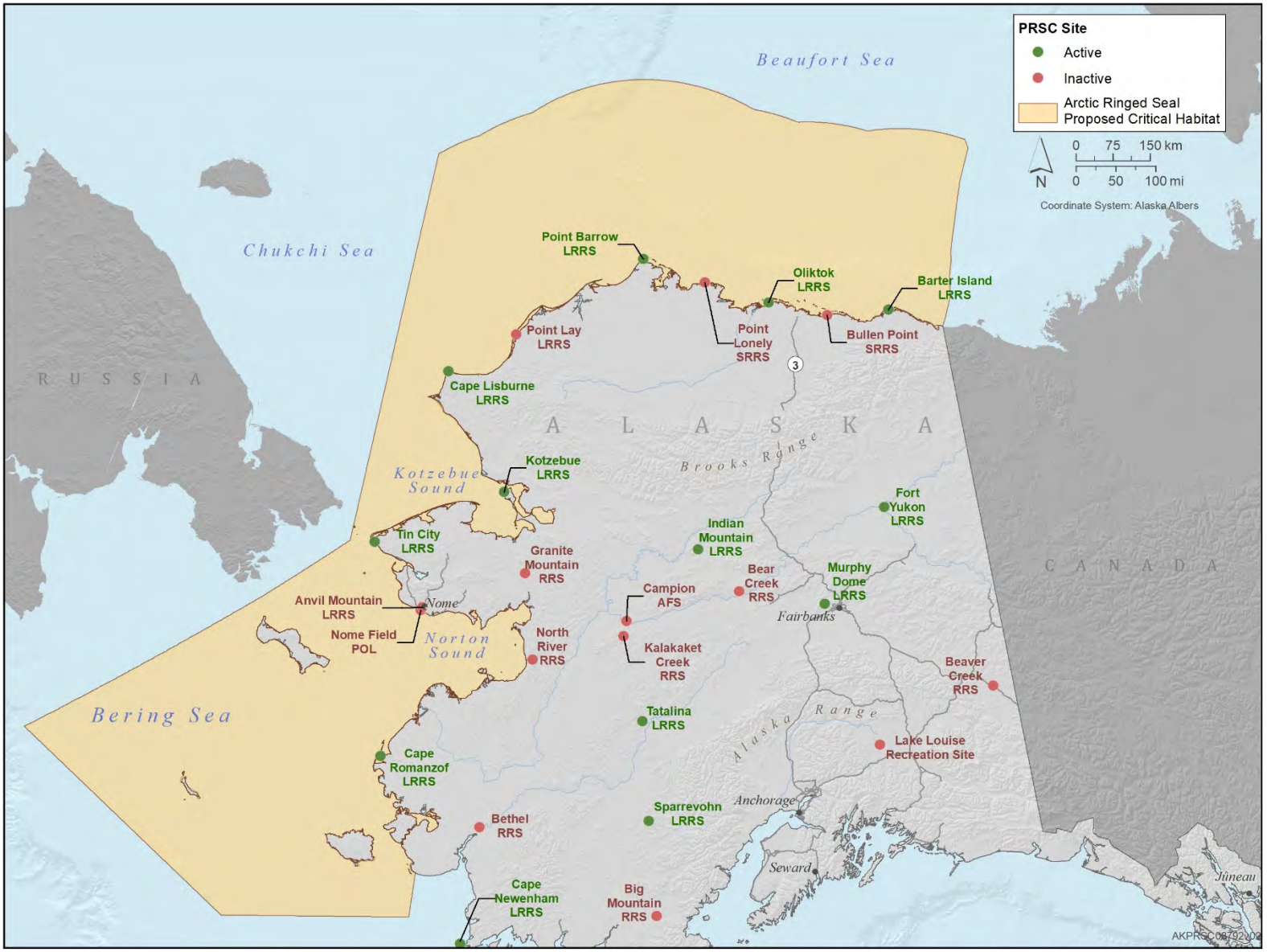

Figure H-33. Proposed Arctic Ringed Seal Critical Habitat along the Northern and Western Coasts of Alaska
(Source: NMFS 2014)

H.3.10.2 Outdoor Recreation

Natural resources-related recreational activities are fairly limited because Barter Island is isolated from the rest of the Arctic Coastal Plain. A limited amount of recreational fishing for Arctic char is available to LRRS personnel. Even hiking or walking is often limited due to extreme or poor weather conditions. Wildlife viewing of polar bears in the area occurs primarily by tourists. The 1951 Public Land Order no. 715 that withdrew lands for military purposes includes a provision that allows "the right of the natives to hunt, fish, trap, and otherwise use the land in their customary manner."

H.3.11 Mission and Other Impacts on Natural Resources

H.3.11.1 Land Use

Current facilities at the Barter Island LRRS include the module train building (the primary facility that includes the MAR Tower, power plant building, and living quarters), vehicle maintenance shop, and a fuel storage and filling area. In addition, a small 480-square foot weather balloon hut is leased by the National Aeronautics and Space Administration (NASA) and the University of Alaska, Fairbanks (611 CES 2019). In addition, 5-year reviews are conducted at four ERP sites on the site, three of which are located within the main developed area and one just north of the center of the old runway.

ATTACHMENT 4: NATURAL RESOURCES OF THE POINT BARROW, OLIKTOK, AND BARTER ISLAND SITES

Table H-20. Vascular Plant Species Observed or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name	Scientific Name	PB	OL	BI	Observed	Source(s)
SHRUBS						
Bog rosemary	*Andromeda polifolia*					
Alpine bearberry	*Arctostaphylos alpine*			X		2, 4
Red-fruit bearberry	*Arctostaphylos rubra*	X	X	X		2
Dwarf birch	*Betula nana*					
Lapland cassiope	*Cassiope tetragona*	X	X	X	All	2-6
Bunchberry	*Cornus Canadensis*		X			1, 2, 3
Diapensia	*Diapensia lapponica*					2, 3
Arctic avens	*Dryas integrifolia*	X	X	X	OL, BI	1-3, 5, 6
White Mountain-avens	*Dryas octopetala*					2
Crowberry	*Empetrum nigrum*			X	BI	2, 5, 6
Narrowleaf labrador tea	*Ledum palustre decumbens*	X	X	X	OLI	2
Alpine azalea	*Loiseleuria procumbens*					1, 3
Lapland rosebay	*Rhododendron lapponicum*					2, 3
Cloudberry	*Rubus chamaemorus*	X	X	X	BI	2, 4-6
Feltleaf willow	*Salix alaxensis*	X	X	X		2, 4
Arctic willow	*Salix arctica*	X	X	X	All	2, 4-6
Chamisson's willow	*Salix chamissonis*			X	BI	
Alaska bog willow	*Salix fuscescens*	X	X	X	BI	2
Northern willow	*Salix glauca*	X	X	X	PB	2, 5
Woolly willow	*Salix richardsonii*	X	X	X	PB, BI	2, 5
Snow willow	*Salix niphoclada*			X	BI	
Oval-leafed willow	*Salix ovalifolia*	X	X	X	All	2, 5
Veiny-leafed willow	*Salix phlebophylla*	X	X	X	PB, BI	2, 5
Polar willow	*Salix polaris*	X	X	X	PB	2, 6
Diamond-leaf willow	*Salix pulchra*	X	X	X	All	1, 4, 5
Net-veined willow	*Salix reticulate*	X	X	X	OL, BI	2, 3, 5
Round-leaf willow	*Salix rotundifolia*	X	X	X	All	2, 5
Bog blueberry	*Vaccinium uliginosum*			X		2
Mountain cranberry	*Vaccinium vitis-idaea*	X	X	X	All	2
HERBACEOUS						
Alpine foxtail	*Alopecurus alpinus*	X	X	X	All	5, 6
Rock jasmine	*Androsace chamaejasme*	X	X	X	OL, BI	1, 3, 5
Northern jasmine	*Androsace septentrionalis*	X	X	X		1, 4
Pasque flower	*Anemone multiceps*			X		1, 4
Narcissus-flower anemone	*Anemone narcissiflora*					1, 3
Northern anemone	*Anemone parviflora*	X	X	X		1, 3
Yellow anemone	*Anemone richardsonii*	X	X	X		1, 3
Pussytoes	*Antennaria friesiana*	X	X	X		1, 4
Cats paws	*Antennaria monocephala*	X	X	X		1, 4
Polar grass	*Arctagrostis latifolia*	X	X	X	All	5
Pendent grass	*Arctophila fulva*	X	X	X	All	1, 4, 5, 6
Tall sandwort	*Arenaria capillaris*					1, 4
Alpine arnica	*Arnica alpina*	X	X	X		1, 3, 4
Frigid arnica	*Arnica frigida*	X	X	X		1, 3
Lessing's arnica	*Arnica lessingii*					1, 4

Table H-20. Vascular Plant Species Observed or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name	Scientific Name	PB	OL	BI	Observed	Source(s)
Arctic wormwood	*Artemisa arctica arctica*		X	X	BI, OL	1, 4
Arctic wormwood	*Artemisa arctica comata*			X	BI	1, 4-6
Northern wormwood	*Artemisa borealis*		X	X		1, 4
Purple wormwood	*Artemisia globularia*					1, 3
Wormwood	*Artemisia* sp.		X	X	OL, BI	6
Siberian aster	*Aster sibiricus*	X	X	X		1, 3
Alpine milkvetch	*Astragalus alpinus*	X	X	X	BI, OL	1, 3-5
Milkvetch	*Astragalus umbellatus*	X	X	X	BI, OL	1, 3, 5
Mountain meadow bistort	*Polygonum bistorta*	X	X	X	BI, OL	5
Alpine bistort	*Polygonum viviparum*	X	X	X	All	5
Moonwort	*Botrychium lunaria*					1, 4
Purplish braya	*Braya purpurascens*			X	BI	5
Bluejoint	*Calamagrostis canadensis*					1, 4, 6
Reed bent grass	*Calamagrostis deschampioides*		X		OL	6
Reed bent grass	*Calamagrostis* sp.		X	X		1, 4
Reed bent grass	*Calamagrostis stricta*	X			PB	5
Marsh marigold	*Caltha palustris*	X	X	X	All	1, 3, 5
Bluebell	*Campanula lasiocarpa*	X	X	X		1, 3
Bittercress	*Cardamine digitata*			X	BI	1, 3, 5
Boreal bittercress	*Cardamine hyperborea*					
Cuckoo flower	*Cardamine pratensis*	X	X	X	All	1, 4-6
Sedge	*Carex aquatilis*	X	X	X	All	1, 4-6
Sedge	*Carex atrofusca*					
Sedge	*Carex bigelowii*	X	X	X	BI, OL	1, 4-6
Sedge	*Carex capillaris*		X	X	OL, BI	5
Sedge	*Carex glareosa*			X	BI	5
Sedge	*Carex maritima*			X	BI	5
Sedge	*Carex membranacea*			X	BI	5
Sedge	*Carex misandra*			X	BI	5
Sedge	*Carex rariflora*		X	X	OL, BI	5
Sedge	*Carex rotundata*		X	X	OL, BI	5
Sedge	*Carex saxatilis*		X	X	OL, BI	5
Sedge	*Carex subspathacea*	X	X	X	All	5
Sedge	*Carex ursina*	X	X	X	All	5
Sedge	*Carex vaginata*					
Elegant paintbrush	*Castilleja elegans*					1, 3
Paintbrush	*Castilleja* sp.					1
Beringian chickweed	*Cerastium beeringianum*	X	X	X	All	1, 4-6
Chickweed	*Cerastium jenisejense*	X		X	PB, BI	5
Arctic daisy	*Chrysanthemum arcticum*			X		1, 3
Entire-leaved chrysanthemum	*Chrysanthemum integrifolium*	X	X	X	OL, BI	1, 3, 5
Northern water carpet	*Chrysosplenium tetrandrum*	X		X	PB, BI	5
Bering Sea water carpet	*Chrysosplenium wrightii*	X		X	BI	5
Alaska spring beauty	*Claytonia sarmentosa*					1, 3
Scurvy grass	*Cochlearia officinalis*	X	X	X	All	5
Coral root	*Corallorrhiza trifida*		X	X		1, 3
Cushion hawk's beard	*Crepis nana*			X		1, 3, 4
Dwarf larkspur	*Delphinium brachycentrum*					
Frigid shooting star	*Dodecatheon frigidum*		X	X		1, 3
Ochotsk douglasia	*Douglasia ochotensis*		X	X		1, 3

Table H-20. Vascular Plant Species Observed or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name	Scientific Name	PB	OL	BI	Observed	Source(s)
Draba	*Draba alpina*			X	BI	5
Smoothing whitlow-grass	*Draba hirta*		X	X		1, 3, 6
Draba	*Draba lactea*	X		X	PB, BI	5, 6
Tundra grass	*Dupontia fischeri*	X	X	X	All	5, 6
Fireweed	*Epilobium angustifolium*					
	Epilobium davuricum					
River beauty	*Epilobium latifolium*	X	X	X	BI	1, 3, 5, 6
Common horsetail	*Equisetum arvense*			X	BI	5
Variegated horsetail	*Equisetum variegatum*			X	BI	5
Cutleaf fleabane	*Erigeron compositus*					1, 3
Dwarf fleabane	*Erigeron eriocephalus*			X	BI	5
Fleabane	*Erigeron humilis*			X		1, 3
Arctic fleabane	*Erigeron hyperboreus*			X		1, 3
Narrow-leafed cottongrass	*Eriophorum angustifolium*	X	X	X	All	5
Russet cottongrass	*Eriophorum russeolum*	X	X	X	All	5
Arctic cottongrass	*Eriophorum scheuchzeri*	X	X	X	All	1, 3, 5, 6
Cottongrass	*Eriophorum triste*	X		X	PB, BI	5
Sheathed cottongrass	*Eriophorum vaginatum*	X	X	X	All	5
Arctic forget-me-not	*Eritichum aretioides*	X	X	X		1, 3
Edward's eutrema	*Eutrema edwardsii*			X	BI	5
Alpine fescue	*Festuca brachyphylla*	X		X	PB, BI	5
Red fescue	*Festuca rubra*			X	BI	5
Fescue grass	*Festuca* sp.	X	X	X		1, 4, 6
Glaucous gentian	*Gentiana glauca*	X				1, 3
Glacier avens	*Geum glaciale*			X		1, 3
Alpine eskimo potato	*Hedysarum hedysaroides*					1, 4
Alpine holy grass	*Hierochloe alpine*	X	X	X	All	5
Arctic holy grass	*Hierochloe pauciflora*	X	X	X	All	5
Mare's tail	*Hippuris tetraphylla*			X	BI	5
Mare's tail	*Hippuris vulgaris*			X	BI	
Seabeach sandwort	*Honckenya peploides*	X	X	X	All	5
Rush	*Juncus biglumis*	X		X	PB, BI	5
Glaucous weaselsnout	*Lagotis glauca*			X	BI	1, 3, 5
Bladder pod	*Lesquerella arctica*		X	X		1, 4
Lyme grass	*Leymus mollis*	X		X	PB	5
Alp lily	*Lloydia serotina*	X	X	X	OL	1, 3
Alpine azalea	*Loiseleuria procumbens*					1, 3
Arctic lupine	*Lupinus arcticus*	X	X	X		1, 4
Arctic woodrush	*Luzula arctica*	X		X	PB, BI	5
Northern woodrush	*Luzula confuse*	X		X	PB, BI	5
Many-flowered woodrush	*Luzula multiflora*			X	BI	5
Tundra woodrush	*Luzula tundricola*					
Wahlenberg's woodrush	*Luzula wahlenbergii*					
Fir club moss	*Lycopodium selago*		X		OL	
Catchfly	*Melandrium affine*					
Bladder campion	*Melandrium apetalum*	X	X	X	OL, BI	1, 4, 6
Oysterleaf	*Mertensia maritime*	X		X	PB, BI	5
Arctic sandwort	*Minuartia arctica*			X	BI	1, 4, 5
Alpine forget-me-not	*Myosotis alpestris*					1, 3
Moutain sorrel	*Oxyria digyna*	X		X	PB, BI	5

Table H-20. Vascular Plant Species Observed or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name	Scientific Name	PB	OL	BI	Observed	Source(s)
Boreal oxytrope	*Oxytropis borealis*					
Blackish oxytrope	*Oxytropis nigrescens bryophila*		X	X	BI	1, 3, 5
Arctic poppy	*Papaver hultenii*	X			PB	5
Lapland poppy	*Papaver lapponicum*	X	X	X	BI	1, 3, 5
Macoun's poppy	*Papaver macounii*	X	X	X	All	5, 6
Kotzebue bog star	*Parnassia kotzebuei*					
Grass of parnassus	*Parnassia palustris*		X	X		1, 3, 4
Mustard	*Parrya nudicaulis*					
Lousewort	*Pedicularis capitata*	X	X	X	BI	1, 3, 5
Lousewort	*Pedicularis kanei*	X	X	X	All	
Lousewort	*Pedicularis labradorica*					
Lousewort	*Pedicularis lanata*	X		X	PB, BI	5
Lousewort	*Pedicularis langsdorffii*	X			PB	5
Oeder's lousewort	*Pedicularis oederi*					1, 3
Lousewort	*Pedicularis sudetica*	X	X	X	All	1, 3, 5, 6
Bumble bee flower	*Pedicularis verticillata*	X	X	X		1, 3, 6
Sweet coltsfoot	*Petasites frigides*	X	X	X	All	1, 5, 6
Snow grass	*Phippsia algida*	X		X	PB, BI	5
Siberian phlox	*Phlox sibirica*					1, 3
Common bluegrass	*Poa alpigena*	X		X	PB, BI	5
Alpine bluegrass	*Poa alpine*					1, 4
Arctic bluegrass	*Poa arctica*	X	X	X	All	5
Blue grass	*Poa glauca*	X	X	X	All	6
Blue grass	*Poa* sp.	X	X	X		1, 4
Tall Jacob's ladder	*Polemonium acutiflorum*	X	X	X		1, 3
Boreal Jacob's ladder	*Polemonium boreale*			X	BI	5
Two-flowered cinquefoil	*Potentilla biflora*					1, 3
Arctic cinquefoil	*Potentilla hyparctica*	X		X	PB, BI	5
Marsh fivefinger	*Potentilla palustris*		X	X		1, 3
Bright conquefoil	*Potentilla pulchella*			X	BI	5
One-flowered cinquefoil	*Potentilla uniflora*		X	X		1, 3
Northern primrose	*Primula borealis*		X	X	OL, BI	1, 3, 5
Anderson's alkali grass	*Puccinellia andersonii*					
Dwarf alkali grass	*Puccinellia langeana*	X		X	PB, BI	5
Creeping alkali grass	*Puccinellia phryganodes*	X	X	X	All	5
Large-flowered wintergreen	*Pyrola grandiflora*	X	X	X	OL	1, 3
Gmelin's buttercup	*Ranunculus gmelinii*			X	BI	5
Arctic buttercup	*Ranunculus hyperboreus*	X		X	All	5
Snow buttercup	*Ranunculus nivalis*	X		X	PB, BI	5
Pallas's buttercup	*Ranunculus pallasii*	X		X	PB, BI	5
Pygmy buttercup	*Ranunculus pygmaeus*	X		X	PB, BI	5
Buttercup	*Ranunculus* sp.	X	X	X		1, 4, 6
White water crowfoot	*Ranunculus trichophyllus*					
Roseroot	*Rhodiola integrifolia*		X	X	OL, BI	5
Arctic dock	*Rumex arcticus*	X	X	X	OL, PB	1, 4, 5
Dock	*Rumex graminifolius*					1, 4, 6
Snow pearlwort	*Sagina nivalis*	X		X	PB, BI	5
Narrow-leafed saussurea	*Saussurea angustifolia*	X	X	X	OL, BI	1, 3, 5
Spotted saxifrage	*Saxifraga bronchialis*	X	X	X	OL	1, 3, 6
Tufted saxifrage	*Saxifraga caespitosa*	X	X	X	All	5, 6

Table H-20. Vascular Plant Species Observed or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name	Scientific Name	PB	OL	BI	Observed	Source(s)
Bulbous saxifrage	*Saxifraga cernua*	X	X	X	All	1, 3, 5
Saxifrage	*Saxifraga davurica*					
Whiplash saxifrage	*Saxifraga flagellaris*	X	X	X		1, 3
Foliolose saxifrage	*Saxifraga foliolosa*	X	X	X	All	5
Hawkweed-leafed saxifrage	*Saxifraga heiracifolia*	X	X	X	All	1, 3, 5
Yellow marsh saxifrage	*Saxifraga hirculus*	X	X	X	All	1, 3-6
Brook saxifage	*Saxifraga nelsoniana*	X	X	X	PB, BI	1, 3, 5
Alpine saxifrage	*Saxifraga nivalis*	X			PB	5
Purple saxifrage	*Saxifraga oppositifolia*	X	X	X	All	1, 3, 5
Heart-leaf saxifrage	*Saxifraga punctata*	X	X	X		1, 3
Alpine brook saxifrage	*Saxifraga rivularis*	X		X	PB, BI	5
Thyme-leaved saxifrage	*Saxifraga serpyllifolia*					1, 3
Arctic senecio	*Senecio atropurpureus frigidus*	X	X	X	All	5
Marsh fleawort	*Senecio congestus*	X	X	X	All	1, 3, 5, 6
Black-tipped groundsel	*Senecio lugens*	X	X	X		1, 3
Alaska-Yukon senecio	*Senecio yukonensis*			X	BI	5
Moss campion	*Silene acaulis*			X	OL, BI	1, 3
Smelowskia	*Smelowskia calycina*					1, 3
Goldenrod	*Solidago multiradiata*		X	X		1, 3
Fleshy stitchwort	*Stellaria crassifolia*			X	BI	5
Edwards's stitchwort	*Stellaria edwardsii*	X		X	PB, BI	
Low chichweed	*Stellaria humifusa*	X	X	X	All	
Long-stalked stitchwort	*Stellaria laeta*	X		X	PB, BI	1, 5, 6
Lyrate dandelion	*Taraxacum alaskanum*			X	BI	5
Horned dandelion	*Taraxacum ceratophorum*	X	X	X	All	5
Dandelion	*Taraxacum* spp.	X	X	X		1, 3
Wild chamomile	*Tripleurospermum phaeocephalum*			X	BI	5
Spiked trisetum	*Trisetum spicatum*			X	BI	5
Common butterwort	*Utricularia vulgaris*			X	BI	5
Capitate valerian	*Valeriana capitata*	X	X	X	BI	1, 3, 5
Mountain heliotrope	*Valeriana sitchensis*			X		1, 3

Sources:

1. Hulten 1968.
2. Viereck and Little 1972.
3. White 1974.
4. Pratt 1991.
5. Elias et al. 1996.
6. 611 ASG 1995c.

2002 site visits by Schick and Frost (ABR, Inc.).

Table H-21. Fish Species Known to Occur or Potentially Occurring on or near the Point Barrow, Oliktok, and Barter Island Sites

Common Name	Scientific Name	Point Barrow	Oliktok	Barter Island
Arctic char	*Salvelinus alpinus*	X	X	X
Arctic cisco	*Coregonus autumnalis*	X	X	X
Arctic flounder	*Liopsetta glacialis*	X	X	X
Arctic grayling	*Thymallus arcticus*	X	X	X
Bering cisco	*Coregonus laurettae*	X	X	
Broad whitefish	*Coregonus nasus*	X	X	X
Burbot	*Lota lota*		X	
Capelin	*Mallotus villosus*			
Chum salmon	*Oncorhynchus keta*	X	X	X
Dolly Varden	*Salvelinus malma*	X	X	X
Eelpout	*Lycodes* sp.			X
Fourhorn sculpin	*Myoxocephalus quadricornis*		X	X
Humpback whitefish	*Coregonus pidschian*	X	X	X
Northern pike	*Esox lucius*	X		
Pacific herring	*Clupea pallasi*		X	
Pink salmon	*Oncorhynchus gorbuscha*	X	X	X
Polar cod	*Boreogadus saida*	X	X	
Rainbow smelt	*Osmerus mordax*	X	X	X
Round whitefish	*Prosopium cylindraceum*		X	
Saffron cod	*Eleginus gracilis*	X		X
Sardine cisco	*Coregonus sardinella*	X	X	X
Sheefish	*Stenodus leucichthys*		X	X
Starry flounder	*Platichthys stellatus*	X		

Sources: Morrow 1980; Craig 1984; Minerals Management Service 1987a; Robbins et al. 1991; ICF Technology, Inc. 1996a; 611 ASG 1995c, 1999c; Braund and Associates 2004; Johnson and Blossom 2019b.

Table H-22. Mammal Species Observed or Potentially Occurring on or near the Point Barrow, Oliktok, and Barter Island Sites

Common Name (ESA Status)*	Scientific Name	Point Barrow	Oliktok	Barter Island
TERRESTRIAL				
Arctic fox	*Alopex lagopus*	X	X	X
Arctic ground squirrel	*Spermophilus parryii*	X	X	X
Brown bear	*Ursus arctos*	X	X	X
Caribou	*Rangifer tarandus*	X	X	X
Ermine	*Mustela erminea*	X	X	
Hoary marmot	*Marmota caligata*			
Least weasel	*Mustela nivalis*	X	X	X
Moose	*Alces americanus*	X		
Muskox	*Ovibos moschatus*		X	X
Nearctic brown lemming	*Lemmus trimucronatus*	X	X	X
Nearctic collared lemming	*Dicrostonyx groenlandicus*	X	X	X
Red fox	*Vulpes vulpes*		X	
Red-backed vole	*Myodes rutilus*			X
Root vole	*Microtus oeconomus*			X
Wolf	*Canis lupus*	X		X
Wolverine	*Gulo gulo*	X		
MARINE†				
Arctic ringed seal (T)	*Phoca hispida hispida*	X	X	X
Bearded seal (T)	*Erignathus barbatus*	X	X	X
Beluga	*Delphinapterus leucas*	X	X	X
Bowhead (E)	*Balaena mysticetus*	X	X	X
Common minke whale	*Balaenoptera acutorostrata*	X		
Gray whale	*Eschrichtius robustus*	X	X	X
Harbor porpoise	*Phocoena phocoena*	X		
Killer whale	*Orcinus orca*	X	X	X
Narwhal	*Monodon monoceros*	X	X	
Pacific walrus	*Odobenus rosmarus divergens*	X	X	
Polar bear (T)	*Ursus maritimus*	X	X	X
Ribbon seal	*Histriophoca fasciata*	X		
Spotted seal	*Phoca largha*	X	X	X

Notes: *E = endangered, T = threatened; †All marine mammals are listed under the MMPA.
Sources: Barkalow 1952; Hall 1972; Minerals Management Service 1987b; 611 ASG 1995c; Wynne 1993; Day et al. 1995; ICF Technology, Inc. 1996a; Boveng et al. 2013; Smith et al. 2017.

Table H-23. Bird Species Known to or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name (Federal Status)*	Scientific Name	PB	OL	BI	Observed†
Alder flycatcher	*Empidonax alnorum*	X			PB
American golden-plover	*Pluvialis dominica*	X	X	X	All
American kestrel	*Falco sparverius*	X			PB
American pipit	*Anthus rubescens*	X		X	PB
American robin	*Turdus migratorius*	X	X		PB
American tree sparrow	*Spizelloides arborea*	X			PB
American wigeon	*Mareca americana*	X	X	X	All
Arctic tern	*Sterna paradisaea*	X	X	X	All
Arctic warbler	*Phylloscopus borealis*	X			PB
Baird's sandpiper	*Calidris bairdii*	X	X	X	All
Bank swallow	*Riparia riparia*	X			PB
Barn swallow	*Hirundo rustica*	X	X		PB, OL
Bar-tailed godwit	*Limosa lapponica*	X	X		PB, OL
Black guillemot	*Cepphus grille*	X	X		PB, OL
Black scoter	*Melanitta americana*	X	X		All
Black-bellied plover	*Pluvialis squatarola*	X	X	X	OL, BI
Black-capped chickadee	*Poecile atricapillus*	X			PB
Black-legged kittiwake	*Rissa tridactyla*	X	X		PB, OL
Bluethroat	*Cyanecula svecica*	X			PB
Brant	*Branta bernicla*	X	X	X	All
Brewer's blackbird	*Euphagus cyanocephalus*	X			PB
Brown-headed cowbird	*Molothrus ater*	X			PB
Buff-breasted sandpiper	*Calidris subruficollis*	X	X	X	All
Cackling goose	*Branta hutchinsii*	X	X	X	All
Canada goose	*Branta canadensis*	X	X	X	OL, BI
Canada jay	*Perisoreus canadensis*	X			PB
Canada warbler	*Cardellina canadensis*	X			PB
Canvasback	*Aythya valisineria*		X		OL
Chipping sparrow	*Spizella passerina*	X			PB
Cliff swallow	*Petrochelidon pyrrhonota*	X			PB
Common eider	*Somateria mollissima*	X	X	X	All
Common nighthawk	*Chordeiles minor*	X			PB
Common raven	*Corvus corax*	X	X	X	All
Common redpoll	*Acanthis flammea*	X	X	X	All
Crested auklet	*Aethia cristatella*	X			PB
Curlew sandpiper	*Calidris ferruginea*	X			PB
Dark-eyed junco	*Junco hyemalis*	X			PB
Dovekie	*Alle alle*	X			PB
Dunlin	*Calidris alpina*	X	X	X	All
Dusky thrush	*Turdus naumanni*	X			PB
Eastern kingbird	*Tyrannus tyrannus*	X			PB
Eastern yellow wagtail	*Motacilla tschutschensis*	X	X	X	All
Emperor goose	*Anser canagicus*	X			PB
Eurasian dotterel	*Charadrius morinellus*	X		X	PB, BI
Eyebrowed thrush	*Turdus obscurus*	X			PB
Fieldfare	*Turdus pilaris*	X			PB
Fox sparrow	*Passerella iliaca*	X			PB
Glaucous gull	*Larus hyperboreus*	X	X	X	All
Golden eagle (BGEPA)	*Aquila chrysaetos*			X	BI

Table H-23. Bird Species Known to or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name (Federal Status)*	Scientific Name	PB	OL	BI	Observed†
Golden-crowned sparrow	*Zonotrichia atricapilla*	X			PB
Gray-cheeked thrush	*Catharus minimus*	X			PB
Great horned owl	*Bubo virginianus*	X			PB
Greater scaup	*Aythya marila*	X	X	X	All
Greater white-fronted goose	*Anser albifrons*	X	X	X	All
Green-winged teal	*Anas crecca*	X	X	X	All
Gyrfalcon	*Falco rusticolus*	X	X	X	All
Harris's sparrow	*Zonotrichia querula*	X			PB
Hermit thrush	*Catharus guttatus*	X			PB
Herring gull	*Larus argentatus*	X		X	PB, BI
Hoary redpoll	*Acanthis hornemanni*	X	X	X	All
Horned grebe	*Podiceps auritus*	X			PB
Horned lark	*Eremophila alpestris*	X		X	PB, BI
Horned puffin	*Fratercula corniculata*	X			PB
Hudsonian godwit	*Limosa haemastica*	X			PB
Iceland gull	*Larus glaucoides*		X		OL
Ivory gull	*Pagophila eburnea*	X			PB
Killdeer	*Charadrius vociferus*	X	X		PB
King eider	*Somateria spectabilis*	X	X	X	All
Kittlitz's murrelet	*Brachyramphus brevirostris*	X			PB
Lapland longspur	*Calcarius lapponicus*	X	X	X	All
Least auklet	*Aethia pusilla*	X			PB
Least sandpiper	*Calidris minutilla*	X		X	PB
Lesser sand-plover	*Charadrius mongolus*	X			PB
Little bunting	*Emberiza pusilla*	X			PB
Long-billed dowitcher	*Limnodromus scolopaceus*	X	X	X	All
Long-tailed duck	*Clangula hyemalis*	X	X	X	All
Long-tailed jaeger	*Stercorarius longicaudus*	X	X	X	All
Mallard	*Anas platyrhynchos*	X	X	X	OL, BI
Mew gull	*Larus canus*	X			PB
Mountain bluebird	*Sialia currucoides*	X			PB
Northern fulmar	*Fulmarus glacialis*	X			PB
Northern harrier	*Circus hudsonius*	X	X	X	All
Northern pintail	*Anas acuta*	X	X	X	All
Northern rough-winged swallow	*Stelgidopteryx serripennis*	X			PB
Northern shoveler	*Spatula clypeata*	X	X	X	All
Northern waterthrush	*Parkesia noveboracensis*	X			PB
Northern wheatear	*Oenanthe oenanthe*	X			PB
Orange-crowned warbler	*Leiothlypis celata*	X			PB
Pacific loon	*Gavia pacifica*	X	X	X	All
Pacific wren	*Troglodytes pacificus*	X			PB
Pallas's bunting	*Emberiza pallasi*	X			PB
Parakeet auklet	*Aethia psittacula*	X			PB
Parasitic jaeger	*Stercorarius parasisticus*	X	X	X	All
Pectoral sandpiper	*Calidris melanotos*	X	X	X	All
Pelagic cormorant	*Phalacrocorax pelagicus*	X			PB
Peregrine falcon	*Falco peregrinus*	X	X	X	All
Pomarine jaeger	*Stercorarius pomarinus*	X	X	X	All

Table H-23. Bird Species Known to or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name (Federal Status)*	Scientific Name	PB	OL	BI	Observed†
Red knot	*Calidris canutus*	X			PB
Red phalarope	*Phalaropus fulicarius*	X	X	X	All
Red-breasted merganser	*Mergus serrator*	X	X	X	All
Red-necked phalarope	*Phalaropus lobatus*	X	X	X	All
Red-necked stint	*Calidris ruficollis*	X			PB
Red-tailed hawk	*Buteo jamaicensis*	X			PB
Red-throated loon	*Gavia stellata*	X	X	X	All
Red-winged blackbird	*Agelaius phoeniceus*	X			PB
Rock ptarmigan	*Lagopus muta*	X		X	PB, BI
Ross' gull	*Rhodoctethia rosea*	X			PB
Rough-legged hawk	*Buteo lagopus*		X	X	OL, BI
Ruby-crowned kinglet	*Regulus calendula*	X			PB
Ruddy turnstone	*Arenaria interpres*	X	X	X	PB, OL
Rusty blackbird	*Euphagus carolinus*	X			PB
Sabine's gull	*Xema sabini*	X	X	X	OL, BI
Sanderling	*Calidris alba*	X	X	X	All
Sandhill crane	*Antigone canadensis*	X		X	PB, BI
Savannah sparrow	*Passerculus sandwichensis*	X	X	X	All
Say's phoebe	*Sayornis saya*	X			PB
Scarlet tanager	*Piranga olivacea*	X			PB
Semipalmated plover	*Charadrius semipalmatus*	X	X	X	All
Semipalmated sandpiper	*Calidris pusilla*	X	X	X	All
Sharp-tailed sandpiper	*Calidris acuminata*	X	X		PB
Short-eared owl	*Asio flammeus*	X		X	PB, BI
Short-tailed shearwater	*Ardenna tenuirostris*	X			PB
Siberian accentor	*Prunella montanella*	X			PB
Slaty-backed gull	*Larus schistisagus*	X			PB
Smith's longspur	*Calcarius pictus*	X			PB
Snow bunting	*Plectrophenax nivalis*	X	X	X	All
Snow goose	*Anser caerulescens*	X	X	X	All
Snowy owl	*Bubo scandiacus*	X	X	X	All
Solitary sandpiper	*Tringa solitaria*	X			PB
Spectacled eider (T)	*Somateria fischeri*	X	X	X	All
Spotted sandpiper	*Actitis macularius*	X			PB
Steller's eider (T)	*Polysticta stelleri*	X			PB
Stilt sandpiper	*Calidris himantopus*	X		X	PB
Surf scoter	*Melanitta perspicillata*	X	X	X	All
Thick-billed murre	*Uria lomvia*	X	X		PB, OL
Tree swallow	*Tachycineta bicolor*	X	X	X	PB, BI
Tufted puffin	*Fratercula cirrhata*	X			PB
Tundra swan	*Cygnus columbianus*	X	X	X	All
Upland sandpiper	*Batramia longicauda*			X	BI
Varied thrush	*Ixoreus naevius*	X	X		PB, OL
Violet-green swallow	*Tachycineta thalassina*	X			PB
Wandering tattler	*Tringa incana*	X			PB
Western sandpiper	*Calidris mauri*	X	X	X	PB, BI
Western tanager	*Piranga ludoviciana*	X			PB
Western wood-pewee	*Contopus sordidulus*	X			PB
Whimbrel	*Numenius phaeopus*	X	X	X	All

Table H-23. Bird Species Known to or Potentially Occurring on or near the Point Barrow (PB), Oliktok (OL), and Barter Island (BI) Sites

Common Name (Federal Status)*	Scientific Name	PB	OL	BI	Observed†
White wagtail	*Motacilla alba*	X			PB
White-crowned sparrow	*Zonotrichia leucophrys*	X			PB
White-rumped sandpiper	*Calidris fuscicollis*	X	X	X	PB, OL
White-winged scoter	*Melanitta deglandi*		X	X	OL, BI
Willow ptarmigan	*Lagopus lagopus*	X	X	X	All
Willow Warbler	*Phylloscopus trochilus*	X			PB
Wilson's snipe	*Gallinago delicata*	X	X	X	All
Wilson's phalarope	*Phalaropus tricolor*	X			PB
Wilson's warbler	*Cardellina pusilla*	X			PB
Wood sandpiper	*Tringa glareola*	X			PB
Yellow warbler	*Setophaga petechia*	X	X		PB, OL
Yellow-billed loon	*Gavia adamsii*	X	X	X	All
Yellow-rumped warbler	*Setophaga coronata*	X			PB

Notes: *BGEPA = Bald and Golden Eagle Protection Act, T = threatened. All bird species are protected under the MBTA except for ptarmigan.

Sources: †Potentially Occurring Species: Hall 1972; Pitelka 1974; King 1977; Spindler 1978, 1979; Garner and Reynolds 1987; Gusey 1988; Norton et al. 1993; Day et al. 1995; 611 ASG 1995d.
Observed: Hall 1972; Pitelka 1974; Andres and Brann 1997; Andres et al. 1999; Ritchie et al. 2003; Frost et al. 2007; Oasis Environmental, Inc. 2008; Suydam (in litt.); Pearce et al. 2018; 611th Avifaunal Database (https://usfws-mbm-landbirds.shinyapps.io/611thAvifaunalDatabase/).

H.4 CAPE LISBURNE LRRS

H.4.1 Location and Area

Cape Lisburne LRRS consists of 1,123 acres along the shore of Ledyard Bay in the Chukchi Sea and lies within the Chukchi Sea Unit of the Alaska Maritime NWR. The LRRS is 700 miles and 570 miles northwest of Anchorage and Fairbanks, respectively (Figure H-1). The remote site is accessible only by air or sea. The MAR tower is located at Upper Camp at approx. 1,600 ft MSL, and facilities in support of site operations are located at Lower Camp (Figure H-34). The two camps are connected by a 3.9-mile winding road (Figure H-35).

Figure H-34. View of Cape Lisburne LRRS, Lower Camp (looking west)

H.4.2 Installation History

The installation at Cape Lisburne was one of the 12 original AC&W radar sites built in the early 1950s to establish an air defense system in Alaska. The facility became operational in 1953. To resupply the station, a runway was constructed in 1953 and expanded in 1956. A WACS site was co-located with the AC&W radar site in 1957. In 1983, the AC&W squadrons were inactivated and Cape Lisburne was redesignated an LRRS. A MAR system was installed in 1985 at Upper Camp and remains active. Unnecessary facilities were removed as the radar systems were increasingly automated and Clean Sweep activities were completed at the site during 2001-2004 (611 CES 2019).

H.4.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. The year-round operation, maintenance, and support of the LRRS is currently conducted by 3 on-site contractor personnel (611 CES 2019).

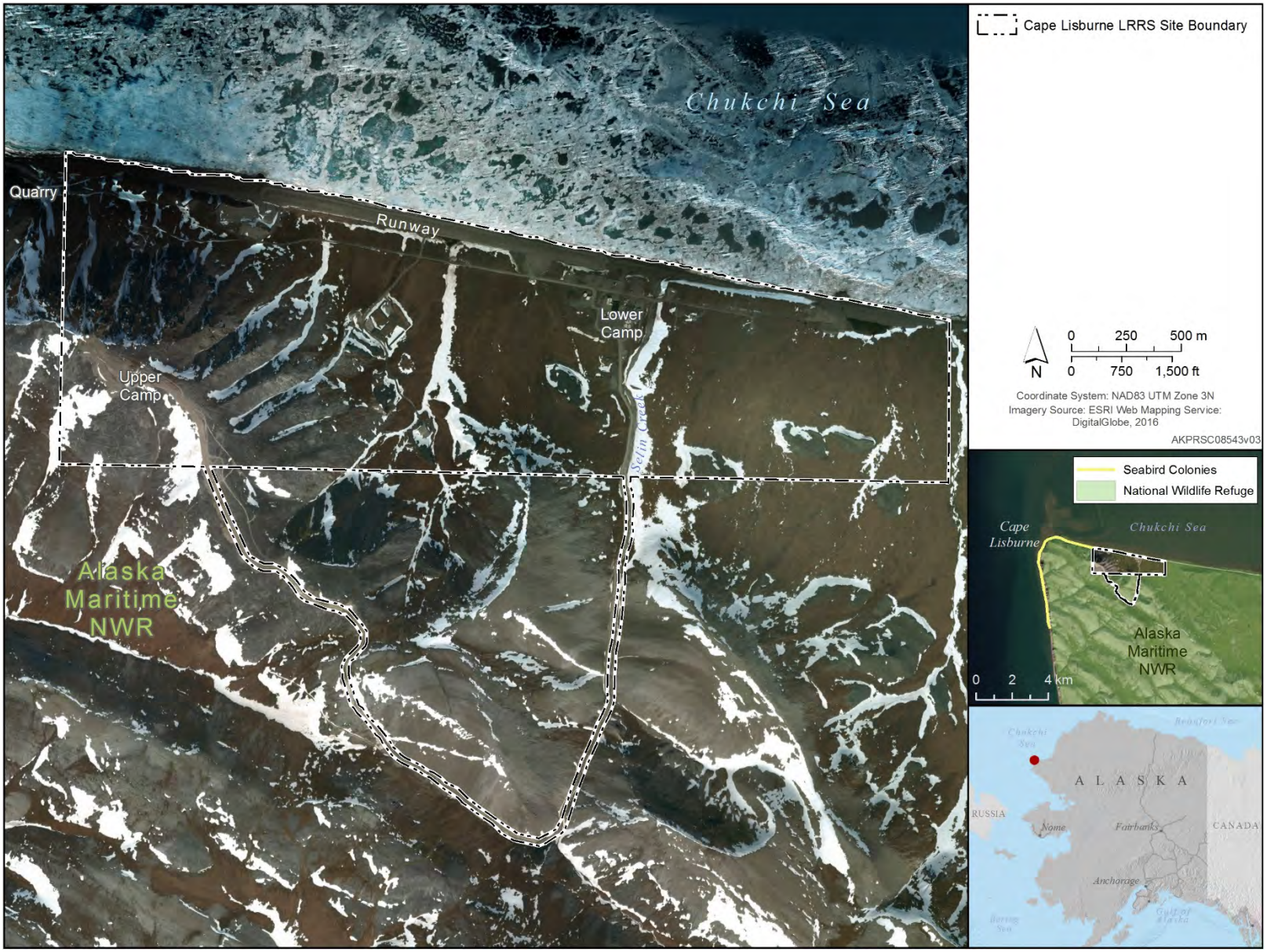

Figure H-35. Overview of Cape Lisburne LRRS

H.4.4 Surrounding Communities

Point Hope, located 35 miles to the southwest of the LRRS, is the nearest community. No road connects Point Hope and Cape Lisburne LRRS. The estimated 2018 population of Point Hope was 693, with 89% being Inupiat (State of Alaska 2018). The local economy is largely based on subsistence hunting, fishing, and whaling. Approximately 57% of full time positions in Point Hope are with city and borough governments. Residents produce a wide array of arts and crafts for sale including whalebone and caribou skin masks, baleen baskets, ivory carvings, and Iñupiaq parkas (North Slope Borough 2019a).

H.4.5 Regional Land Use

Point Hope is located near the end of a triangular spit, which juts 15 miles into the Chukchi Sea. This peninsula is one of the longest continually inhabited areas in North America. Point Hope residents utilize a remarkable array of subsistence resources in the Cape Lisburne area, most notably bowhead (Bacon et al. 2011).

H.4.6 Local and Regional Natural Areas

Cape Lisburne LRRS is within the Chukchi Sea Unit of the Alaska Maritime NWR. The NWR is spread along most of the 47,300 miles of Alaska's coastline. The refuge hosts seabird populations of both national and international significance. Activities focus on long-term ecosystem monitoring, marine resources research, and invasive species management (USFWS 2019a).

H.4.7 Physical Environment

H.4.7.1 Climate

Cape Lisburne lies on the fringe of the Arctic Climatic Zone. Average summer temperatures rarely exceed the high 40s to low 50s ºF (Table H-24). Average winter temperatures range between -4º and -14 ºF. Precipitation is light, averaging only 11 in annually. Snow can occur in any month of the year but primarly during October-April. Winds are predominantly from the east and average 14 mph throughout the year.

Table H-24. Monthly Climate Averages for Cape Lisburne, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	4.6	-4.2	-0.7	11.2	30.1	42.5	49.8	48.5	40.1	26.1	12.7	2.6
Avg. Low (ºF)	-6.8	-14.3	-11.1	0.4	21.5	33.5	40.5	41.3	34.4	19.8	4.8	-6.4
Avg. Precipitation (inches)	0.5	0.3	0.3	0.4	0.4	0.6	1.9	2.7	2.0	1.1	0.8	0.3
Avg. Snowfall (inches)	5.0	2.9	2.9	3.7	1.9	0.6	0.5	0.4	3.4	9.2	7.3	3.5
Avg. Wind Speed (mph)	14	16	13	12	11	11	13	14	16	16	15	16
Prevailing Wind Direction	E	E	E	E	E	E	SSW	SSW	E	ENE	E	E

Source: 611 CES 2019.

H.4.7.2 Topography

Cape Lisburne is part of the Kotzebue Sound subregion of Alaska which encompasses 41,000 miles^2 and includes the De Long Mountains. Headwaters of the subregion's major waterways (the Kivalina, Wulik, Noatak, Kobuk, and Ambler rivers) rise in the De Long and Baird mountains. Cape Lisburne LRRS is located in the Lisburne Hills of the De Long Mountains.

The main base camp facilities at Lower Camp are along a coastal strip at 50 ft MSL. Upper Camp is at 1,585 ft MSL (Argonne National Laboratory 2013).

H.4.7.3 Geology and Soils

The geology of the Cape Lisburne LRRS Lower Camp and airfield is dominated by highly permeable talus and alluvial fan deposits, consisting of clay, silt, sand, gravel, and cobbles with some boulders. A tundra surface layer mantles coastal lowlands. The material may be mixed where they occur as talus (deposited as a result of downslope unchannelized runoff) but appears to be stratified along the course of Selin Creek. The stream alluvium is on the order of 40 ft thick near the station's water intake. The unconsolidated deposits are underlain by block shale. The geology at Upper Camp is dominated by relatively thin accumulations of gravelly residuum. Shale bedrock outcrops along steep-walled slopes and in eroded areas (Gutleber undated [a]).

Permafrost is relatively continuous in the Cape Lisburne area. The permafrost layer may reach a maximum depth of 600 to 800 ft below grade at the coast and, further inland, maximum permafrost depths may reach 1,330 ft below grade (Gutleber undated [a]).

H.4.8 Hydrology

H.4.8.1 General

Drainage at Cape Lisburne LRRS flows overland to diversion channels which terminate at the Chukchi Sea. Some LRRS runoff is directed to Selin Creek (Figure H-35), which also discharges to the Chukchi Sea. Selin Creek is significant because the LRRS obtains its water resources from shallow alluvial sediments underlying the stream (Gutleber undated [a]).

Lower Camp is underlain by thick, continuous permafrost. The depth of summer thawing in undisturbed ground ranges from 1 to 4 ft; during winter, seasonal frost penetrates completely to the top of underlying permafrost. Shallow groundwater occurs in the active zone above the permafrost layer during summer and fall. The shallow groundwater is discharged to the Chukchi Sea. The existence of groundwater at Upper Camp is unknown. If groundwater is present, it is likely contained in fractures, fissures, faults, bedding planes, or other secondary openings in local bedrock (Gutleber undated [a]).

H.4.8.2 Floodplains

The land rises quickly from the sea, so there is no coastal flooding. The coastal floodplain is below the headland of the beach. The floodplain of Selin Creek is within the banks of the creek as it leaves the mountain valley and flows by Lower Camp. The creek and the road to Upper Camp both occupy the valley floor. The flood level within the valley is less than 3 ft (Legare 1998).

H.4.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Cape Lisburne LRRS and the surrounding area. Attachment 5 contains lists of vascular plants (Table H-27), fish (Table H-28), mammals (Table H-29), and birds (Table H-30) known to occur or potentially occurring in the Cape Lisburne area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Cape Lisburne site are discussed in in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.4.9.1 Ecoregion Classification

The Cape Lisburne site is located in the Brooks Foothills ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.4.9.2 Vegetation/Habitat

A general vegetation map of the Cape Lisburne LRRS was prepared in 1995 (611 ASG 1995d). Schick et al. (2004) made significant improvements in vegetation mapping at Cape Lisburne using 2000 digital aerial photography, conducting flora and fauna surveys, and mapping wildlife habitat. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Cape Lisburne LRRS. CEMML used the most recent imagery found on Google Earth for the site and, if available, 2009-2010 SPOT-5 satellite imagery. The most recent vegetation or habitat mapping for Cape Lisburne LRRS was prepared using high-resolution satellite imagery acquired in 2010-2013, and then supplemented by field visits conducted in July-September 2015 (611 CES/CEIE 2016). A total of 15 habitat classes were identified (Table H-25 and Figure H-36) (descriptions of the habitat classes and their constituent land-cover types can be found in Appendix 2 of 611 CES/CEIE [2016]).

Table H-25. Cape Lisburne LRRS Habitat Classes (2013)

Habitat Class	Area (acres)	Proportion
Lowland Moist Graminoid-Shrub Tundra	363.7	33.2%
Upland Dwarf Scrub	302.6	27.6%
Developed/Disturbed	182.6	16.3%
Upland Rock	172.7	15.8%
Lowland Non-patterned Wet Tundra	33.5	3.1%
Coastal Barrens	33.2	3.0%
Riverine Barrens	10.9	1.0%
Upland Dwarf Scrub (Snowbed)	5.1	0.5%
Marine Water	5.0	0.5%
Lowland Low Open Scrub	3.9	0.4%
Coastal Brackish Water	3.2	0.3%
Riverine Dwarf Scrub	2.9	0.3%
Riverine Low Open Scrub	2.6	0.2%
Lowland Moist Herb Meadow	0.4	<0.1%
Lowland Aquatic Grass Marsh	0.2	<0.1%
Total	**1122.5**	

Notes: †Refer to Figure H-36. Due to the scale of the figure, habitat classes that comprise ≤0.5% of the site are not shown on Figure H-36.
*The original Artificial Barrens and Artificial Partially Vegetated classes have been combined into Developed/Disturbed.
Source: 611 CES/CEIE 2016.

The Cape Lisburne area is primarily comprised of alpine and moist tundra interspersed with extensive areas of barren ground, particularly at higher elevations. The four most extensive habitat classes are Lowland Moist Graminoid-Shrub Tundra, Upland Dwarf Scrub, Developed/Disturbed, and Upland Rock (Table H-25). Lush vegetation grows in the valleys and surrounding Lower Camp, and wetlands occur along the runway. Alpine tundra occurs in mountainous areas and along well-drained rocky ridges. Much of this tundra consists of barren rocks, but low mat plants, both herbaceous and shrubby, are interspersed between the bare rocks and rubble. Plants with a low growth form are typical of this exposed, windswept area. Common species at Cape Lisburne LRRS include mountain avens, Arctic willow, crowberry, narrowleaf Labrador tea, arnica, cassiope and cotton grass. On drier, more stony and barren areas, cushion plants, such as moss campion and saxifrages, may be found (Gutleber undated [a]). See Table H-27 for a list of vascular plant species on or in the vicinity of the Cape Lisburne site.

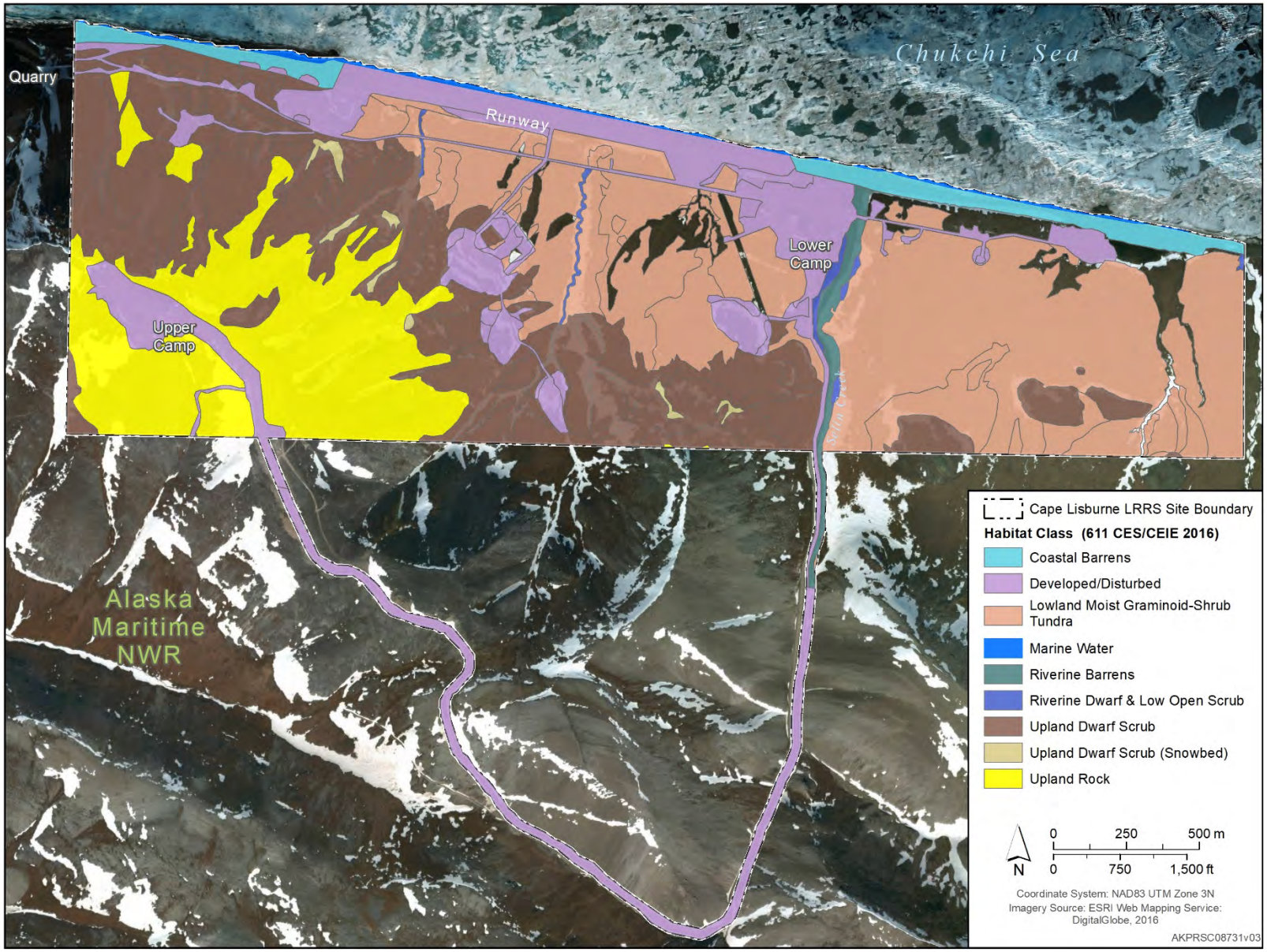

Figure H-36. Cape Lisburne LRRS Habitat Classes (2013)

H.4.9.3 Wetlands

The current mapping of wetlands at Cape Lisburne LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 1,123-acre Cape Lisburne site, 498 acres (or 44%) are considered wetlands per the NWI mapping (Table H-26 and Figure H-37). Freshwater forested/shrub wetlands make up the majority of the wetlands on the site and occur along lower elevations east and west of Lower Camp. Wetlands at Cape Lisburne are strongly dominated by moist tundra, with few wetter areas of persistent standing water or seasonal flooding. Dominant herbaceous plants include *Eriophorum angustifolium, Carex aquatilus, Dupontia fisheri,* and *Arctagrostis latifolia*; the shrub component of these wetlands is dominated by *Salix pulchra, S. rotundifolia,* and *Dryas integrifolia* (Schick et al. 2004).

Table H-26. Cape Lisburne LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	**Proportion**	**Area (acres)**	**Proportion**
Freshwater Forested/Shrub	455.6	40.6%	0	0
Estuarine and Marine	26.5	2.4%	37.2	3.3%
Riverine	11.2	1.0%	131.0	11.7%
Estuarine and Marine Deepwater	3.4	0.3%	0	0
Freshwater Emergent	0.7	0.1%	136.8	12.2%
Freshwater Pond	0.3	<0.1%	0.9	0.1%
Wetlands Total	**497.7**	**44.3%**	**306.0**	**27.3%**
Upland	625.5	55.7%	817.0	72.7%
Site Total	**1,123.2**		**1,123.0**	

Notes: *See Figure H-37. †See Figure H-38.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

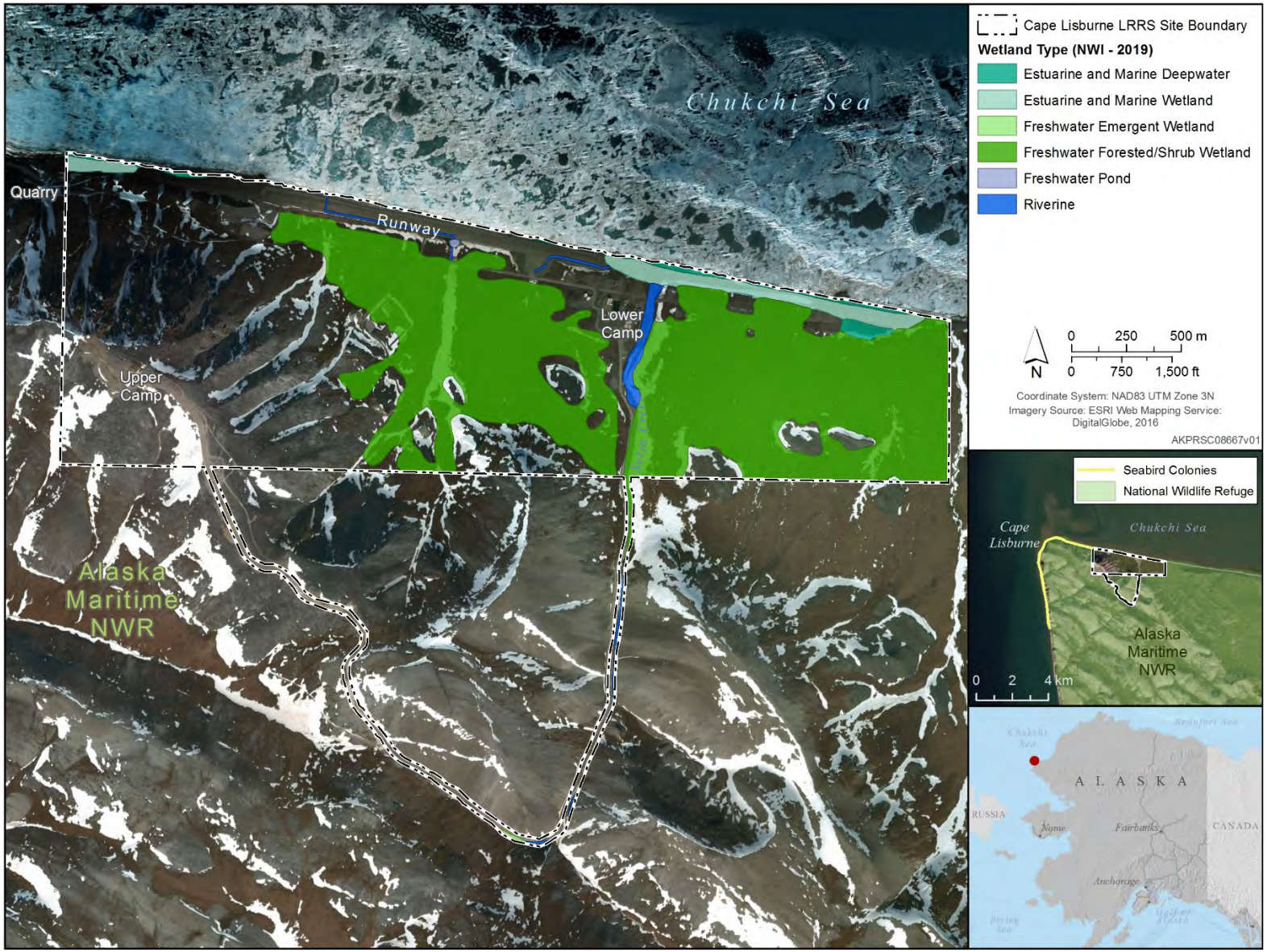

Figure H-37. Cape Lisburne LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

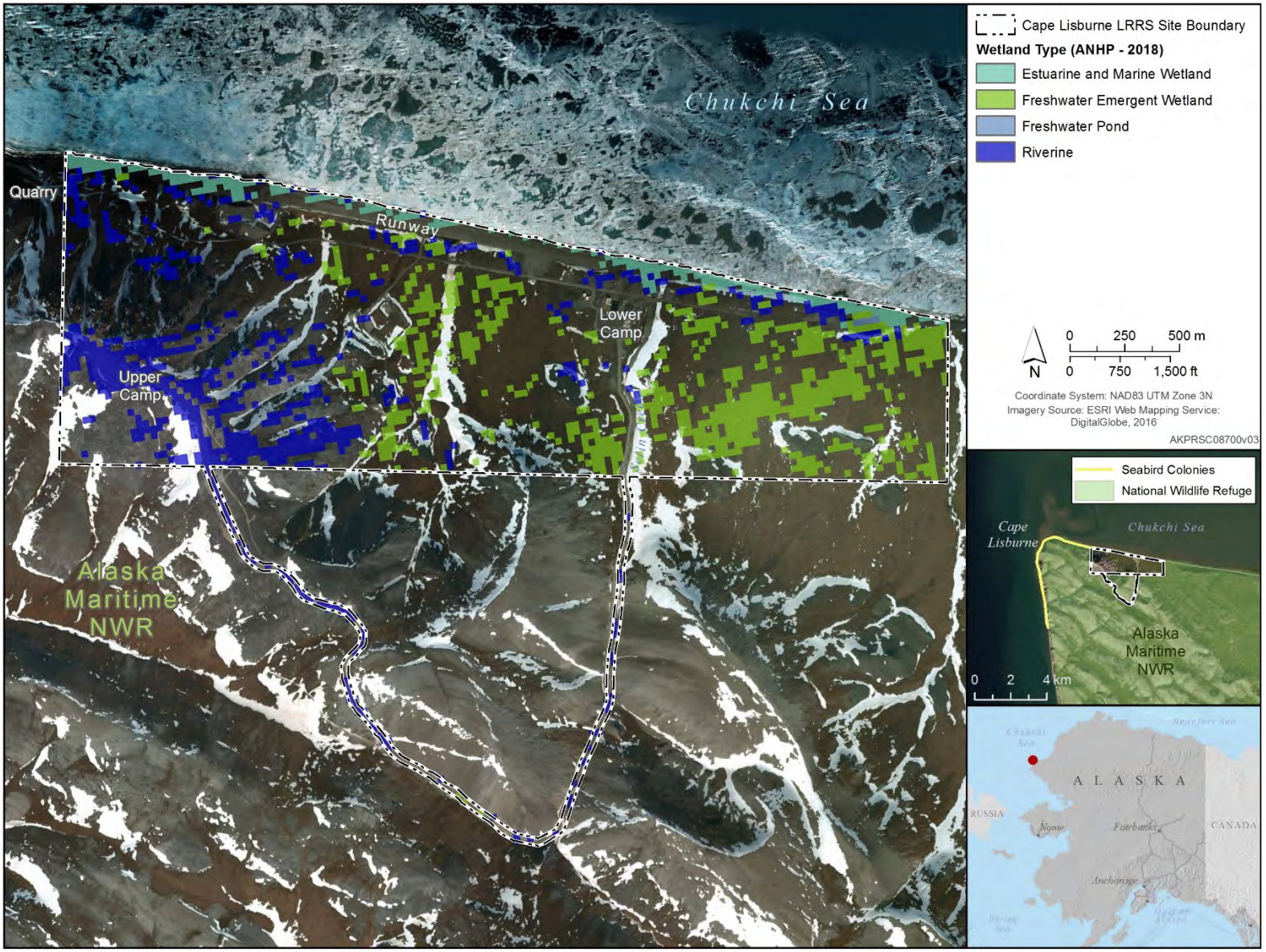

Figure H-38. Cape Lisburne LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.4.9.4 Fish and Wildlife

Cape Lisburne LRRS encompasses about 1,123 acres of gently sloping tundra and steep mountainous terrain. The most common wildlife habitats at the site are lowland tundra near the coast and dwarf scrub and partly barren rock in the mountains. Relatively little riverine and no lacustrine habitat is present. Near the coast, gently sloping terrain is dominated by lowland moist and wet tundra types.

H.4.9.4.1 Fish

Although fish surveys have not been conducted at or in the vicinity of the Cape Lisburne site, 29 fish species potentially occur in the marine waters adjacent to the Cape Lisburne site including Arctic grayling, Arctic cisco, Dolly Varden, Arctic char, whitefish, three sculpin species, rainbow smelt, ninespine stickleback, and chum, coho, Chinook, sockeye, and pink salmon (Table H-28). Selin Creek, which flows through Lower Camp, does not upport anadromous fish (Johnson and Blossom 2019b).

H.4.9.4.2 Mammals

Terrestrial Mammals

A fairly diverse range of terrestrial mammals inhabits northwestern Alaska and 22 species are expected to occur on or in the vicinity of the Cape Lisburne site (Table H-29). Caribou are the most wide-ranging and conspicuous species. Cape Lisburne is within the summer range of the Western Arctic herd. Wolves inhabit the entire region and travel extensively, generally along water courses. They prey on a wide variety of wildlife such as Arctic hare, Arctic ground squirrel, and waterfowl; however, caribou are their principal prey. In higher and drier alpine communities of the Lisburne Hills, brown bear, red fox, Arctic ground squirrel, and Alaska marmot den in dry soils of the tundra. Other mammals likely inhabiting the area include muskox, Arctic fox, wolverine, lemmings, shrews, voles, hares, porcupine, short-tailed weasel, American mink, and Canadian lynx.

Marine Mammals

Pacific walrus, four species of seal (bearded, ribbon, ringed, and spotted), six species of whale (bowhead, fin, minke, gray, beluga, and killer), harbor porpoise, and polar bear occur in the region (Table H-29). Marine mammals are discussed in detail in Section H.4.9.5 (ESA- and MMPA-listed Species).

H.4.9.4.3 Birds

A total of 82 species have been recorded on or in the vicinity of the Cape Lisburne site (Table H-30). Of particular importance is that the western boundary of the LRRS is shared with the USFWS Cape Lisburne portion of the Alaska Maritime NWR. Hundreds of thousands of multiple seabird species inhabit cliffs and rocky shores at Cape Lisburne beginning 0.75 mile west of the airfield at First Beach and also along the cliff above Kittiwake Beach, the next western area, and continuing west around the point and then to the south (Figure H-35). From May to mid-October each year, primary nesting species include 400,000-500,000 common and thick-billed murres, 20,000-30,000 black-legged kittiwakes, and a few thousand tufted and horned puffins, parakeet auklets, black guillemots, pelagic cormorants, and glaucous gulls (Dragoo et al. 2017).

Other birds frequenting these coastal habitats include loons; tundra swan; Canada and white-fronted geese; harlequin duck; common, king, Steller's, and spectacled eiders; longtail duck; black and surf scoters; red-breasted merganser; sandhill crane; several species of plovers and sandpipers; jaegers; and gulls. Bird species found in upland habitats include willow and rock ptarmigan, whimbrel, buff-breasted sandpiper, parasitic and long-tailed jaegers, and lapland longspur. Savannah sparrow, Pacific golden-plover, common redpoll, and snow bunting are also common inhabitants of upland tussock and mountain avens

communities. Birds of prey that have been sighted in uplands and river basins around Cape Lisburne include rough-legged hawk, golden eagle, peregrine falcon, gyrfalcon, and snowy, boreal, and short-eared owls (Gutleber undated [a]; Dragoo et al. 2017).

Important Bird Areas (IBAs)

Cape Lisburne LRRS is adjacent to the Lisburne Peninsula Marine IBA (Figure H-29). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The Lisburne Peninsula Marine IBA has been designated by Audubon Alaska as a globally important IBA due to the presence of large breeding colonies of black-legged kittiwakes (Audubon Alaska 2014).

H.4.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Seven ESA-listed species occur or potentially occur on or in the vicinity of Cape Lisburne LRRS: threatened spectacled and Steller's eider, polar bear, and ringed and bearded seals; and the endangered fin whale and bowhead (Table H-29 and Table H-30).

Spectacled and Steller's Eiders. Day et al. (1995) surveyed for spectacled and Steller's eiders at remote USAF sites, including Cape Lisburne. There is a low potential for either species to nest at Cape Lisburne LRRS although they are known to occur in adjacent offshore waters. Ledyard Bay is one of the primary molting grounds for spectacled eiders breeding on the North Slope. During molt (late June through mid-October), they congregate in large, dense flocks that may be particularly susceptible to disturbance as the birds are flightless for a few weeks. As Ledyard Bay was identified as an important molting area for spectacled eiders, it was designated as critical habitat in 2001 (USFWS 2001a). Critical habitat within marine waters extends from 1 nm offshore of the mean low tide line to approximately 20 miles offshore from Cape Lisburne to Icy Cape (Figure H-39).

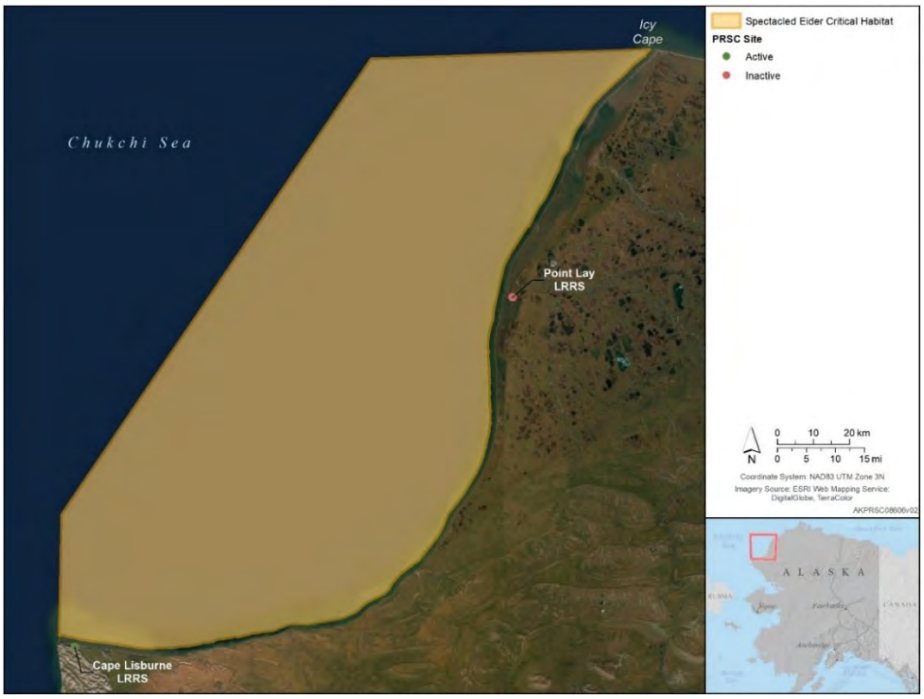

Figure H-39. Spectacled Eider Critical Habitat in the Vicinity of Cape Lisburne and Point Lay LRRS

(*Source*: USFWS 2001a)

Polar Bear. Polar bears migrate south through the area in the fall and winter, then move north in the spring and summer. Denning habitat has historically been utilized on offshore Chukchi Sea ice from November to March. Polar bears have been observed wandering along the runway and into Lower Camp (PRSC 2020).

Although the Cape Lisburne LRRS has been excluded from polar bear critical habitat designation (USFWS 2010), the surrounding terrestrial area is within denning critical habitat and the nearby barrier islands are considered barrier island critical habitat that also includes a 1-mile no disturbance zone (Figure H-30 and Figure H-31). In addition, the adjacent marine waters are considered sea ice critical habitat (Figure H-32). In September of 2017, a polar bear was observed approximately 3 km away from a monitoring location near the Cape Lisbrune Seawall project site (McKay et al 2017). The USAF has funded a cooperative agreement with the University of Washington, in order to document how sea ice changes may influence which locations may see polar bear visitation increase, decrease, initiate or cease all together.

Bearded and Ringed Seals. Both seals occur on Barter Island on a regular basis and are harvested by native hunters (Harcharek et al. 2018). In 2014, the marine waters adjacent to the Cape Lisburne site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bowhead and Fin Whale. Bowhead occur on a regular basis and are harvested by native hunters. Fin whales are infrequent in the deeper offshore waters of Cape Lisburne.

MMPA-listed Species

Pacific Walrus. Hauled out Pacific walrus are known to occur on Cape Lisburne LRRS. From 2016 to 2019, monitoring of walrus near the installation was conducted during quarry operations and seawall construction activities and walrus were routinely observed in nearshore waters and hauled out on the beaches of in the vicinity of the LRRS. For 4 days in October 2019, approximately 1,200 walrus hauled out on First Beach, immediately adjacent to the western boundary of the Cape Lisburne site (Figure H-40) (MacKay et al. 2016, 2017; DNA Environmental Consultants 2018a, 2018b, 2019). In addition, an historical walrus haulout that has supported up to 10,000 individuals during July – December is approximately 1.5 miles west of the LRRS boundary (Fishbach et al. 2016) (Figure H-41).

Other Whales. Minke, gray, and killer whales are infrequent in the deeper offshore waters. The Cape Lisburne area is especially important for beluga for molting and possibly for feeding and calving (611 ASG 1995d). Beluga occur on a regular basis and are harvested by native hunters.

H.4.10 Other Natural Resources Information

H.4.10.1 Subsistence

Residents of Point Hope utilize an area along the coast from Cape Sabine to Kivalina and inland along the Kukpuk River and its associated drainages. Caribou and bowhead are staple subsistence items. Ringed and bearded seals are also important, as are beluga, polar bear, walrus, Dall sheep, moose, geese, king and common eiders, murre eggs, and several fish species. Point Hope is 1 of 10 Alaska Eskimo Whaling Commission communities and whaling is the basis for much of the social organization in the region (Bacon et al. 2011).

Figure H-40. Pacific Walrus Hauled Out at First Beach, Cape Lisburne LRRS – October 2019
(*Photo*: DNA Environmental Consultants)

Figure H-41. Pacific Walrus Haulout Site West of First Beach and Cape Lisburne LRRS
(*Source*: Fischbach et al. 2016)

H.4.10.2 Outdoor Recreation

Recreational natural resources use at or near Cape Lisburne LRRS consists primarily of beachcombing, hunting, furbearer trapping, fishing, and ATV and snow machine riding along trails and beaches. Boating on the Chukchi Sea is an occasional recreational activity; however, this is limited by the presence of sea ice. When sea ice is not present, seas are often too rough for boating.

Recreational vehicle use on the gravel road and on the beach around Cape Lisburne LRRS is common. ATV users are educated about the need to remain on the established road system, thereby minimizing impacts to the tundra vegetation.

While hunting is not allowed on Cape Lisburne LRRS property, DoD personnel may obtain authorization to fly private aircraft to Cape Lisburne on their own time and at their own cost, but this is not common. Apparently, distance and cost discourages recreational visits even though big game in the area occurs in abundance. Hunting is done during free time by BOS contract personnel assigned to the LRRS and temporary duty personnel (military, civilian, or contractor) working at the site. Primary big game species include brown bear and caribou. LRRS personnel engage in a limited amount of furbearer trapping, primarily as a winter recreation. Species trapped include wolverine and red and Arctic foxes.

H.4.11 Mission and Other Impacts on Natural Resources

H.4.11.1 Land Use

Living quarters for personnel and operations support facilities and utilities are at Lower Camp, including power plant, solid waste incinerator, sewage treatment plant, water pump station, water supply tank, airfield, non-directional beacon building, fuel tanks, and cold storage buildings. Base personnel use heavy construction equipment for snow removal and maintenance operations, and four-wheel drive trucks for on-site equipment and personnel transportation (611 CES 2019). The Air Force also leases space to the USFWS, FAA, and AT&T.

Sea Wall. The airfield at Cape Lisburne LRRS runs parallel to the shoreline and is subject to heavy erosion and damage from storm surge. The airfield was originally constructed with a 5,450-ft stone seawall on the ocean side of the runway. The rock reinforcement on the seawall is continuously depleted by heavy seas and ice. Started in 2016, the seawall is currently being reconstructed as a 5-year project; construction is limited by short construction seasons. The reconstruction project includes completely removing the stone seawall adjacent to the runway, recovering competent stone for reuse, and using new stone obtained from a permitted quarry. The quarry is immediately west of the site boundary on USFWS lands (Figure H-35) (DNA Environmental Consultants 2018). The Air Force has a 25-year Right-of-Way Permit and Special Use Permit from the USFWS to obtain rock material for on-going maintenance of the seawall, runway, and roads of the LRRS (USFWS 2015b).

Airfield. The gravel airstrip is 4,800 ft long and 135 ft wide and equipped with Runway End Identifier Lights (REIL) and Precision Approach Path Indicator (PAPI) light systems, and distance-remaining indicator lights (611 CES 2019).

Barge Landing. Cape Lisburne LRRS is served by ocean-going barges that deliver fuel, construction materials and equipment, and other large or heavy equipment and maintenance components. When a barge is due, operations personnel construct a temporary barge landing and use heavy construction equipment to anchor the barge. The temporary barge landing is typically washed away by wave action after use.

ATTACHMENT 5: NATURAL RESOURCES OF THE CAPE LISBURNE, KOTZEBUE, AND TIN CITY SITES

Table H-27. Vascular Plant Species Known to or Potentially Occurring on the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name	Scientific Name	TC	Kot	CL	Occurrence	Source
SHRUBS						
American green alder	*Alnus crispa*	X	X		Kot	2
Sitka alder	*Alnus sinuata*		X			2
Bog-rosemary	*Andromeda polifolia*	X	X	X	Kot	2
Alpine bearberry	*Arctostaphylos alpina*	X	X	X	Kot	2, 4
Red-fruit bearberry	*Arctostaphylos rubra*	X	X	X	Kot	2
Dwarf Arctic birch	*Betula nana*	X	X	X	Kot	2
Four-angled cassiope	*Cassiope tetragona*	X	X	X	TC, CL	2-4
Leatherleaf	*Chamaedaphne calyculata*		X		Kot	2
Bunchberry	*Cornus canadensis*	X	X	X		1-3
Diapensia	*Diapensia lapponica*	X	X	X	CL, TC	2, 3
Entire-leaf mountain avens	*Dryas integrifolia*	X	X	X	TC	2
White mountain avens	*Dryas octopetala*	X	X	X	CL, TC	1-3
Crowberry	*Empetrum nigrum*	X	X	X	All	2
Narrowleaf Labrador tea	*Ledum palustre*	X	X	X	All	2
Twin-flower	*Linnaea borealis*	X	X	X		2
Alpine-azalea	*Loiseleuria procumbens*	X	X	X	TC	1-3
Shrubby cinquefoil	*Pentaphylloides floribunda*	X	X			2, 3
Blue mountain heath	*Phyllodoce coerulea*	X				2
White spruce	*Picea glauca*		X		Kot	2
Kamchatka Rhododendrom	*Rhododendron camtschaticum*	X				1, 2
Lapland rosebay	*Rhododendron lapponicum*	X	X	X		2, 3
Currant	*Ribes* sp.	X	X		TC	1, 4
American red currant	*Ribes triste*		X		Kot	2
Prickly rose	*Rosa acicularis*	X	X			2, 3
Nagoonberry	*Rubus arcticus*	X	X	X	Kot, CL	2
Cloudberry	*Rubus chamaemorus*	X	X	X	All	2, 4
Feltleaf willow	*Salix alaxensis*	X	X	X	All	2, 4
Littletree willow	*Salix arbusculoides*		X			2
Arctic willow	*Salix arctica*	X	X	X	CL, TC	2, 4
Barren-ground willow	*Salix brachycarpa*	X	X	X		2, 4
Silver willow	*Salix candida*					2
Chamisso willow	*Salix chamissonis*	X	X	X	TC	2, 4
Alaska bog willow	*Salix fuscescens*	X	X	X	Kot, CL	2
Grayleaf (northern) willow	*Salix glauca*	X	X	X	TC, Kot	2
Halberd willow	*Salix hastata*	X	X	X		2
Willow	*Salix interior*	X			TC	1
Oval-leafed willow	*Salix ovalifolia*	X	X	X	CL, TC	2
Skeleton leaf willow	*Salix phlebophylla*	X	X	X	TC, CL	2
Polar willow	*Salix polaris*	X		X	TC	2
Diamond-leaf willow	*Salix pulchra*	X	X	X	All	1, 4
Netleaf (net-veined) willow	*Salix reticulata*	X	X	X	All	2, 3
Richardson willow	*Salix richardsonii*	X	X	X	All	2
Least (round-leaf) willow	*Salix rotundifolia*	X	X	X	CL, TC	2
Buffalo berry (soapberry)	*Shepherdia canadensis*		X			1, 4
Beauverd spirea	*Spiraea stevenii*	X	X		Kot	2

Table H-27. Vascular Plant Species Known to or Potentially Occurring on the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name	Scientific Name	TC	Kot	CL	Occurrence	Source
Bog cranberry	*Vaccinium oxycoccus*	X				2
Bog blueberry	*Vaccinium uliginosum*	X	X	X	Kot, TC	2
Mountain cranberry	*Vaccinium vitis-idaea*	X	X	X	All	2
HERBACEOUS						
Monkshood	*Aconitium delphinifolium*	X	X	X	All	1, 3
Musk root (moschatel)	*Adoxa moschatellina*	X	X			1, 4
Wild chives	*Allium schoenoprasum*	X	X			1, 3
Alpine foxtail	*Alopecurus alpinus*			X	CL	
Round leaf orchid	*Amerorchis rotundifolia*		X			1, 3
Rock jasmine	*Androsace chamaejasme*	X	X	X	TC	1, 3
Northern jasmine	*Androsace septentrionalis*	X	X	X		1, 4
Anemone	*Anemone multiceps*	X		X	TC, CL	
Narcissus-flower anemone	*Anemone narcissiflora*	X	X	X	CL, TC	1, 3
Northern anemone	*Anemone parviflora*	X	X	X	CL, TC	1, 3
Yellow anemone	*Anemone richardsonii*	X	X	X	All	1, 3
Anemone	*Anemone* sp.	X			TC	1
Wild celery	*Angelica lucida*	X	X		Kot	1, 4
Pussytoes	*Antennaria friesiana*	X	X	X	TC, CL	1, 4
Cats paws	*Antennaria monocephala*	X		X	TC	1, 4
Lyre-leaf rockcress	*Arabis lyrata*	X				1, 4
Polar grass	*Arctagrostis latifolia*	X	X	X	All	
Pendent grass	*Arctophila fulva*	X	X	X	All	1, 4
Tall sandwort	*Arenaria capillaris*			X		1, 4
Thrift	*Armeria maritima*	X			TC	
Frigid arnica	*Arnica frigida*	X	X	X	TC, CL	1, 3
Lessing's arnica	*Arnica lessingii*	X	X	X	CL, TC	1, 4
Alaska wormwood	*Artemisia alaskana*	X				1, 4
Arctic wormwood	*Artemisia arctica*	X	X	X	All	1, 4
Northern wormwood	*Artemisa borealis*	X	X	X	TC	1, 4
Furcated wormwood	*Artemisia furcata*	X			TC	
Purple wormwood	*Artemisa globularia*	X		X	CL, TC	1, 3
Wormwood	*Artemisia glomerata*	X			TC	
Common wormwood	*Artemisa tilesii*	X	X	X	All	1, 4
Bering Sea wormwood	*Artemisia senjavinensis*	X	X		TC	1, 3
Siberian aster	*Aster sibiricus*	X	X	X	Kot	1, 3
Milkvetch	*Astragalus aboriginum*	X			TC	
Alpine milkvetch	*Astragalus alpinus*	X	X	X	Kot	1, 3, 4
Polar milkvetch	*Astragalus polaris*			X	CL	
Hairy Arctic milkvetch	*Astragalus umbellatus*	X	X	X	TC	1, 3
Wintercress	*Barbarea orthoceras*	X	X		Kot	1, 4
Beckmannia	*Beckmannia erucaeformis*		X		Kot	1, 4
Broomrape	*Boschniakia rossica*	X	X			1, 3
Moonwort	*Botrychium lunaria*	X	X	X		1, 4
Alaska boykinia	*Boykinia richardsonii*	X				1, 3
Braya	*Braya glabella*	X			TC	
Thoroughwax	*Bupleurum americanum*	X		X	TC, CL	
Bluejoint grass	*Calamagrostis canadensis*	X	X	X	Kot	1, 4
Reed bent grass	*Calamagrostis* sp.	X	X	X	Kot, TC	1, 4
	Caltha natans			X	CL	

Table H-27. Vascular Plant Species Known to or Potentially Occurring on the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name	Scientific Name	TC	Kot	CL	Occurrence	Source
Marsh marigold	*Caltha palustris*	X	X	X	CL, TC	1, 3
Bluebell	*Campanula lasiocarpa*	X	X	X	TC, CL	1, 3
Bluebells of Scotland	*Campanula rotundifolia*	X				1, 3
Single-flowered harebell	*Campanula uniflora*	X			TC	
Bittercress	*Cardamine bellidifolia*	X		X	TC, CL	
Bittercress	*Cardamine digitata*	X	X	X	CL	1, 3
	Cardamine microphylla	X		X	TC, CL	
Cuckoo flower	*Cardamine pratensis*	X	X	X	Kot	1, 4
	Cardamine purpurea	X		X	TC, CL	
Sedge	*Carex aquatilis*	X	X	X	All	1, 4
Sedge	*Carex atrofusca*	X	X	X	All	
Sedge	*Carex bigelowii*	X	X	X	All	1, 4
Sedge	*Carex glacialis*	X			TC	
Sedge	*Carex lachenalii*			X	CL	
Sedge	*Carex lyngbyaei*	X	X			1, 4
Sedge	*Carex membranacea*	X			TC	
Sedge	*Carex microchaeta*	X		X	TC, CL	
Sedge	*Carex misandra*	X		X	TC, CL	
Sedge	*Carex podocarpa*	X			TC	
Sedge	*Carex rotundata*		X		Kot	
Sedge	*Carex rupestris*	X			TC	
Sedge	*Carex scirpoidea*	X		X	TC, CL	
Elegant paintbrush	*Castilleja elegans*	X	X	X	TC, CL	1, 3
Paintbrush	*Castilleja* sp.	X	X	X		1
Bering chickweed	*Cerastium beeringianum*	X	X	X	CL, TC	1, 4
Chickweed	*Cerastium jenisejense*					1, 4
Dwarf fireweed	*Chamaenerion latifolium*	X	X	X	CL, TC	1, 3
Northern water carpet	*Chrysosplenium tetandrum*	X	X	X	All	
Wright's water carpet	*Chrysosplenium wrightii*	X		X	TC, CL	
	Claytonia acutifolia	X		X	TC, CL	
Arctic springbeauty	*Claytonia arctica*	X			TC	
Alaska spring beauty	*Claytonia sarmentosa*	X	X	X	TC, CL	1, 3
	Claytonia scammaniana			X	CL	
Marsh fivefinger	*Comarum palustre*	X	X	X	Kot	1, 3
Coral root	*Corallorrhiza trifida*	X	X			1, 3
Cushion hawk's beard	*Crepis nana*	X		X		1, 3, 4
	Cnidium cnidiifolium		X		Kot	
Scurvy grass	*Cochlearia officinalis*	X		X	TC, CL	
Few-flowered corydalis	*Corydalis pauciflora*			X	CL	
Northern lady's slipper	*Cypripedium passerinum*	X	X			1, 3
Arctic daisy	*Dendranthema arcticum*	X	X	X	TC	1, 3
Dwarf larkspur	*Delphinium brachycentrum*			X	CL	
	Deschampsia caespitosa	X			TC	
Tansy mustard	*Descurainia sophioides*		X		Kot	
Frigid shooting star	*Dodecatheon frigidum*	X	X	X	CL, TC	1, 3
Ochotsk douglasia	*Douglasia ochotensis*	X		X	TC, CL	1, 3
	Draba alpina	X			TC	
	Draba corymbosa	X		X	TC, CL	
Smoothing whitlow-grass	*Draba hirta*	X		X		1, 3

Table H-27. Vascular Plant Species Known to or Potentially Occurring on the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name	Scientific Name	TC	Kot	CL	Occurrence	Source
	Draba lactea	X			TC	
	Draba longipes			X	CL	
	Draba nivalis	X			TC	
	Draba palanderiana	X		X	TC, CL	
	Dupontia fischeri	X		X	TC, CL	
Fireweed	*Epilobium angustifolium*	X	X	X	All	1, 3, 4
Horsetail	*Equisetum arvense*	X	X	X	All	
Horsetail	*Equisetum variegatum*	X		X	All	
Horsetail	*Equisetum* sp.	X	X	X	All	1
Fleabane	*Erigeron humilis*	X	X	X	TC	1, 3
Arctic fleabane	*Erigeron hyperboreus*	X	X	X		1, 3
	Eriophorum angustifolium	X	X	X	All	
	Eriophorum brachyantherum			X	CL	
	Eriophorum russeolum			X	CL	
Arctic cottongrass	*Eriophorum scheuchzeri*	X	X	X	All	1, 3
Sheathed cottongrass	*Eriophorum vaginatum*	X	X	X	CL, Kot	1, 3, 4
Arctic forget-me-not	*Eritichum aretioides*	X	X	X	TC, CL	1, 3
	Eritrichium chamissonis			X	CL	
	Eutrema edwardsii			X	CL	
	Festuca baffinensis	X			TC	
	Festuca brachyphylla	X		X	TC, CL	
	Festuca rubra	X		X	TC, CL	
Fescue grass	*Festuca* sp.	X	X	X		1, 4
Northern bedstraw	*Galium boreale*	X	X	X		1, 3
Whitish gentian	*Gentiana algida*	X	X			1, 3
Glaucous gentian	*Gentiana glauca*	X	X	X	TC	1, 3
	Gentiana propinqua	X	X	X	All	
Glacier avens	*Geum glaciale*	X		X	CL, TC	1, 3
Ross avens	*Geum rossii*	X			TC	1, 3
Alpine eskimo potato	*Hedysarum hedysaroides*	X	X	X		1, 4
Cow parsnip	*Heracleum lanatum*	X	X	X	CL	1, 3
	Hierochloe alpina	X		X	TC, CL	
	Hierochloe odorata		X		Kot	
Mare's Tail	*Hippuris vulgaris*	X	X	X	All	
Seabeach Sandwort	*Honckenya peploides*	X	X	X	All	
	Huperzia haleakalae	X			TC	
	Huperzia selago	X		X	TC, CL	
Wild iris	*Iris setosa*	X	X		Kot, TC	1, 3, 4
	Juncus arcticus			X	CL	
	Juncus biglumis	X			TC	
Glaucous weaselsnout (lagotis)	*Lagotis glauca*	X	X	X	CL, TC	1, 3
Vetchling	*Lathyrus palustris*	X	X			1, 4
Alpine milk vetch	*Lathyrus maritimus*	X	X		Kot, TC	1
Leatherleaved saxifrage	*Leptarrhena pyrolifolia*	X		X	CL, TC	
Bladder pod	*Lesquerella arctica*	X	X	X		1, 4
Entire-leaved chrysanthemum	*Leucanthemum integrifolium*	X	X	X	TC	1, 3
Lyme grass	*Leymus mollis*	X	X	X	All	
Alp lily	*Lloydia serotina*	X	X	X	TC, CL	1, 3
Arctic lupine	*Lupinus arcticus*	X	X	X	Kot	1, 4

Table H-27. Vascular Plant Species Known to or Potentially Occurring on the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name	Scientific Name	TC	Kot	CL	Occurrence	Source
	Luzula arctica	X		X	TC, CL	
	Luzula arcuata			X	CL	
	Luzula confusa		X	X	Kot, CL	
	Luzula multiflora	X			TC	
	Luzula parviflora		X		Kot	
	Luzula wahlenbergii	X			TC	
Alpine club moss	*Lycopodium alpinum*	X			TC	1, 4
	Lycopodium annotinum		X		Kot	
Bogbean (buckbean)	*Menyanthes trifoliata*	X	X			1, 4
Oysterleaf	*Mertensia maritima*	X		X	TC, CL	
Chiming bells	*Mertensia paniculata*	X	X		Kot	1, 3
Arctic sandwort	*Minuartia arctica*	X		X	TC, CL	1, 4
	Minuartia elegans	X		X	TC, CL	
	Minuartia macrocarpa	X			TC	
	Minuartia obtusiloba	X		X	CL, TC	
	Minuartia rubella	X			TC	
Water Blinks	*Montia fontana*			X	CL	
Alpine forget-me-not	*Myosotis alpestris*	X	X	X	CL, TC	1, 3
Mountain Sorrel	*Oxyria dignya*	X		X	CL, TC	
	Oxytropis arctica			X	CL	
Barneby's milkvetch	*Oxytropis arctica* var. *barnebyana*		X		Kot	
Maydell's oxytrope	*Oxytropis maydelliana*	X	X		TC, Kot	
	Oxytropis mertensiana	X			TC	
Blackish oxytrope	*Oxytropis nigrescens bryophila*	X	X	X	All	1, 3
	Oxytropis nigrescens gorodkovii	X			TC	
	Packera cymbalaria	X		X	CL, TC	
	Papaver gorodkovii			X	CL	
Arctic poppy	*Papaver hultenii*	X	X	X	CL	1, 3
	Papaver lapponicum			X	CL	
Macoun's poppy	*Papaver macounii*	X			TC, CL	1
Walpole poppy	*Papaver walpolei*	X			TC	1, 3
	Parnassia kotzebuei	X	X	X	All	
Grass of Parnassus	*Parnassia palustris*	X	X	X	Kot	1, 3, 4
Parrya	*Parrya nudicaulis*	X	X	X	CL, TC	1, 3
Capitate lousewort	*Pedicularis capitata*	X	X	X	All	1, 3
Wooly lousewort	*Pedicularis kanei*	X	X	X	All	1
	Pedicularis lanata	X	X	X	All	
	Pedicularis langsdorffii	X		X	TC, CL	
	Pedicularis lapponica	X		X	TC, CL	
Oeder's lousewort	*Pedicularis oederi*	X	X	X	TC, CL	1, 3
Fernweed	*Pedicularis sudetica*	X	X	X	All	1, 3
Bumblebee flower	*Pedicularis verticillata*	X	X	X		1, 3
Frigid Coltsfoot	*Petasites frigidus*	X	X	X	All	
Snow Grass	*Phippsia algida*	X		X	TC, CL	
	Phlox richardsonii	X			TC	
Siberian phlox	*Phlox sibirica*	X		X		1, 3
Butterwort	*Pinguicula vulgaris*	X	X			1, 3, 4
Bog orchid	*Platanthera convallariaefolia*	X				1, 3
Small northern bog orchid	*Platanthera obtusata*	X	X			1, 3

Table H-27. Vascular Plant Species Known to or Potentially Occurring on the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name	Scientific Name	TC	Kot	CL	Occurrence	Source
	Poa abbreviata			X	CL	
Alpine bluegrass	*Poa alpine*	X		X	TC, CL	1, 4
	Poa arctica	X		X	TC, CL	
	Poa glauca	X		X	TC, CL	
Blue grass	*Poa* sp.	X	X	X	All	1, 4
Tall Jacob' ladder	*Polemonium acutiflorum*	X	X	X	All	1, 3
	Polemonium boreale			X	CL	
Jacob's ladder	*Polemonium pulcherrimum*	X	X			1, 3, 4
Bistort	*Polygonum bistorta*	X	X	X	TC, CL	1, 3
Alpine meadow bistort	*Polygonum viviparum*	X	X	X	All	1, 4
Two-flowered cinquefoil	*Potentilla biflora*	X	X	X	CL, TC	1, 3
	Potentilla elegans	X			TC	
	Potentilla hookeriana	X		X	TC, CL	
	Potentilla hyparctica	X			TC	
	Potentilla norvegica	X			NC	
	Potentilla vahliana	X			TC	
	Potentilla pulchella		X		Kot	
One-flowered cinquefoil	*Potentilla uniflora*	X	X	X	TC, CL	1, 3
	Primula anvilensis	X			TC	
Northern primrose	*Primula borealis*	X	X	X	CL, TC	1, 3
Wedge-leafed primrose	*Primula cuneifolia*	X	X			1, 3
Chukchi primrose	*Primula tschuktschorum*	X		X	TC, CL	
Pink pyrola	*Pyrola asarifolia*	X	X			1, 3
Large-flowered wintergreen	*Pyrola grandiflora*	X	X	X	All	1, 3
	Ranunculus glacialis	X			TC	
	Ranunculus hyperboreus	X			TC	
	Ranunculus kamchaticus	X			TC	
	Ranunculus lapponicus	X			CL	
	Ranunculus nivalis	X	X	X	All	
	Ranunculus pallasii		X		Kot	
	Ranunculus sulphureus			X	CL	
Buttercup	*Ranunculus* sp.	X	X	X	CL	1, 4
Roseroot	*Rhodiola integrifolia*	X	X		TC	1, 3
Arctic dock	*Rumex arcticus*	X	X	X	All	1, 4
Dock	*Rumex graminifolius*	X	X	X		1, 4
Rumex	*Rumex krassei*	X		X		
	Sagina nivalis	X			TC	
Burnet	*Sanguisorba officinalis*	X	X			1, 4
	Saussurea angustifolia	X		X	TC, CL	
Narrow-leafed saussurea	*Saussurea viscida*	X	X	X		1, 3
Spotted saxifrage	*Saxifraga bronchialis*	X	X	X	CL, TC	1, 3
	Saxifraga caespitosa	X		X	CL, TC	
Bulbous (bulblet) saxifrage	*Saxifraga cernua*	X	X	X	CL, TC	1, 3
	Saxifraga eschscholtzii	X		X	CL, TC	
Whiplash saxifrage	*Saxifraga flagellaris*	X		X	CL, TC	1, 3
	Saxifraga foliolosa	X		X	CL, TC	
Rusty saxifrage	*Saxifraga hieracifolia*	X	X	X	CL, TC	1, 3
Yellow marsh saxifrage	*Saxifraga hirculus*	X	X	X	All	1, 3, 4
Brook saxifage	*Saxifraga nelsoniana*	X	X	X	CL, TC	1, 3

Table H-27. Vascular Plant Species Known to or Potentially Occurring on the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name	Scientific Name	TC	Kot	CL	Occurrence	Source
	Saxifraga nudicaulis	X			TC	
Purple mountain saxifrage	*Saxifraga oppositifolia*	X		X	TC, CL	1, 3
	Saxifraga razshivinii			X	CL	
	Saxifraga reflexa			X	CL	
	Saxifraga rivularis	X		X	CL, TC	
Thyme-leaved saxifrage	*Saxifraga serpyllifolia*	X		X	CL, TC	1, 3
	Saxifraga sibirica	X		X	CL, TC	
Spiked saxifrage	*Saxifraga spicata*	X				1, 3
Nodding saxifrage	*Saxifraga tenuis*	X			TC	
	Selaginella sibirica	X			TC	
Marsh fleabane	*Senecio congestus*	X	X	X	TC	1, 3
Black-tipped groundsel	*Senecio lugens*	X	X	X	TC	1, 3
Seabeach scenecio	*Senecio pseudoarnica*	X	X			1, 3
	Sibbaldia procumbens	X			TC	
Moss campion	*Silene acaulis*	X	X	X	TC, CL	1, 3
Arctic lychnis	*Silene involucrata*	X			TC	1
	Silene macrosperma	X			TC	
Bladder campion	*Silene uralensis*	X	X	X	CL, TC	1, 4
	Smelowskia borealis			X	CL	
Smelowskia	*Smelowskia calycina*	X	X	X	CL	1, 3
Goldenrod	*Solidago multiradiata*	X	X	X	TC	1, 3
Bur-reed	*Sparganium angustifolim*	X	X			1, 4
	Stellaria dicranoides	X		X	CL, TC	
	Stellaria humifusa			X	CL	
	Stellaria longipes			X	CL	
	Taraxacum ceratophorum	X		X	TC, CL	
	Taraxacum hyparcticum	X			TC	
Dandelion	*Taraxacum* sp.	X	X	X	CL, Kot	1, 3
	Tephroseris atropurpurea frigidus	X		X	CL, TC	
	Tephroseris atropurpurea tomentosa	X		X	CL, TC	
	Thalictrum alpinum	X			TC	
	Tofieldia coccinea	X	X	X	All	
	Tripleurospermum phaeocephalum	X			TC	
Trisetum	*Trisetum sibircum*	X			TC	1
	Trisetum spicatum	X	X	X	All	
Arrow grass	*Triglochin maritimum*	X	X			1, 4
Bladderwort	*Utricularia intermedia*	X	X			1, 4
Capitate valerian	*Valeriana capitata*	X	X	X	All	1, 3
Two-flowered violet	*Viola biflora*	X				1, 3
Alaska violet	*Viola langsdorffii*	X				1, 3
	Wilhelmsia physodes	X			TC	
Death Camass	*Zygadenus elegans*	X	X		TC	1, 3

Sources:

- Potentially Occurring: Hulten 1968; Viereck and Little 1972; White 1974; Pratt 1991; Lipkin 1999.
- Observed: 611 ASG 1995d; Lipkin 1999.

Table H-28. Fish Species Potentially Occurring on or near the Tin City, Kotzebue, and Cape Lisburne Sites

Common Name	Scientific Name	Tin City	Kotzebue	Cape Lisburne
Alaska blackfish	*Dallia pectoralis*			X
Alaska pollock	*Gadus chalcogrammus*			X
Arctic char	*Salvelinus alpinus*	X		X
Arctic cisco	*Coregonus autumnalis*			X
Arctic flounder	*Liopsetta glacialis*	X	X	
Arctic grayling	*Thymallus arcticus*			X
Arctic lamprey	*Lethenteron camtschaticum*			X
Arctic staghorn sculpin	*Gymnocanthus tricuspis*			X
Bering cisco	*Coregonus laurettae*			X
Bering flounder	*Hippoglossoides robustus*			X
Canadian eelpout	*Lycodes polaris*			X
Capelin	*Mallotus villosus*			X
Chinook salmon	*Oncorhynchus tshawytscha*	X	X	X
Chum salmon	*Oncorhynchus keta*	X	X	X
Coho salmon	*Oncorhynchus kisutch*	X	X	X
Dolly varden	*Salvelinus malma*	X	X	X
Fourhorn sculpin	*Myoxocephalus quadricornis*			X
Least cisco	*Coregonus sardinella*		X	
Ninespine stickleback	*Pungitus pungitus*	X	X	X
Pacific cod	*Gadus macrocephalus*			X
Pacific halibut	*Hippoglossus stenolepis*			X
Pacific herring	*Clupea pallasi*	X	X	
Pacific tomcod	*Microgadus proximus*	X	X	
Pink salmon	*Oncorhynchus gorbuscha*	X	X	X
Polar cod	*Boreogadus saida*	X	X	
Rainbow smelt	*Osmerus mordax*	X	X	X
Saffron cod	*Eleginus gracilis*			X
Shorthorn sculpin	*Myoxocephalus scorpius*			X
Slimy sculpin	*Cottus cognatus*			X
Sockeye salmon	*Oncorhynchus nerka*	X	X	X
Starry flounder	*Platichthys stellatus*			X
Twohorn sculpin	*Icelus bicornis*			X
Whitefish	*Coregonus* sp.	X		X
Yellowfin sole	*Limanda asper*			X

Sources: Flock and Hubbard 1979; Morrow 1980; Minerals Management Service 1987b; USFWS 1988; Robbins *et al*. 1991; 611 ASG 1995d; Johnson and Blossom 2019b.

Table H-29. Mammal Species Observed or Potentially Occurring on or near the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name (ESA Status)*	Scientific Name	TC	Kot	CL	Observed
TERRESTRIAL					
Alaskan hare	*Lepus othus*	X	X	X	
Alaska marmot	*Marmota broweri*			X	CL
American mink	*Neovison vison*	X	X	X	
Arctic fox	*Alopex lagopus*	X	X	X	CL
Arctic ground squirrel	*Spermophilus parryii*	X	X	X	CL
Brown bear	*Ursus arctos*	X		X	CL
Canadian lynx	*Lynx canadensis*	X	X	X	
Caribou	*Rangifer tarandus*	X	X	X	TC, CL
Cinereus shrew	*Sorex cinereus*		X	X	
Common muskrat	*Ondatra zibethicus*	X	X		
Dall's sheep	*Ovis dalli*			X	CL
Ermine	*Mustela erminea*	X	X	X	
Gray wolf	*Canis lupus*	X		X	CL
Least weasel	*Mustela nivalis*	X	X	X	
Meadow vole	*Microtus pennsylvanicus*	X	X		
Muskox	*Ovibos moschatus*	X		X	TC, CL
Nearctic brown lemming	*Lemmus trimucronatus*	X	X	X	
Nearctic collared lemming	*Dicrostonyx groenlandicus*	X	X		
North American porcupine	*Erethizon dorsata*	X	X	X	CL
North American river otter	*Lontra canadensis*	X	X	X	
Northern red-backed vole	*Myodes rutilus*	X	X	X	
Red fox	*Vulpes vulpes*	X	X	X	CL
Root vole	*Microtus oeconomus*	X	X	X	
Singing vole	*Microtus miurus*	X	X		
Snowshoe hare	*Lepus americanus*	X	X		
Tundra shrew	*Sorex tundrensis*		X	X	
Wolverine	*Gulo gulo*	X	X	X	
MARINE†					
Arctic ringed seal (T)	*Phoca hispida hispida*	X	X	X	CL
Bearded seal (T)	*Erignathus barbatus*	X	X	X	
Beluga	*Delphinapterus leucas*	X	X	X	CL
Bowhead (E)	*Balaenoptera mysticetus*	X		X	CL
Common minke whale	*Balaenoptera acutorostrata*	X	X	X	CL
Fin whale (E)	*Balaenoptera physalus*	X	X	X	
Gray whale	*Eschrichtius robustus*	X	X	X	TC, CL
Harbor porpoise	*Phocoena phocoena*	X	X	X	
Humpback whale (E)	*Megaptera novaeangliae*	X			
Killer whale	*Orcinus orca*	X	X	X	
North Pacific right whale (E)	*Eubalaena japonica*	X			
Pacific walrus	*Odobenus rosmarus divergens*	X		X	TC, CL
Polar bear (T)	*Ursus maritimus*	X	X	X	CL
Ribbon seal	*Histriophoca fasciata*	X	X	X	
Spotted seal	*Phoca largha*	X	X	X	CL
Steller sea lion (E)	*Eumetopias jubatus*	X			

Notes: *E = endangered, T = threatened; †All marine mammals are listed under the MMPA.

Sources: USFWS undated (b); Flock and Hubbard 1979; Wynne 1993 611 ASG 1995d; MacKay et al. 2016, 2017; Dragoo et al. 2017; NOAA Fisheries 2019.

Table H-30. Bird Species Observed or Potentially Occurring on or near the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name (Federal Status)*	Scientific Name	TC	Kot	CL	Observed
Alder flycatcher	*Empidonax alnorum*		X		Kot
Aleutian tern	*Onychoprion aleuticus*	X	X		Kot
American golden-plover	*Pluvialis dominica*	X	X	X	Kot, CL
American pipit	*Anthus rubescens*	X	X	X	All
American robin	*Turdus migratorius*		X		Kot
American tree sparrow	*Spizelloides arborea*	X	X	X	Kot, CL
American wigeon	*Mareca americana*	X	X	X	Kot
Ancient murrelet	*Synthliboramphus antiquus*	X			
Arctic loon	*Gavia arctica*	X	X	X	TC
Arctic tern	*Sterna paradisaea*	X	X	X	All
Arctic warbler	*Phylloscopus borealis*	X	X		TC, Kot
Baird's sandpiper	*Calidris bairdii*	X	X	X	TC
Bank swallow	*Riparia riparia*	X	X		Kot
Barn swallow	*Hirundo rustica*		X	X	
Bar-tailed godwit	*Limosa lapponica*	X	X	X	
Black guillemot	*Cepphus grylle*	X	X	X	CL
Black scoter	*Melanitta americana*	X	X	X	CL, Kot
Black turnstone	*Arenaria melanocephala*	X	X	X	Kot
Black-bellied plover	*Pluvialis squatarola*	X	X	X	
Black-legged kittiwake	*Rissa tridactyla*	X	X	X	All
Blackpoll warbler	*Setophaga striata*		X		Kot
Black-tailed gull	*Larus crassirostris*			X	CL
Bluethroat	*Cyanecula svecica*	X	X	X	
Boreal owl	*Aegolius funereus*		X		
Brant	*Branta bernicla*	X	X	X	All
Bristle-thighed curlew	*Numenius tahitiensis*	X	X	X	
Bufflehead	*Bucephala albeola*			X	CL
Canada goose	*Branta canadensis*	X	X	X	Kot, CL
Canada jay	*Perisoreus canadensis*			X	CL
Canvasback	*Aythya valisineria*	X	X	X	Kot, CL
Cliff swallow	*Petrochelidon pyrrhonota*	X	X	X	CL
Common eider	*Somateria mollissima*	X	X	X	All
Common loon	*Gavia immer*	X	X	X	TC, CL
Common murre	*Uria aalge*	X	X	X	TC, CL
Common raven	*Corvus corax*	X	X	X	All
Common redpoll	*Acanthis flammea*	X	X	X	All
Crested auklet	*Aethia cristatella*	X	X	X	
Curlew sandpiper	*Calidris ferruginea*	X	X	X	TC
Dark-eyed junco	*Junco hyemalis*				TC
Dunlin	*Calidris alpina*	X	X	X	TC, CL
Eastern yellow wagtail	*Motacilla tschutschensis*	X	X	X	All
Emperor goose	*Anser canagicus*	X	X	X	TC
Fox sparrow	*Passerella iliaca*	X	X	X	Kot, TC
Glaucous gull	*Larus hyperboreus*	X	X	X	All
Glaucous-winged gull	*Larus glaucescens*		X	X	CL
Golden eagle (BGEPA)	*Aquila chrysaetos*	X	X	X	TC, CL
Golden-crowned sparrow	*Zonotrichia atricapilla*				TC
Gray-cheeked thrush	*Catharus minimus*		X		Kot
Gray-crowned rosy-finch	*Leucosticte tephrocotis*			X	CL
Greater scaup	*Aythya marila*	X	X	X	Kot
Greater white-fronted goose	*Anser albifrons*	X	X	X	All
Green-winged teal	*Anas crecca*		X		Kot

Table H-30. Bird Species Observed or Potentially Occurring on or near the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name (Federal Status)*	Scientific Name	TC	Kot	CL	Observed
Gyrfalcon	*Falco rusticolus*	X	X	X	All
Harlequin duck	*Histrionicus histrionicus*	X	X	X	TC, CL
Herring gull	*Larus argentatus*		X	X	CL
Hoary redpoll	*Acanthis hornemanni*		X	X	TC, CL
Horned grebe	*Podiceps auritus*	X	X	X	
Horned lark	*Eremophila alpestris*	X	X	X	TC, CL
Horned puffin	*Fratercula corniculata*	X	X	X	TC, CL
Hudsonian godwit	*Limosa haemastica*	X	X	X	Kot
Ivory gull	*Pagophila eburnea*		X		
Killdeer	*Charadrius vociferus*			X	
King eider	*Somateria spectabilis*	X	X	X	TC, CL
Kittlitz's murrelet	*Brachyramphus brevirostris*	X	X	X	TC, CL
Lapland longspur	*Calcarius lapponicus*	X	X	X	All
Least auklet	*Aethia pusilla*	X	X	X	
Least sandpiper	*Calidris minutilla*	X	X	X	
Lesser scaup	*Aythya affinis*		X		
Long-billed dowitcher	*Limnodromus scolopaceus*	X	X	X	Kot
Long-tailed duck	*Clangula hyemalis*	X	X	X	All
Long-tailed Jaeger	*Stercorarius longicaudus*	X	X	X	All
Mallard	*Anas platyrhynchos*	X	X	X	Kot
Merlin	*Falco columbarius*	X	X	X	All
Mew gull	*Larus canus*	X	X	X	Kot
Northern goshawk	*Accipiter gentiles*	X	X		Kot
Northern harrier	*Circus hudsonius*	X	X	X	Kot, CL
Northern pintail	*Anas acuta*	X	X	X	All
Northern shoveler	*Spatula clypeata*	X	X	X	Kot
Northern shrike	*Lanius borealis*	X	X	X	TC, Kot
Northern waterthrush	*Parkesia noveboracensis*		X		Kot
Northern wheatear	*Oenanthe oenanthe*	X	X	X	TC, CL
Olive-sided flycatcher	*Contopus cooperi*				Kot
Orange-crowned warbler	*Oreothlypis celata*		X		TC, Kot
Pacific golden-plover	*Pluvialis fulva*	X	X	X	Kot, CL
Pacific loon	*Gavia pacifica*	X	X	X	All
Parakeet auklet	*Aethia psittacula*	X	X	X	CL
Parasitic jaeger	*Stercorarius parasiticus*	X	X	X	All
Pectoral sandpiper	*Calidris melanotos*	X	X	X	Kot, CL
Pelagic cormorant	*Phalacrocorax pelagicus*	X	X	X	TC, CL
Peregrine falcon	*Falco peregrines*	X	X	X	All
Pigeon guillemot	*Cepphus columba*	X		X	TC, CL
Pomarine jaeger	*Stercorarius pomarinus*	X	X	X	All
Red knot	*Calidris canutus*	X	X	X	
Red phalarope	*Phalaropus fulicarius*	X	X	X	CL
Red-breasted merganser	*Mergus serrator*	X	X	X	Kot, CL
Redhead	*Aythya Americana*	X	X	X	
Red-necked grebe	*Podiceps grisegena*	X	X	X	Kot, TC
Red-necked phalarope	*Phalaropus lobatus*	X	X	X	Kot, CL
Red-necked stint	*Calidris ruficollis*	X			
Red-throated loon	*Gavia stellata*	X	X	X	All
Red-throated pipit	*Anthus cervinus*	X		X	
Red-winged blackbird	*Agelaius phoeniceus*			X	CL
Rock ptarmigan	*Lagopus muta*	X	X	X	TC, CL
Rock sandpiper	*Calidris ptilocnemis*	X	X	X	TC

Table H-30. Bird Species Observed or Potentially Occurring on or near the Tin City (TC), Kotzebue (Kot), and Cape Lisburne (CL) Sites

Common Name (Federal Status)*	Scientific Name	TC	Kot	CL	Observed
Ross's gull	*Rhodostethia rosea*		X	X	CL
Rough-legged hawk	*Buteo lagopus*	X	X	X	TC
Ruddy turnstone	*Arenaria interpres*	X	X	X	Kot
Rusty blackbird	*Euphagus carolinus*		X		Kot
Sabine's gull	*Xema sabini*	X	X		TC, CL
Sanderling	*Calidris alba*	X	X	X	
Sandhill crane	*Antigone canadensis*	X	X	X	All
Savannah sparrow	*Passerculus sandwichensis*	X	X	X	All
Say's phoebe	*Sayornis saya*	X			
Semipalmated plover	*Charadrius semipalmatus*	X	X	X	All
Semipalmated sandpiper	*Calidris pusilla*	X	X	X	All
Sharp-tailed sandpiper	*Calidris acuminata*	X	X	X	
Short-billed dowitcher	*Limnodromus griseus*			X	CL
Short-eared owl	*Asio flammeus*	X	X		Kot
Short-tailed shearwater	*Ardenna tenuirostris*	X	X	X	CL
Slaty-backed gull	*Larus schistisagus*	X	X		TC, CL
Snow bunting	*Plectrophenax nivalis*	X	X	X	TC, CL
Snow goose	*Anser caerulescens*	X	X	X	TC, CL
Snowy owl	*Bubo scandiacus*	X	X	X	TC, CL
Sooty shearwater	*Ardenna grisea*			X	CL
Spectacled eider (T)	*Somateria fischeri*	X	X	X	TC, CL
Spotted sandpiper	*Actitis macularius*	X	X	X	
Steller's eider (T)	*Polysticta stelleri*	X	X	X	CL
Surf scoter	*Melanitta perspicillata*	X	X	X	TC, CL
Thick-billed murre	*Uria lomvia*	X	X	X	Kot, CL
Tree swallow	*Tachycineta bicolor*	X	X		Kot
Tufted puffin	*Fratercula cirrhata*	X	X	X	CL
Tundra swan	*Cygnus columbianus*	X	X	X	TC, Kot
Varied thrush	*Ixoreus naevius*	X	X		TC
Violet-green swallow	*Tachycineta thalassina*			X	CL
Wandering tattler	*Heteroscelus incanus*			X	CL
Western sandpiper	*Calidris mauri*	X	X	X	All
Whimbrel	*Numenius phaeopus*		X	X	Kot, CL
White wagtail	*Motacilla alba*	X	X	X	TC, CL
White-crowned sparrow	*Zonotrichia leucophrys*	X	X	X	All
White-winged scoter	*Melanitta deglandi*	X	X	X	Kot, CL
Willow ptarmigan	*Lagopus lagopus*	X	X	X	Kot, CL
Wilson's snipe	*Gallinago delicata*	X	X	X	All
Wilson's warbler	*Cardellina pusilla*	X	X	X	Kot
Yellow warbler	*Setophaga petechia*		X		Kot
Yellow-billed loon	*Gavia adamsii*	X	X	X	TC, CL
Yellow-rumped warbler	*Setophaga coronata*		X		

Notes: BGEPA = Bald and Golden Eagle Protection Act, E = endangered, T = threatened. All bird species are protected under the MBTA except for ptarmigan.

Sources: Potentially Occurring. Childs 1969; Flock and Hubbard 1979; Armstrong 1998; Gibson 1993; Day et al. 1995; 611 ASG 1995d; Day and Stickney 1996; Andres et al. 1999.
Observed. 611 ASG 1995d; Day et al. 1995; Day and Stickney 1996; Andres and Brann 1997; Andres et al. 1999; Boisvert et al. 2004; Boisvert and Day 2006; Dragoo et al. 2017; Pardieck et al. 2018; Dragoo and Dragoo 2019; 611th Avifaunal Database (https://usfws-mbm-landbirds.shinyapps.io/611thAvifaunalDatabase/).

H.5 CAPE NEWENHAM LRRS

H.5.1 Location and Area

Accessible only by air or sea, Cape Newenham LRRS is located 460 miles southwest of Anchorage (Figure H-1). The 2,103-acre installation is located on a peninsula between Kuskokwim Bay to the north and Bristol Bay to the south within the Togiak NWR (Figure H-42 and Figure H-43). Cape Newenham has Upper and Lower camps that are connected by a gravel roadway.

Figure H-42. View of Cape Newenham LRRS (Lower Camp) with Upper Camp in the Background

H.5.2 Installation History

Cape Newenham LRRS is one of 12 original AC&W sites constructed as a part of the air defense system in Alaska. Construction of the facility was completed in 1952. Radar was installed at Upper Camp in 1954 when the installation became operational. Communications were originally provided by a high frequency radio system, which was replaced by WACS. By 1979 WACS was obsolete and was replaced by a commercial satellite earth terminal system. In 1977, 80 military personnel were replaced when support services were contracted; 14 military personnel remained on site. A MAR system was installed in 1984, which remains active today, and other modifications were made to remotely operate and maintain the radar from Elmendorf Region Operations Control Center. This allowed all military positions to be eliminated and permitted total operation by a contractor (Argonne National Laboratory and CEMML 2013). Clean Sweep removed inactive structures at the LRRS in 2011 and 2012.

H.5.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. Four contractor personnel are responsible for the operation, maintenance, and support of the MAR year-round (611 CES 2019).

Figure H-43. Overview of Cape Newenham LRRS

H.5.4 Surrounding Communities

Platinum (27 miles northeast) and Goodnews Bay (37 miles northeast) are the nearest communities to the installation. With an estimated 2018 population of 53 (State of Alaska 2018), Platinum has a mixed economy dependent on local government, commercial fishing, and subsistence resources. The village of Goodnews Bay is on the north shore of Goodnews Bay at the mouth of the Goodnews River. Goodnews Bay is a traditional Yup'ik Eskimo village, formerly known as Mumtraq. Goodnews Bay relies on subsistence products for its existence. With an estimated 2018 population of 283 (State of Alaska 2018), employment is primarily in local government and schools.

H.5.5 Regional Land Use

The Cape Newenham site is surrounded by lands and waters of the Togiak NWR managed by the USFWS. Archeological evidence indicates that the area of the current Togiak NWR has been continuously occupied by Eskimos for at least 2,000 years. One site on Cape Newenham LRRS shows evidence of possible human occupancy dating 4,000 to 5,000 years ago (USFWS 2009a). Today very little activity occurs within NWR lands surrounding the LRRS.

H.5.6 Local and Regional Natural Areas

Cape Newenham LRRS falls within Togiak NWR Unit 7, comprised of the Kinegnak and Slug River drainages and the Cape Pierce/Cape Newenham subunit. Togiak NWR was established in 1980. Management direction for the refuge is provided in the *Comprehensive Conservation Plan, Togiak National Wildlife Refuge* (USFWS 2009a). The coastal zone in the Cape Pierce/Cape Newenham subunit consists of sand and gravel beaches, sea cliffs, estuaries, and littoral and pelagic waters. The area possesses diverse fish and wildlife resources and habitats of national and international significance. In addition to the unit's high biological values, the Cape Pierce/Cape Newenham area also has unusual scenic qualities. The Cape Pierce/Cape Newenham subunit lies within a wildlife sensitive zone. This designation emphasizes the importance of the area for wildlife, and pilots are requested to avoid flights below 2,000 ft AGL (USFWS 2009a).

H.5.7 Physical Environment

H.5.7.1 Climate

Cape Newenham is located in a maritime climatic zone. Both the maritime climate of Bristol and Kuskokwim bays and the continental climate of interior Alaska affect the area. Varying topography also affects local temperatures, types of precipitation, and wind conditions. Temperatures at the LRRS range from an average minimum of 12 ºF in February to an average maximum of 49-53 ºF in summer. Fall is the wettest season, and the least precipitation occurs in spring. Snowfalls primarily from October through April. Winds are fairly constant year-round and average 14 mph (Table H-31).

Table H-31. Monthly Climate Averages for Cape Newenham, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	23.4	21.6	26.8	31.3	41.2	49.0	53.4	53.3	49.4	38.5	32.3	24.5
Avg. Low (ºF)	14.0	11.9	17.3	22.7	33.5	41.0	45.8	47.1	43.4	32.4	25.0	14.8
Avg. Precipitation (inches)	1.8	1.1	1.6	1.7	2.0	2.8	3.8	5.9	5.4	4.8	3.7	2.1
Avg. Snowfall (inches)	12.3	9.0	10.4	10.0	4.3	0	0	0	0.1	5.5	12.4	12.9
Avg. Wind Speed (mph)	15	17	14	13	12	10	11	13	15	15	16	17
Prevailing Wind Direction	ESE	ESE	ESE	N	S	S	S	S	N	N	ESE	N

Source: 611 CES 2019.

H.5.7.2 Topography

Jutting into the Bering Sea, Cape Newenham is a small peninsula at the southern terminus of the Ahklun Mountains between Bristol Bay and Kuskokwim Bay. The topography of Cape Newenham is steep, rugged, and rocky. The coastline is dominated by volcanic rock cliffs reaching elevations of 1,100 ft and is interspersed with sandy, dune-lined beaches and bays. The cliffs have been sculpted by wind and sea, resulting in spectacular arches and pinnacles. The southern shore of the Cape Newenham peninsula consists of high rocky escarpments, which plunge from 500 to 2,000 ft MSL directly into Bristol Bay. All streams on the peninsula flow north through steep-sided, U-shaped valleys into Kuskokwim Bay. Elevations at Cape Newenham LRRS range from 2,000 ft MSL at Upper Camp, to 650 ft MSL at Lower Camp, and to 250 ft MSL at the lower end of the landing strip.

H.5.7.3 Geology and Soils

The geology of Upper Camp is dominated by a thin accumulation of residual sand, gravel, cobbles, and boulders that have developed due to the weathering of underlying bedrock. Bedrock outcrops are common, especially on eroded surfaces and along steeply sloping valley walls and escarpments. The local bedrock is a dense, fractured volcanic greenstone. A mixture of talus and alluvium has washed downslope, forming a moderately thick accumulation of poorly stratified sediments on the steeply sloping valley floor where the Lower Camp, stream channel, and barge landing area are situated (Headquarters, Alaska Air Command 1988).

Soils on the site are Pergelic Cryumbrepts. These soils are thin, well-drained sands, gravels, or stony loams overlying bedrock (Headquarters, Alaska Air Command 1988).

Permafrost is discontinuous in this area. Lower Camp is underlain by predominantly fine-grained deposits and contains isolated masses of permafrost. Permafrost is probably absent at Upper Camp (Headquarters, Alaska Air Command 1988).

H.5.8 Hydrology

H.5.8.1 General

The valley above Lower Camp is the principal recharge zone of groundwater for the installation. The Lower Camp valley consists of a thick zone (approximately 100 ft) of consolidated, highly permeable, coarse-grained talus and alluvium. This material generally contains groundwater at shallow depths (3-6 ft). The talus/alluvial material receive upslope recharge and discharges downslope. It is reported that groundwater in bedrock flows under artesian conditions at the Lower Camp area (Headquarters, Alaska Air Command 1988).

The Upper Camp area is underlain by poorly-sorted coarse talus, which occurs primarily on steep slopes which overlie bedrock. Groundwater may occur in these sediments seasonally as perched water, but discharge of runoff into bedrock or downslope is more likely (Headquarters, Alaska Air Command 1988).

Drainage at Cape Newenham LRRS flows into an unnamed drainage within boundaries of the installation. The creek flows through the valley, past the airstrip and into Kuskokwim Bay (see H.5.9.3, *Wetlands*).

H.5.8.2 Floodplains

Surface runoff is contained within ditches and natural drainages; thus, both camps are well-drained and do not flood. Upper reaches of the creek would probably contain a 100-year flood, and lower reaches would certainly contain such a flood. Flow depth in lower reaches of the creek would be less than 6 ft. Coastal flooding was estimated to reach 15 ft MSL, based on regional storm levels (Legare 1998).

H.5.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Cape Newenham LRRS. Attachment 6 contains lists of vascular plants (Table H-34), fish (Table H-35), mammals (Table H-36), and birds (Table H-37) known to occur or potentially occurring in the Cape Newenham area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Cape Newenham site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.5.9.1 Ecoregion Classification

The Cape Newenham site is located in the Ahklun Mountains ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.5.9.2 Vegetation/Habitat

A general vegetation map of Cape Newenham LRRS was prepared in 1995 (611 ASG 1995e). Schick et al. (2004) made significant improvements in vegetation mapping at Cape Newenham LRRS using 2002 QuickBird pan-sharpened natural color imagery, conducting flora and fauna surveys, and mapping wildlife habitat. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, used the most recent imagery found on Google Earth and mapped habitat classes for Cape Newenham LRRS. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 5 habitat classes were identified (Table H-32 and Figure H-44).

Table H-32. Habitat Classes at Cape Newenham LRRS (2017)

Habitat Class	Acres	Proportion
Developed and Barren Land	956.1	45.5%
Shrub/Scrub	821.5	39.1%
Sedge/Herbaceous	295.2	14.1%
Herbaceous Marsh	0.4	<0.1%
Open Water	27.3	1.3%
Total	**2100.5**	

Source: CEMML 2019a.

The Cape Newenham LRRS area encompasses about 2,100 acres of gently sloping tundra and rocky mountainous terrain. The area is well-drained to moderately well-drained, and there are relatively few wet tundra habitats. The site is strongly dominated by upland dwarf shrub/scrub, which occur primarily on mountain slopes and well-drained bluffs, and are characterized by dwarf shrub-scrub less than 1.6 ft high and includes heath and crowberry. An abundance of mosses and lichens grow amidst dwarf shrubs. Two major types of communities may occur here, creeping dwarf shrub fellfield and dwarf shrub-lichen heath. Creeping dwarf shrub fellfield refers to relatively bare, elevated communities with stony soil. This type is dominated by matted dwarf shrubs, such as white mountain avens, is rich in lichens, and often includes netleaf willow, crowberry, alpine azalea, and alpine bearberry. Dominant dwarf shrubs include crowberry, narrow leaf Labrador tea, spirea, dwarf Arctic birch, and dwarf willows. Facing the Bering Sea on the south side of the LRRS are steep and partially vegetated cliffs. Although a few scattered low willows occur along the stream at the northern end of the property, there are no habitats dominated by low or tall shrubs (Schick et al. 2004).

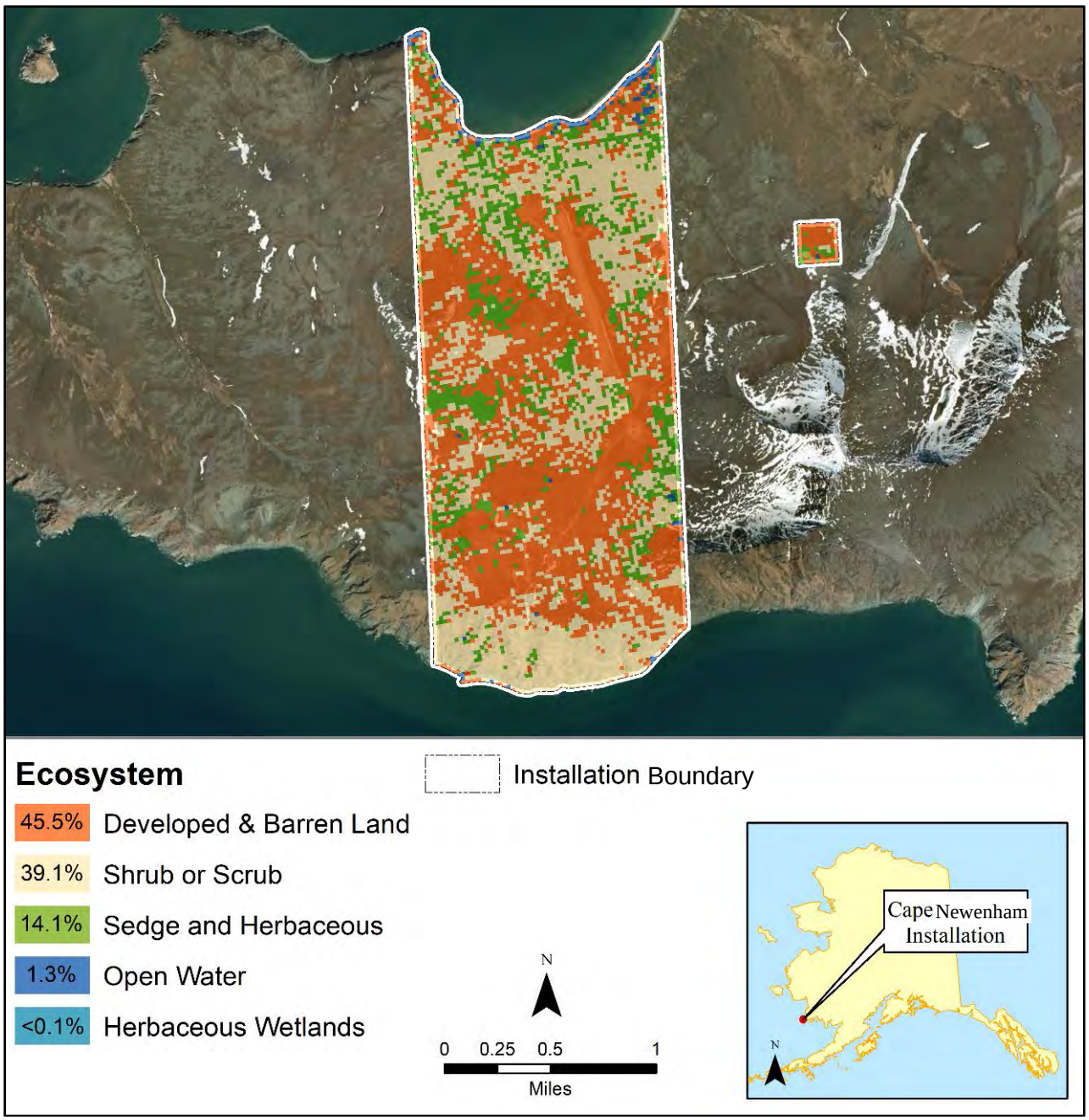

Figure H-44. Cape Newenham LRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

H.5.9.3 Wetlands

The current mapping of wetlands at Cape Newenham is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 2,100-acre Cape Newenham site, 390 acres (or 19%) are considered wetlands per the NWI mapping (Table H-33 and Figure H-45). The most common wetland type is freshwater emergent wetland. These areas are moist dwarf scrub habitats and can be saturated, moderately well-drained, or well-drained, depending primarily on soil type, microtopography, and landscape position. Dominant shrub species in these areas include *Empetrum nigrum, Vaccinium uliginosum, V. vitis-idaea, Ledum decumbens, Dryas octopetala, Arctostaphylos alpina,* and *Salix rotundifolia* (Schick et al. 2004).

Table H-33. Cape Newenham LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	333.9	15.9%	75.0	3.6%
Estuarine and Marine Deepwater	42.7	2.0%	3.9	0.2%
Riverine	10.0	0.5%	29.3	1.4%
Estuarine and Marine	2.2	0.1%	24.6	1.2%
Freshwater Forested/Shrub	0	0	19.3	0.9%
Freshwater Lake/Pond	0	0	12.2	0.6%
Wetlands Total	**388.8**	**18.5%**	**164.3**	**7.8%**
Upland	1,714.1	81.5%	1,938.1	92.2%
Site Total	**2,102.9**		**2,102.4**	

Notes: *See Figure H-45. †See Figure H-46.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

H.5.9.4 Fish and Wildlife

H.5.9.4.1 Fish

All five species of Pacific salmon are abundant in the Kuskokwim drainage. Chum, king (chinook), and sockeye (red) salmon are the most abundant. In general, these salmon species pass through marine waters offshore of the LRRS during spring to early summer as juveniles on their way to open ocean, then again in the summer-fall period as adults on their way to their natal streams for spawning. Other freshwater and anadromous species in the area include whitefish, rainbow trout, Arctic char, Dolly Varden, Arctic grayling, least cisco, Alaska blackfish, and coastrange sculpin (Table H-35).

One unnamed stream occurs on the site and is bisected by the runway and empties into Kuskokwim Bay (Figure H-45). Fish species that may occur within this stream are unknown and it has not listed in the ADFG stream catalog program (Johnson and Blossom 2019a).

Figure H-45. Cape Newenham LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

Figure H-46. Cape Newenham LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.5.9.4.2 Mammals

Terrestrial Mammals

Of the 35 mammal species known to occur or are expected to occur on or in the vicinity of the Cape Newenham site, 22 are terrestrial (Table H-36). Large mammals of Togiak NWR include brown bear, caribou, wolf, and wolverine. The area supports a variety of fur-bearing and small mammals including red and Arctic foxes, porcupine, ermine, least weasel, lemmings, shrews, voles, Arctic ground squirrel, and snowshoe and Alaskan hares. American mink, beaver, muskrat, and river otter are found in or near various freshwater systems of the subregion (USFWS 2009a).

Marine Mammals

Of the 13 marine mammals that are known to occur or are expected to occur in the Cape Newenham area, 6 are cetaceans or whales and 7 are pinnipeds or seals (Table H-36). Marine mammals are discussed in detail in Section H.5.9.5 (ESA- and MMPA-listed Species).

H.5.9.4.3 Birds

A total of 156 avian species have been recorded on or have the potential to occur in the vicinity of the Cape Newenham site (Table H-37). Bristol Bay is an important stopover for waterfowl and shorebirds coming from wintering areas throughout the Pacific. Birds from the North American Pacific Flyway and several Asiatic routes funnel through this area. Bays and lagoons along the Togiak NWR coastline are heavily used as staging grounds in spring and fall. Rugged coastal cliffs, particularly in the Cape Newenham/Cape Pierce area, provide excellent habitat for nesting seabirds and raptors (USFWS 1988).

The Cape Newenham/Cape Pierce area supports one of the largest mainland seabird colonies in the Bering Sea (USFWS 1991a). Prime seabird habitat is provided by cliffs associated with Kuskokwim and Bristol bays, and hundreds of thousands of cliff-nesting seabirds occupy coastal areas around Cape Newenham LRRS. The area also provides coastal and shoreline habitat for marine birds and shorebirds, and moist and alpine tundra habitats support several species of passerines (USFWS 1989b).

Studies conducted by Petersen et al. (1991) determined the distribution and abundance of breeding and suspected breeding birds in the Ahklun Mountains and sea cliffs that border Cape Newenham LRRS. The two most common nesting species on cliff faces are common murres and black-legged kittiwakes. Common birds from the Ahklun Mountains include the red-throated loon, harlequin duck, green-winged teal, northern pintail, long-tailed duck, common goldeneye, red-breasted merganser, golden eagle, Wilson's snipe, red-necked phalarope, red phalarope, mew gull, semipalmated plover, greater yellowlegs, spotted sandpiper, western sandpiper, Arctic tern, American robin, golden-crowned sparrow, rosy finch, lapland longspur, rock sandpiper, and snow bunting.

Upper Camp is located along Radar Mountain, which rises as a steep-walled promontory providing nesting habitat for thousands of seabirds, including kittiwakes. Lower Camp is located approximately 500 ft west of two ponds at the base of Jagged Mountain. Kittiwakes from the entire peninsula use these ponds to collect nest material and to bathe throughout the breeding season (USFWS 1993b).

Raptor species sighted and/or nesting along the coastal cliffs in the Cape Newenham area include bald eagle, rough-legged hawk, peregrine falcon, and gyrfalcon. A pair of bald eagles nested on one promontory (known as Eagle Point) west of Radar Mountain from 1990 to 1992. In 1993 one pair of rough-legged hawks nested on another promontory (known as DC Point) west of Radar Mountain, and a second pair nested on a promontory on the northern side of the Cape Newenham peninsula, east of the runway. A

peregrine falcon was sighted from Lower Camp in July 1993, and peregrine falcons have been nesting at Cape Pierce since at least 1989 (USFWS 1993b).

Important Bird Areas (IBAs)

Cape Newenham LRRS is adjacent to the Cape Peirce and Cape Newenham Colonies Coastal IBA (Figure H-47). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The Lisburne Peninsula Marine IBA has been designated by Audubon Alaska as a globally important IBA due to the presence of approximately 13 large seabird colonies. Collectively, these colonies contain 11 seabird species and an estimated 835,000 birds. The meta-colony is an IBA for tufted puffin (80,100) and black-legged kittiwake (108,443). The largest colony, Bird Rock (1.5 miles west of the LRRS), contains 4 seabird species and an estimated 320,000 birds (Audubon Alaska 2014).

H.5.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Seven ESA-listed species occur or potentially occur on or in the vicinity of the Cape Newenham LRRS: threatened spectacled and Steller's eider, and ringed and bearded seals; and the endangered Steller sea lion, fin whale, and bowhead (Table H-36 and Table H-37).

Spectacled and Steller's Eiders. Steller's eiders may be seen in offshore waters during migration, and the waters surrounding the Cape Newenham Peninsula have been identified as important molting areas (USFWS 2019e). Spectacled eiders may occur in late summer during molt within offshore waters of Kuskokwim Bay north of Cape Newenham (Spectacled Eider Recovery Team 1996).

Steller Sea Lion. The Steller sea lion is found at Cape Newenham. In 1993, NMFS designated all Steller sea lion rookeries and major haulouts as critical habitat (NMFS 1993). Critical habitat includes terrestrial, aerial, and aquatic zones associated with rookeries and haulouts. The terrestrial zone extends 3,000 ft landward from each major rookery and haulout. Aquatic zones extend 20 NM seaward from the major rookeries and haulouts. Lastly, critical habitat also includes air zones extending 3,000 ft above these terrestrial and aquatic zones. This designation includes the marine waters around Cape Newenham, with the rookery/haulout located at the tip of Cape Newenham (Figure H-48). Based on aerial surveys in July 2015 and 2017, the sea lion haulout at Cape Newenham supported approximately 100-200 animals (Fritz et al. 2015; Sweeney et al. 2017).

Ringed and Bearded Seals. Ringed and bearded seals occur in the Cape Newenham area in winter where ice is present (Wynne 1993).

Bowhead and Fin Whale. Both species are expected to be rare visitors in the offshore waters of Cape Newenham.

MMPA-listed Species

The Pacific walrus are known to haul out at Cape Newenham LRRS and adjacent coastlines (PRSC 2020). A major walrus haulout is located to the west of the LRRS and has supported 1,000 to less than 10,000 animals during April-December (Fischbach et al. 2016) (Figure H-49). Harbor seals and spotted seals haulout on rocks just off the Cape Newenham coast (Jemison 1992). Gray whales may occur in pods of up to 300 animals in Hagemeister Strait to the east, and in pods of 25 near Cape Newenham LRRS. Less abundant but still common are killer whale and beluga; beluga calve in and around the mouth of the Igushik River, approximately 100 miles east of Cape Newenham. Common minke whales have been seen

occasionally in coastal waters (USFWS 1986a). Harbor and Dall's porpoise commonly occur in these coastal waters (Wynne 1993).

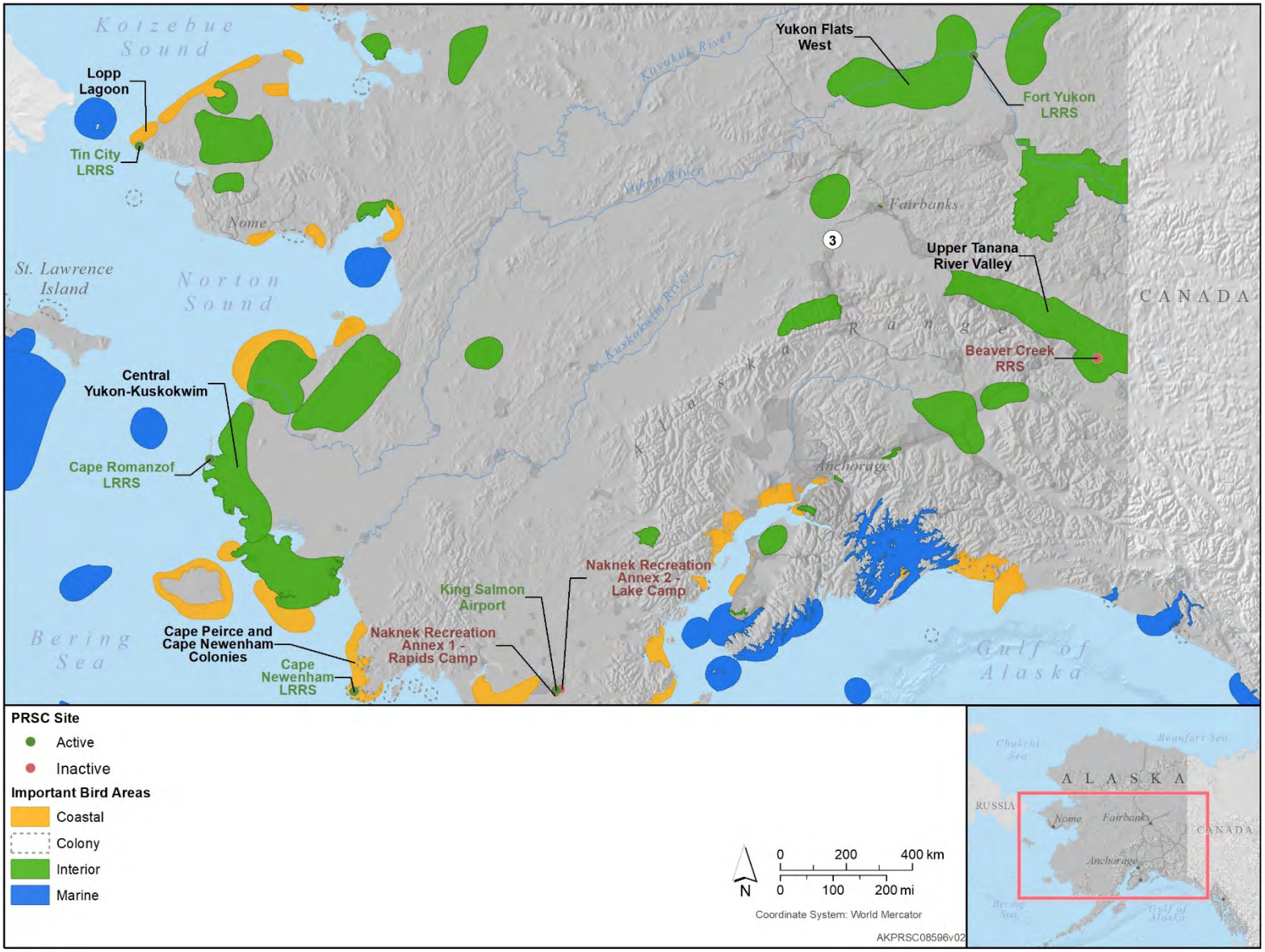

Figure H-47. Important Bird Areas (IBAs) within the Vicnity of Central Coastal and Interior Alaska PRSC Sites
(*Source*: Audubon Alaska 2014)

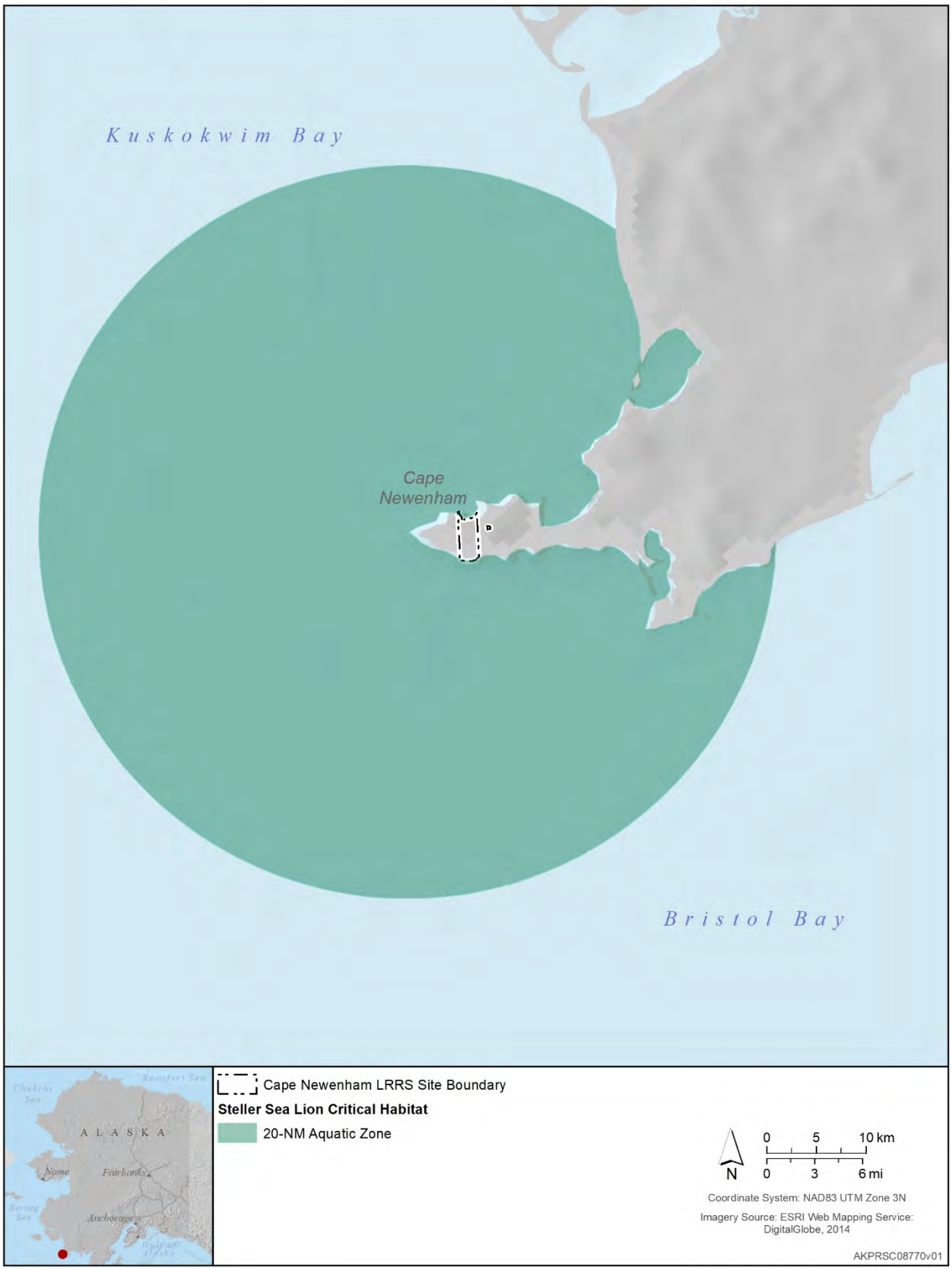

Figure H-48. Steller Sea Lion Critical Habitat within the Vicnity of the Cape Newenham LRRS
(*Source*: NMFS 1993)

Figure H-49. Pacific Walrus Haulout within the Vicinity of Cape Newenham LRRS
(*Source*: Fischbach et al. 2016)

H.5.10 Other Natural Resource Information

H.5.10.1 Subsistence

Demands for natural resources within or near the LRRS include hunting, fishing, and other outdoor recreational activities. Traditional subsistence activates in the Cape Newenham area varies depending on the particular community. Togiak and Twin Hills residents rely heavily on such fish as char, Dolly Varden, smelt, and pike, while Quinhagak residents rely heavily on fish, land mammals, and marine mammals. Chinook, chum, and coho salmon, and char accounted for the majority of the annual subsistence harvest in terms of edible pounds. Much of the community participates in subsistence activities. Freshwater fish are intensively harvested, and migrating birds and bird eggs along the rocky coastline are also harvested. Residents harvest salmon both for commercial and subsistence purposes (Braund and Associates 2004).

H.5.10.2 Outdoor Recreation

Outdoor recreation at or near Cape Newenham LRRS primarily consists of non-organized activities, such as hunting, fishing, hiking, and wildlife viewing. Hunting is restricted due to USAF policy. BOS contract personnel stationed at Cape Newenham, temporary duty personnel during free time, and subsistence gatherers from neighboring areas hunt or fish in the general area. No interest exists by DoD personnel to travel to the site for recreational purposes. Personnel assigned to the site may do some hiking and wildlife viewing, and some recreational fishing may also occur at the old fish camp east of the site. Personnel have sea kayaked in the cove at Cape Newenham as well as several other coastal sites (personal communication, P. Cooley 2007). In accordance with NWR policy, ATV use must be restricted to established roads (USFWS 1993b). These roads include those maintained by USAF staff but do not include old ATV trails.

H.5.11 Mission and Other Impacts on Natural Resources

H.5.11.1 Land Use

Lower Camp has a runway, power plant, living quarters, and other facilities in support of the LRRS mission. Upper Camp houses radar facilities.

USAF has two outgrants to the FAA. One is for support of the CAPSTONE safety-enhancement project for the safety of aircraft operations in Alaska at Upper Camp, and the other is for the operation and maintenance of Alaskan Telecommunication Infrastructure at Lower Camp (611 CES/CEI 2020a).

Roads. Cape Newenham LRRS has a network of more than 4.5 miles of gravel roads. The road to Upper Camp is approximately 1.5 miles long; it is maintained during the summer and is traversed using a PistenBully in the winter. Access to Upper Camp can and always has been difficult, especially during low visibility, high icing, heavy winds, and other extreme weather conditions. Upper Camp can be iced in or snowed in, and may not be accessible for days or weeks at a time.

Barge Landing. Cape Newenham LRRS is served by ocean-going barges to deliver fuel, construction materials and equipment, and other large or heavy equipment and maintenance components. When a barge is due, operations personnel construct a temporary barge landing, and use heavy construction equipment to anchor the barge. The temporary barge landing is typically washed away by wave action after each use.

Airfield. The gravel airfield is 3,950 ft long by 150 ft wide and equipped with Runway Edge Indicator Lights (REIL) and Precision Approach Path Indicator (PAPI) light systems, and frangible distance-remaining indicators. The inclined airfield goes from an elevation of 225 to 550 ft MSL.

ATTACHMENT 6: NATURAL RESOURCES OF THE CAPE ROMANZOF, CAPE NEWENHAM, AND COLD BAY SITES

Table H-34. Vascular Plant Species Observed or Potentially Occurring on the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name	Scientific Name	CR	CN	CB	Observed	Source
SHRUBS						
Sitka alder	*Alnus sinuata*		X	X	CB, CN	2, 9, 10
Bog -rosemary	*Andromeda polifolia*	X	X	X	CR	1-3
Alpine bearberry	*Arctostaphylos alpina*	X	X	X	All	2, 4, 8-10
Red bearberry	*Arctostaphylos rubra*	X		X	CR	2, 9
Bearberry (kinninnik)	*Arctostaphylos uva-ursi*			X		2
Dwarf Arctic birch	*Betula nana*	X	X	X	All	2, 9
Alaska cassiope	*Cassiope lycopodiodes*		X	X	CN	2, 9
Starry cassiope	*Cassiope stelleriana*		X	X	CN	1-3, 9
Four-angled cassiope	*Cassiope tetragona*	X				2-4
Leatherleaf	*Chamaedaphne calyculata*	X	X			2
Bunchberry	*Cornus canadensis*	X	X	X		1-3
Lapland cornel	*Cornus suecica*	X	X	X	All	2, 9, 10
Diapensia	*Diapensia lapponica*	X	X		CN, CR	2, 3, 9
Entire-leaved mountain avens	*Dryas integrifolia*			X	CB	10
White mountain avens	*Dryas octopetala*	X	X	X	All	2, 9
Crowberry	*Empetrum hermaphroditum*	X	X	X	All	2, 9, 10
Narrowleaf Labrador tea	*Ledum decumbens*	X	X	X	All	2, 9, 10
Twin-flower	*Linnaea borealis*	X	X		CR	2, 9
Alpine-azalea	*Loiseleuria procumbens*	X	X	X	All	1-3, 8-10
Sweet gale	*Myrica ga le*	X	X			2
Shrubby cinquefoil	*Pentaphylloides floribunda = Potentilla fruiticosa*		X			2, 3
Aleutian (mountain) heather	*Phyllodoce aleutica*	X	X	X	CR, CN	1-3, 9
Aleutian (mountain) heather	*Phyllodoce aleutica*	X	X	X	CR, CN	1-3, 9
Blue mountain heath	*Phyllodoce coerulea*	X	X		CR	2, 8, 9
Kamchatka rhododendron	*Rhododendron camtshaticum*			X	CB, CN	2, 3, 9, 10
Currant	*Ribes* sp.	X	X			1, 4
Nagoonberry	*Rub us arcticus*	X	X	X	All	2, 8-10
Cloudberry	*Rubus chamaemorus*	X	X	X	CN, CR	2, 4, 8, 9
Salmonberry	*Rubus spectabilis*			X	CB	2, 10
Feltleaf willow	*Salix alaxensis*	X	X	X	CN, CR	2, 4, 9
Littletree will ow	*Salix arbusculoides*		X		CN	2, 9
Arctic willow	*Salix arctica*	X	X	X	All	2, 4, 9, 10
Barclay willow	*Salix barclayi*	X	X	X	All	2, 4, 9, 10
Barren-ground willow	*Salix brachycarpa*			X		2, 4
Undergreen willow	*Salix commutata*			X		2
Alaska bog willow	*Salix fuscescens*	X	X	X	CN, CR	2, 9
Grayleaf willow	*Salix glauca*	X	X	X	All	2, 8-10
Halberd willow	*Salix hastata*		X			2
Oval-leafed willow	*Salix ovalifolia*	X	X	X	CN	2, 9
Skeleton leaf willow	*Salix phlebophylla*	X				2, 9
Polar willow	*Salix polaris*	X				2
Tealeaf willow	*Salix pulchra*	X	X	X	All	1, 4, 9, 10
Net leaf willow	*Salix reticulata*	X	X	X	All	2, 3, 9, 10
Richardson willow	*Salix richardsonii = Salix lanata richardsonii*	X	X		CN	2, 9
Least willow	*Salix rotundifolia*	X	X	X	All	2
Sprouti ng willow	*Salix stolonifera*			X		2
Pacific red-elder	*Sambucus racemosa*		X	X	CB	2, 10

Table H-34. Vascular Plant Species Observed or Potentially Occurring on the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name	Scientific Name	CR	CN	CB	Observed	Source
Spirea	*Spiraea stevenii = Spiraea beauverdiana*	X	X		CN, CR	2, 8, 9
Early blueberry	*Vaccinium ovalifolium*		X	X		2
Bog cranberry	*Vaccinium oxycoccus*	X	X	X		2
Bog blueberry	*Vaccinium uliginosum*	X	X	X	CN, CR	2, 9
Mountain cranberry	*Vaccinium vitis-idaea*	X	X	X	All	2, 9, 10
Highbush cranberry	*Viburnum edule*		X			2
Northern yarrow	*Achillea millefolium*	X	X	X	All	1, 9, 10
HERBACEOUS						
Monkshood	*Aconitum delphinifolium*	X	X		CN, CR	1, 9
Greater monkshood	*Aconitum maximum*			X	CB	1, 10
Alaskan bent grass	*Agrostis alaskana*			X	CB	1, 10
Bent grass	*Agrostis geminata*			X	CB	1, 10
Bent grass	*Agrostis scabra*	X			CR	1
Shortawn foxtail	*Alopecurus aequalis*			X	CB	1, 10
Rock jasmine	*Androsace chamaejasme*		X	X		1, 3
Narcissus-flower anemone	*Anemone narcissiflora*	X	X	X	All	1, 3, 9, 10
Northern anemone	*Anemone parviflora*	X	X	X	CR	1, 3, 9
Yellow anemone	*Anemone richardsonii*	X	X	X	CR	1, 3, 9
Wild celery	*Angelica lucida*	X	X	X	All	1, 4, 9, 10
Cats paws	*Antennaria monocephala*		X		All	1, 4, 9, 10
Pussytoe	*Antennaria rosea*			X	CB	1, 10
Lyre-leaf rockcress	*Arabis lyrata, Arabis hirsuta*	X	X	X	CB, CN	1, 4, 9
Polar grass	*Arctogrostis latifolia*	X	X	X	All	1, 9, 10
Pendent grass	*Arctophila fulva*	X	X	X	CN	1, 4, 9
Thrift	*Armeria maritimum*			X	CB	1, 10
Tall meadow arnica	*Arnica chamissonis*			X		1, 4
Frigid arnica	*Arnica frigida*	X	X		CR	1, 3, 9
Lessing's arnica	*Arnica lessingii*	X	X	X	CN, CR	1, 4, 9
Arctic wormwood	*Artemisia arctica*	X	X	X	CN, CR	1, 9
Arctic wormwood	*Artemisia comata*	X	X	X		1, 4
Wormwood	*A rtemisia glomerata subglabra*	X				5
Purple wormwood	*Artemisia globularia*		X	X	CN, CB	1, 3, 9, 10
Common wormwood	*Artemisa tilesii*	X	X	X	CN, CR	1, 4, 9
Goatsbeard	*Aruncus sylvester*			X		1, 3
Siberian aster	*Aster sibiricus*	X	X	X		1, 3
Northern aster	*Aster subspicatus*			X		1, 4
Alpine milkvetch	*Astragalus alpinus*	X	X	X		1, 3, 4
Hairy arctic milkvetch	*Astragalus umbellatus*	X	X	X	CR	1, 3, 9
Lady fern	*Athyrium filix-femina*	X	X	X	All	1, 4, 9, 10
Wintercress	*Barbarea orthoceras*	X	X	X	CN, CB	1, 4, 9
Broomrape	*Boschniakia rossica*			X		1, 3
Moonwort	*Botrychium boreale*			X		1, 4
Moonwort	*Botry chium lanceolatum*			X		1, 4
Moonwort	*Botrychium lunaria*	X	X	X		1, 4
Rattlesnake fern	*Botrychium virginianum*			X		1, 4
Smooth brome	*Bromus inermis*			X	CB	1
Alaska brome	*Bromus sitchensis*			X	CB	1, 10
Thorough-wort	*Bupleurum americanum = Bupleurum triradiatum*	X			CR	1, 9
Bluejoint	*Calamagrostis canadensis*	X	X	X	All	1, 4, 9 ,10
Reed bent grass	*Calamagrostis* sp.	X	X	X	CN, CB	1, 4
Mountain marigo ld	*Caltha leptosepala*			X		1, 3
Marsh marigold	*Caltha palustris*	X	X	X	CN, CR	1, 3, 9
Bluebell	*Campanula lasiocarpa*	X	X	X	All	1, 3, 9 ,10

Table H-34. Vascular Plant Species Observed or Potentially Occurring on the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name	Scientific Name	CR	CN	CB	Observed	Source
Bittercress	*Cardamine purpurea*	X				1, 3
Cuckoo flower	*Ca rdamine pratensis*	X	X	X		1, 4
Water sedge	*Carex aquatilis*	X	X	X	All	1, 4, 9, 10
Sedge	*Carex atheroides*					1, 4
Bigelow's sedge	*Carex bigelowii*	X	X		CN, CR	1, 4, 9
Mud sedge	*Carex limosa*				CB	1, 10
Lyngbye edge	*Carex lyngbyaei*	X	X	X		1, 4
Longawn sedge	*Carex macrochaeta*			X	CB	1, 10
Fragile sedge	*Carex membranacea*		X		CN	1, 9
Smallawned sedge	*Carex microchaeta*	X	X	X	All	1, 9, 10
Shortstalk sedge	*Carex podocarpa*	X			CR	1, 9
Looseflower alpine sedge	*Carex rariflora*		X		CN	1, 9
Rock sedge	*Carex saxatalis*			X	CB	1, 10
Showy sedge	*Carex spectabilis*			X	CB	1, 10
Paintbrush	*Castilleja* sp.	X	X	X		1
Coastal paintbrush	*Castilleja unalaschensis*	X		X	CB, CR	1, 3, 6, 10
Aleutian chickweed	*Cerastium aleuticum*			X	CB	1, 10
Beringian chickweed	*Cerastium beeringianum*	X	X	X	CN, CR	1, 4, 9
Chickweed	*Cerastium fischerianum*		X	X		1, 4
Fireweed	*Chamerion angustifolium = Epilobium angustifolium*	X	X	X	All	1, 3, 4, 6, 8-10
Dwarf fireweed	*Chamerion latifolium = Epilobium latifolium*	X	X	X	CN, CR	1, 3, 8, 9
Northern water carpet	*Chrysosplenium wrightii*		X	X		1, 4, 9, 10
Enchanter's nightshade	*Circaea alpina*			X	CB	1, 10
Spring beauty	*Claytonia chamissoi*			X		1, 4
Alaska spring beauty	*Claytonia sarmentosa*	X	X	X	CN, CR	1, 3, 9
Marsh fivefinger	*Comarum palustre = Potentilla palustris*	X	X	X	CN, CB	1, 3, 9
Parsley fern	*Cryptogramma crispa*			X	CB	1, 3, 10
Pink lady's slipper	*Cyprip edium guttatum*			X		1, 3
Rose-purple orchis	*Dactylorhiza aristata*			X		1, 3
Arctic daisy	*Dendranthema arcticum = Chrysanthemum arcticum*		X		CN	1, 3, 9
Tufted-hair grass	*Deschampsia beringensis*			X	CB	1, 10
Tufted-hair grass	*Deschampsia caespitosa*	X	X	X	All	1, 9, 10
Frigid shooting star	*Dodecatheon frigidum*	X				1, 3
Alpine willowherb	*Epilobium anagallidifolium*	X	X		CN, CR	1, 9
Purple-leaved willowherb	*Epilobium glandulosum*			X	CB	1, 10
Field horsetail	*Equisetum arvense*	X	X	X	All	1, 9, 10
Dwarf scouringrush	*Equisetum scirpoides*		X		CN	1, 9
Woodland horsetail	*Equisetum sylvaticum*	X	X	X	CN, CR	1, 9
Fle abane	*Erigeron humilis*		X	X		1, 3
Arctic fleabane	*Erigeron hyperboreus*	X	X	X		1, 3
Tall cottongrass	*Eriophorum angustifolium*	X	X		CN, CR	1, 9
Red cottongrass	*Eriophorum russeolum*	X	X		CN, CR	1, 9
White cottongrass	*Eriophorum scheuchzeri*	X	X	X		1, 3
Arctic eyebright	*Euphrasia mollis*			X	CB	1, 4, 10
Fescue grass	*Festuca altaica*	X	X	X	All	1, 4, 9, 10
Sheep fescue	*Festuca brachyphylla*			X	CB	1, 10
Red fescue	*Festuca rubra*			X	CB	1, 10
Coastal strawberry	*Fragaria chiloensis*			X	CB	1, 10
Indian rice	*Fritillaria camschatcensis*		X	X	CN, CB	1, 3, 9, 10
Northern bedstraw	*Galium boreale*	X	X	X	CR	1, 3, 9
Whitish gentian	*Gentiana algida*	X	X	X		1, 3
Glaucous gentian	*Gentiana glauca*	X	X		CN, CR	1, 3, 9

Table H-34. Vascular Plant Species Observed or Potentially Occurring on the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name	Scientific Name	CR	CN	CB	Observed	Source
Wild geranium	*Geranium erianthum*	X	X	X	CN, CB	1, 3, 9, 10
Large-leaved avens	*Geum macrophyllum m acrophyllum*			X	CB	1, 10
Ross avens	*Geum rossii*	X	X	X	CN, CB	1, 3, 9, 10
Oak fern	*Gymnocarpium dryopteris*	X	X	X	All	1, 9, 10
Cow parsnip	*Heracleum lanatum*	X	X	X	CR, CB	1, 3, 9,10
Alpine holy-grass	*Hierochloe alpina*	X	X		CN, CR	1, 9
Common marestail	*Hippuris vulgaris*		X		CN	1, 9
Seabeach sandwort	*Honckenya peploides*		X		CN	1, 9
Meadow barley	*Hordeum brachyantherum*			X	CB	1, 10
Fir club moss	*Huperzia selago*	X	X	X	All	1, 9, 10
Wild iris	*Iris setosa*	X	X	X	CN, CR	1, 3, 4, 8, 9
Northern green rush	*Juncus alpinus*			X	CB	1, 10
Chestnut rush	*Juncus castaneus*	X			CR	1
Thread rush	*Juncus filifor mis*			X	CB	1, 10
Glaucous weaselsnout	*Lagotis glauca*	X	X	X	All	1, 3, 9, 10
Beach pea	*Lathyrus maritimus*	X			CR	1, 9
Marsh pea	*Lathyrus palustris*	X	X	X		1, 4
Leatherleaved saxifrage	*Leptarrhena pyrolifolia = Saxifraga unalaschensis*		X		CN	1, 9
Beach ryegrass	*Leymus mollis = Elymus mollis*	X	X	X	All	1, 9, 10
Beach lovage	*Ligusticum scoticum*	X	X		CN, CR	1, 9
Heart-leaf tway blade	*Listera cordata*	X	X			1, 3, 9
Alp lily	*Lloydia serotina*	X	X	X		1, 3
Partridgefoot	*Luetkea pectinata*			X		1, 3
Arctic lupine	*Lupinus arcticus*	X		X	CR, CB	1, 4, 8
Nootka lupine	*Lupinus nootkatensis*	X	X	X	CR	1, 3, 9
Arctic wood rush	*Luzula arctica*	X	X		CN, CR	1, 9
Curved wood rush	*Luzula arcuata*	X	X		CN, CR	1, 9
Common wood rush	*Luzula multiflora*	X	X		CN, CR	1, 9
Small-flowered wood rush	*Luzula parviflora*	X	X		CN, CR	1, 9
Spiked wood rush	*Luzula spicata*			X	CB	1, 10
Alpine club moss	*Lycopodium alpinum*	X	X	X	CN, CR	1, 4, 9
Stiff club moss	*Lycopodium annotinum*			X	CB	1, 10
Running club moss	*Lycopodium clavatum*	X			CR	1, 9
Bogbean (buckbean)	*Menyanthes trifoliata*			X		1, 4
Seaside chiming bells	*Mertensia maritima*	X	X		CN, CR	1, 9
Chiming bells	*Mertensia paniculata*	X	X		CR	1, 3, 9
Wild snapdragon	*Mimulus gutta tus*		X	X		1, 3
Arctic sandwort	*Minuartia arctica*	X	X	X	CN	1, 4, 9
Arctic sandwort	*Minuartia macrocarpa*	X	X	X	CN, CR	1, 9
Alpine mitrewort	*Mitella pentandra*			X		1, 4
Blunt-leaved sandwort	*Moehring ia lateriflora*			X	CB	1, 10
Alpine forget-me-not	*Myosotis alpestris*	X	X	X		1, 3
Yellow pond lily	*Nuphar polysepalum*			X		1, 4
Mountain sorrel	*Oxyria digyna*	X	X		CN, CR	1, 9
Maydell's oxytrope	*Oxytropis maydelliana*			X	CB	1, 10
Blackish oxytrope	*Oxytropis nigrescens*	X	X	X		1, 3
Fleabane	*Packera cymbalaria = Senecio resedifolius*		X			1, 9
Alaska poppy	*Papaver radicatum alaskanum = Papaver alaskanum*		X	X	CN	1, 3, 9
Kotzebue's grass of Parnassus	*Parnassia kotzebuei*	X	X		CN, CR	1, 9
Grass of Parnassus	*Parnassia palustris*	X	X		CN	1, 3, 4, 9
Parrya	*Parrya nudicaulis*	X		X		1, 3
Capitate lousewort	*Pedicul aris capitata*	X	X	X	All	1, 3, 10
Wooley Lousewort	*Pedicularis kanei*	X	X	X	All	1, 9, 10

Table H-34. Vascular Plant Species Observed or Potentially Occurring on the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name	Scientific Name	CR	CN	CB	Observed	Source
Langsdorff's lousewort	*Pedicularis langsdorffii*	X			CR	1, 9
Oeder's lousewort	*Pedicularis oederi*	X	X	X	CN	1, 3, 9
Fernweed	*Pedicularis sudetica pacifica*	X	X		CN, CR	1, 9
Bumblebee flower	*Pedicularis verticillata*	X	X	X	CN, CR	1, 9
Frigid coltsfoot	*Petasites frigidus*	X	X	X	All	1, 9, 10
Timothy grass	*Phleum commutatum americanum*			X	CB	1, 10
Butterwort	*Pinguicila vulgaris*			X		1, 3, 4
Bog orchid	*Platanthera convallariaefolia*			X		1, 3
Small northern bog orchid	*Platanthera obtusata*	X	X	X		1, 3
Alpine blue grass	*Poa alpina*	X			CR	1, 9
Arctic blue grass	*Poa arctica*	X		X	CR, CB	1, 9, 10
Blue grass	*Poa* sp.	X	X	X	All	1, 4
Tall Jacob's ladder	*Polemonium acutiflorum*	X	X	X	CN, CR	1, 3, 9
Jacob's ladder	*Polemonium pulcherrimum*			X		1, 3, 4
Bistort	*Polygonum bistorta*	X	X		CN, CR	1, 3, 9
Alpine meadow bistort	*Polygonum viviparum*	X	X	X	All	1, 4, 9, 10
Silverweed	*Potentilla anserina*			X	CB	1, 10
Two-flowered cinquefoil	*Potentilla biflora*		X			1, 3
One-flowered cinquefoil	*Potentilla uniflora*	X	X		CN	1, 3
Villous cinquefoil	*Potentilla villosa*		X		CN	1, 9
Northern primrose	*Primula borealis*	X	X			1, 3
Wedge-leafed primrose	*Primula cuneifolia*	X	X	X	CN, CR	1, 3, 9
Primrose	*Primula tschuktschorum*	X	X		CN	1, 9
Pink pyrola	*Pyrola asarifolia*	X	X	X	All	1, 3, 9, 10
Large-flowered wintergreen	*Pyrola grandiflora*	X				1, 3
Least wintergreen	*Pyrola minor*	X	X	X	All	1, 3, 9 ,10
Woodland buttercup	*Ranunculus bongardi*			X	CB	1, 10
Mountain buttercup	*Ranunculus eschscholtzii*		X	X	CN	1, 3, 9
Creeping buttercup	*Ranunculus reptans*		X	X	CB	1, 10
Buttercup	*Ranunculus* sp.	X	X	X	All	1, 4
Roseroot	*Rhodiola integrifolia = Sedum rosea*	X	X	X	CR, CN	1, 3, 8, 9
Arctic dock	*Rumex arcticus*	X	X	X	CN, CR	1, 4, 9
Dock	*Rumex fenestratus*			X	CB	1, 10
Dock	*Rumex graminifolius*	X	X	X	All	1, 4
Sitka burnet	*Sanguisorba canadensis = Sanguisorba stipulata*	X	X	X	All	1, 9, 10
Narrowleaf saw-wort	*Saussurea angustifolium*	X	X		CN, CR	1, 9
Spotted saxifrage	*Saxifraga bronchialis*	X	X	X	CN, CB	1, 3, 9, 10
Whiplash saxifrage	*Saxifraga flagellaris*	X	X	X		1, 3
Rusty saxifrage	*Saxifraga foliolosa*	X	X		CN, CR	1, 9
Rusty saxifrage	*Saxifraga hieracifolia*	X	X		CN	1, 3, 9
Yellow marsh saxifrage	*Saxifraga hirculus*	X	X	X	CN	1, 3, 4, 9
Brook saxifage	*Saxifraga nelsoniana*	X	X	X	All	1, 3, 9, 10
Red stemmed saxifrage	*Saxifraga lyalii*			X		1, 3
Purple mountain saxifrage	*Saxifraga oppositifolia*		X	X	CN, CB	1, 3, 9, 10
Heart-leaf saxifrage	*Saxifraga punctata*		X	X		1, 3
Thyme-leaved saxifrage	*Saxifraga serpyllifolia*	X	X	X	CN	1, 3, 9
Spiked saxifrage	*Saxifraga spicata*	X				1, 3
Marsh fleawort	*Senecio congestus*	X	X	X		1, 3
Seabeach scenecio	*Senecio pseudo-arnica*	X	X	X	CN	1, 3, 9
Sibbaldia	*Sibbaldia procumbens*	X	X		CN, CR	1, 9
Moss campion	*Silene acaulis*	X	X	X	CN, CB	1, 3, 9, 10
Bladder campion	*Silene uralensis = Melandrium apetalum*	X	X	X		1, 4
Goldenrod	*Solidago multiradiata*	X	X	X	All	1, 3, 9, 10

Table H-34. Vascular Plant Species Observed or Potentially Occurring on the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name	Scientific Name	CR	CN	CB	Observed	Source
Goldenrod	*Solidago multiradiata*	X	X	X	All	1, 3, 9, 10
Ladies' tresses	*Spiranthes romanzoffiana*		X	X		1, 3
Clasping twistedstalk	*Streptopus amplexifolius*	X			CR	1, 3, 9
Dandelion	*Taraxacum* sp.	X	X	X		1, 3
Frigid fleabane	*Tephroseris atropurpurea frigida = Senecio atropurpureus frigidus*	X			CR	1, 4, 9
Long beechfern	*Thelypteris phegopteris*	X	X	X	CN, CR	1, 9
Northern asphodel	*Tofieldia coccinea*	X	X	X	All	1, 9, 10
Scotch false asphodel	*Tofieldia pusilla*	X			CN	1, 9
Starflower	*Trientalis europea*	X	X	X	All	1, 9, 10
Downy oatgrass	*Trisetum spicatum*	X	X	X	All	1, 9, 10
Arrow grass	*Triglochin maritimum*			X		1, 4
Capitate valerian	*Valeriana capitata*	X	X	X	All	1, 3, 9, 10
Mountain hare-grass	*Valholdea atropurpurea*	X	X		CN, CR	1, 9
Two-flowered violet	*Viola biflora*	X	X	X		1, 3
Two-flowered violet	*Viola epipsila*	X			CR	1, 9
Alaska violet	*Viola langsdorffii*	X	X	X	All	1, 3, 9, 10

Sources:

1. Hulten 1968.
2. Viereck and Little 1972.
3. White 1974.
4. Pratt 1991.
5. Alaska Natural Heritage Program 1993.
6. 611 ASG 1995e.
7. Lipkin 1999.
8. McCaffery 2000.
9. Schick and Frost (ABR, Inc. 2004 site visit).
10. Roth (ABR, Inc. 2004 site visit).

Table H-35. Fish Species Potentially Occurring on or near the Cape Romanzof, Cape Newenham, and Cold Bay Sites

Common Name	Scientific Name	Cape Romanzof	Cape Newenham	Cold Bay
Alaska blackfish	*Dallia pectoralis*		X	
Alaska pollock	*Gadus chalcogrammus*			X
Arctic char	*Salvelinus alpinus*		X	X
Arctic cisco	*Coregonus autumnalis*	X		
Arctic grayling	*Thymallus arcticus*		X	
Chinook salmon	*Oncorhynchus tshaytscha*		X	X
Chum salmon	*Oncorhynchus keta*	X	X	X
Coastrange sculpin	*Cottus aleuticus*	X	X	
Coho salmon	*Oncorhynchus kisutch*		X	X
Dolly varden	*Salvelinus malma*	X	X	X
Irish lord	*Hemilepidotus* sp.	X	X	X
Masked greenling	*Hexagrammos octagrannus*			X
Ninespine stickleback	*Pungitus pungitus*	X		X
Pacific cod	*Gadus macrocephalus*			X
Pacific herring	*Clupea pallasi*	X	X	X
Pacific ocean perch	*Sebastes alutus*			X
Pacific rainbow smelt	*Osmerus dentex*	X		X
Pacific tomcod	*Microgadus proximus*	X		
Pink salmon	*Oncorhynchus gorbuscha*	X	X	X
Rainbow trout	*Oncorhynchus mykiss*			X
Saffron cod	*Eleginus gracilis*			X
Sheefish	*Stenodus leucichthys*	X		
Smelt	*Osmerus* sp.	X		
Sockeye salmon	*Oncorhynchus nerka*		X	X
Starry flounder	*Platichthys stellatus*	X		
Surf smelt	*Hypomeous pretious*			X
Three-spined stickleback	*Gasterosteous aculeatus*	X		X
Whitefish	*Coregonus* sp.		X	
Whitespotted greenling	*Hexagrammos stelleri*			X
Yellowfin sole	*Limanda asper*	X		X

Sources: Tack 1970; Morrow 1980; USFWS 1989a; Robbins et al. 1991; 611 ASG 1995e.

Table H-36. Mammal Species Observed or Potentially Occurring on or near the Cape Romanzof, Cape Newenham, and Cold Bay Sites

Common Name (ESA Status)*	Scientific Name	Cape Romanzof	Cape Newenham	Cold Bay
TERRESTRIAL				
Alaskan hare	*Lepus othus*	X	X	X
American beaver	*Castor canadensis*	X	X	
American mink	*Neovison vison*	X	X	X
Arctic fox	*Alopex lagopus*	X	X	
Arctic ground squirrel	*Spermophilus parryii*		X	X
Black bear	*Ursus americanus*		X	
Brown bear	*Ursus arctos*		X	X
Canadian lynx	*Lynx canadensis*		X	
Caribou	*Rangifer tarandus*		X	X
Cinereus shrew	*Sorex cinereus*	X		X
Common muskrat	*Ondatra zibethicus*	X	X	
Ermine	*Mustela erminea*	X	X	X
Hoary marmot	*Marmota caligata*		X	
Least weasel	*Mustela nivalis*		X	
Meadow jumping mouse	*Zapus hudsonias*	X		X
Muskox	*Ovibos moschatus*	X		
Nearctic brown lemming	*Lemmus trimucronatus*	X	X	X
North American porcupine	*Erethizon dorsata*		X	X
North American river otter	*Lontra canadensis*	X	X	X
Northern red-backed vole	*Myodes rutilus*	X		X
Red fox	*Vulpes vulpes*	X	X	X
Root vole	*Microtus oeconomus*	X	X	
Shrew	*Sorex* sp.		X	
Snowshoe hare	*Lepus americanus*		X	
Vagrant shrew	*Sorex vagrans*			X
Wolf	*Canis lupus*		X	X
Wolverine	*Gulo gulo*	X	X	X
MARINE†				
Arctic ringed seal (T)	*Phoca hispida hispida*	X	X	
Bearded seal (T)	*Erignathus barbatus*	X	X	
Beluga	*Delphinapterus leucas*	X	X	
Bowhead (E)	*Balaenoptera mysticetus*	X		
Common minke whale	*Balaenoptera acutorostrata*	X	X	
Dall's porpoise	*Phocoenoides dalli*	X	X	
Gray whale	*Eschrichtius robustus*	X	X	
Harbor porpoise	*Phocoena phocoena*	X	X	
Harbor seal	*Phoca vitulina*		X	
Killer whale	*Orcinus orca*	X	X	
Northern fur seal	*Callorhinus ursinus*		X	X
Northern sea otter (T, CH)	*Enhydra lutris kenyoni*			X
Pacific walrus	*Odobenus rosmarus divergens*	X	X	X
Ribbon seal	*Histriophoca fasciata*	X		
Spotted seal	*Phoca largha*	X	X	
Steller sea lion (E, CH)	*Eumetopias jubatus*	X	X	X

Notes: *CH = critical habitat; E = endangered; T = threatened. †All marine mammals are listed under the MMPA.
Sources: USFWS undated (a); McCaffery 2000; Schick-Frost-Roth (ABR, Inc.); Wynne 1993; 611 ASG 1995e; USFWS 2009a.

Table H-37. Bird Species Observed or Potentially Occurring on or near the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name (ESA Status)*	Scientific Name	CR	CN	CB	Observed
Alder flycatcher	*Empidonax alnorum*	X	X		CR
Aleutian tern	*Onychoprion aleuticus*	X	X	X	CR
American dipper	*Cinclus mexicanu*		X	X	CB
American golden-plover	*Pluvialis dominica*	X			CR
American kestrel	*Falco sparverius*	X		X	CR
American pipit	*Anthus rubescens*	X	X	X	All
American robin	*Turdus migratorius*	X	X	X	CR
American tree sparrow	*Spizelloides arborea*	X	X	X	CR
American wigeon	*Mareca americana*	X	X	X	CR, CB
Ancient murrelet	*Synthliboramphus antiquus*			X	
Arctic tern	*Sterna paradisaea*	X	X	X	CR, CB
Arctic warbler	*Phylloscopus borealis*	X	X		CR
Baikal teal	*Anas formosa*		X		
Baird's sandpiper	*Calidris bairdii*	X	X		CR, CN
Bald eagle	*Haliaeetus leucocephalus*	X	X	X	All
Bank swallow	*Riparia riparia*	X	X	X	All
Barrow's goldeneye	*Bucephala islandica*	X	X	X	CR
Bar-tailed godwit	*Limosa lapponica*	X	X	X	CR
Belted kingfisher	*Megaceryle alcyon*	X	X	X	
Black oystercatcher	*Haematopus bachmani*			X	
Black scoter	*Melanitta americana*	X	X	X	All
Black turnstone	*Arenaria melanocephala*	X	X	X	CR
Black-backed wagtail	*Motacilla cinerea*	X			CR
Black-bellied plover	*Pluvialis squatarola*	X	X	X	CR
Black-billed magpie	*Pica hudsonia*		X	X	CB
Black-capped chickadee	*Poecile atricapillus*	X	X	X	CR
Black-headed gull	*Larus ridibundus*	X			CR
Black-legged kittiwake	*Rissa tridactyla*	X	X	X	All
Blackpoll warbler	*Setophaga striata*	X	X		CR
Bluethroat	*Cyanecula svecica*	X			CR
Bohemian waxwing	*Bombycilla garrulus*	X			CR
Bonaparte's gull	*Chroicocephalus philadelphia*	X	X		CR
Brant	*Branta bernicla*	X	X	X	CR, CB
Bristle-thighed curlew	*Numenius tahitiensis*	X	X		CR
Bufflehead	*Bucephala albeola*	X	X	X	CR
Canada goose	*Branta canadensis*	X	X	X	CR
Canada jay	*Perisoreus canadensi*		X		
Canvasback	*Aythya valisineria*	X		X	
Caspian tern	*Sterna caspia*	X			CR
Cassin's auklet	*Ptychoramphus aleuticus*			X	
Cliff swallow	*Petrochelidon pyrrhonota*	X	X		CR
Common eider	*Somateria mollissima*	X	X	X	CR
Common goldeneye	*Bucephala clangula*	X	X	X	CR
Common loon	*Gavia immer*	X	X	X	CR, CB
Common merganser	*Mergus merganser*	X	X	X	CR
Common murre	*Uria aalge*	X	X	X	CR, CN
Common raven	*Corvus corax*	X	X	X	All
Common redpoll	*Acanthis flammea*	X	X	X	All
Common rosefinch	*Carpodacus erythrinus*	X			CR

Table H-37. Bird Species Observed or Potentially Occurring on or near the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name (ESA Status)*	Scientific Name	CR	CN	CB	Observed
Common sandpiper	*Actitis hypoleucos*	X			CR
Crested auklet	*Aethia cristatella*		X	X	
Dark-eyed junco	*Junco hyemalis*	X	X		CR
Double-crested cormorant	*Phalacrocorax auritus*	X	X	X	CR, CN
Downy woodpecker	*Dryobates pubescens*	X	X		
Dunlin	*Calidris alpina*	X	X	X	CR, CB
Eastern yellow wagtail	*Motacilla tschutschensis*	X	X	X	CR, CN
Emperor goose	*Anser canagicus*	X	X	X	CR, CN
Eurasian wigeon	*Mareca penelope*		X	X	
Eyebrowed thrush	*Turdus obscurus*	X			CR
Fork-tailed storm-petrel	*Hydrobates furcatus*		X	X	CN
Fox sparrow	*Passerella iliaca*	X	X	X	CR, CB
Gadwall	*Mareca strepera*		X	X	CB
Glaucous gull	*Larus hyperboreus*	X	X	X	CR
Glaucous-winged gull	*Larus glaucescens*	X	X	X	All
Golden eagle	*Aquila chrysaetos*	X	X	X	CR
Golden-crowned kinglet	*Regulus satrapa*	X			CR
Golden-crowned sparrow	*Zonotrichia atricapilla*	X	X	X	All
Gray-cheeked thrush	*Catharus minimus*	X	X	X	CR, CN
Gray-crowned rosy-finch	*Leucosticte tephrocotis*	X	X	X	All
Greater scaup	*Aythya marila*	X	X	X	All
Greater white-fronted goose	*Anser albifrons*	X	X	X	CR
Greater yellowlegs	*Tringa melanoleuca*	X	X	X	CR, CB
Green-winged teal	*Anas crecca*	X	X	X	CR, CB
Gyrfalcon	*Falco rusticolus*	X	X	X	CR, CB
Harlequin duck	*Histrionicus histrionicus*	X	X	X	CR, CN
Hermit thrush	*Catharus guttatus*	X	X	X	All
Herring gull	*Larus argentatus*	X	X	X	CR
Hoary redpoll	*Acanthis hornemanni*	X	X	X	CR
Horned grebe	*Podiceps auritus*	X	X	X	
Horned lark	*Eremophila alpestris*	X	X		CR
Horned puffin	*Fratercula corniculata*	X	X	X	All
Hudsonian godwit	*Limosa haemastica*	X	X		
King eider	*Somateria spectabilis*	X	X	X	CR, CN
Kittlitz's murrelet	*Brachyramphus brevirostris*		X	X	
Lapland longspur	*Calcarius lapponicus*	X	X	X	All
Leach's storm-petrel	*Hydrobates leucorhous*			X	
Least auklet	*Aethia pusilla*		X	X	
Least sandpiper	*Calidris minutilla*		X	X	CN, CB
Lesser yellowlegs	*Tringa flavipes*	X	X	X	CR
Lincoln's sparrow	*Melospiza lincolnii*	X			CR
Little gull	*Larus minutus*	X			CR
Long-billed dowitcher	*Limnodromus scolopaceus*	X	X	X	CR
Long-tailed duck	*Clangula hyemalis*	X	X	X	CR
Long-tailed jaeger	*Stercorarius longicaudus*	X	X	X	CR, CN
Mallard	*Anas platyrhynchos*	X	X	X	CR, CB
Marbled murrelet	*Brachyramphus marmoratus*	X	X	X	CR
McKay's bunting	*Plectrophenax hyperboreus*	X	X	X	All
Merlin	*Falco columbarius*	X	X	X	CR

Table H-37. Bird Species Observed or Potentially Occurring on or near the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name (ESA Status)*	Scientific Name	CR	CN	CB	Observed
Mew gull	*Larus canus*	X	X	X	CR, CB
Northern Flicker	*Colaptes auratus*	X			CR
Northern goshawk	*Accipiter gentilis*	X	X		
Northern harrier	*Circus hudsonius*	X	X	X	CR
Northern hawk owl	*Surnia ulula*	X	X		
Northern pintail	*Anas acuta*	X	X	X	All
Northern shoveler	*Spatula clypeata*	X	X	X	CR
Northern shrike	*Lanius borealis*	X	X	X	
Northern waterthrush	*Parkesia noveboracensis*	X	X	X	CR
Northern wheatear	*Oenanthe oenanthe*	X	X		CR
Olive-sided flycatcher	*Contopus cooperi*	X	X		CR
Orange-crowned warbler	*Oreothlypis celata*	X		X	CR, CB
Osprey	*Pandion haliaetus*	X	X		CR
Pacific golden-plover	*Pluvialis fulva*	X	X	X	CR
Pacific loon	*Gavia pacifica*	X	X	X	CR
Parakeet auklet	*Aethia psittacula*	X	X	X	CR, CN
Parasitic jaeger	*Stercorarius parasiticus*	X	X	X	All
Pectoral sandpiper	*Calidris melanotos*	X	X	X	CR, CN
Pelagic cormorant	*Phalacrocorax pelagicus*	X	X	X	CR, CN
Peregrine falcon	*Falco peregrinus*	X	X	X	All
Pigeon guillemot	*Cepphus columba*	X	X	X	All
Pine grosbeak	*Pinicola enucleator*	X	X		CB
Pomarine jaeger	*Stercorarius pomarinus*	X	X	X	CR
Purple finch	*Carpodacus purpureus*	X			CR
Red knot	*Calidris canutus*		X		
Red phalarope	*Phalaropus fulicarius*	X	X	X	CR
Red -throated loon	*Gavia stellata*	X	X	X	CR, CB
Red-breasted merganser	*Mergus serrator*	X	X	X	All
Red-breasted nuthatch	*Sitta canadensis*	X			CR
Red-faced cormorant	*Phalacrocorax urile*	X	X	X	CR
Redhead	*Aythya americana*			X	
Red-legged kittiwake	*Rissa brevirostris*		X		
Red-necked grebe	*Podiceps grisegena*	X	X	X	CR, CB
Red-necked phalarope	*Phalaropus lobatus*	X	X	X	CR, CB
Red-tailed hawk	*Buteo jamaicensis*	X	X		
Red-throated pipit	*Anthus cervinus*	X	X		CR, CN
Rock ptarmigan	*Lagopus muta*	X	X	X	CR, CB
Rock sandpiper	*Calidris ptilocnemis*	X	X	X	All
Rough-legged hawk	*Buteo lagopus*	X	X	X	All
Ruby-crowned kinglet	*Regulus calendula*	X			CR
Ruddy turnstone	*Arenaria interpres*	X	X	X	CR
Rufous hummingbird	*Selasphorus rufus*	X			CR
Rusty blackbird	*Euphagus carolinus*	X	X		
Sabine's gull	*Xema sabini*	X	X		CR
Sanderling	*Calidris alba*		X	X	
Sandhill crane	*Antigone canadensis*	X	X	X	CR
Savannah sparrow	*Passerculus sandwichensis*	X	X	X	All
Semipalmated plover	*Charadrius semipalmatus*	X	X	X	All
Semipalmated sandpiper	*Calidris pusilla*	X	X	X	CR

Table H-37. Bird Species Observed or Potentially Occurring on or near the Cape Romanzof (CR), Cape Newenham (CN), and Cold Bay (CB) Sites

Common Name (ESA Status)*	Scientific Name	CR	CN	CB	Observed
Sharp-tailed sandpiper	*Calidris acuminata*		X	X	
Short-billed dowitcher	*Limnodromus griseus*	X	X	X	CB
Short-eared owl	*Asio flammeus*	X	X	X	CR, CB
Short-tailed shearwater	*Ardenna tenuirostris*	X	X	X	CR
Slaty-backed gull	*Larus schistisagus*	X		X	CR
Snow bunting	*Plectrophenax nivalis*	X	X	X	All
Snow goose	*Anser caerulescens*		X	X	
Snowy owl	*Bubo scandiacus*	X	X	X	CR
Song sparrow	*Melospiza melodia*		X	X	CB
Sooty shearwater	*Ardenna griseus*		X		
Spectacled eider (T)	*Somateria fischeri*	X	X		CR
Spotted sandpiper	*Actitis macularius*	X	X		CR
Steller's eider (T)	*Polysticta stelleri*	X	X	X	All
Surf scoter	*Melanitta perspicillata*	X	X	X	CR, CN
Surfbird	*Calidris virgata*	X	X		CR
Swainson's thrush	*Catharus ustulatus*		X		
Thick-billed murre	*Uria lomvia*	X	X		CR
Tree swallow	*Tachycineta bicolor*	X	X	X	All
Tufted duck	*Aythya fuligula*			X	
Tufted puffin	*Fratercula cirrhata*	X	X	X	CR, CN
Tundra swan	*Cygnus columbianus*	X	X	X	CR, CB
Varied thrush	*Ixoreus naevius*	X	X		CR
Violet-green swallow	*Tachycineta thalassina*		X		CN
Wandering tattler	*Heteroscelus incanus*	X	X	X	CR
Western sandpiper	*Calidris mauri*	X	X	X	All
Whimbrel	*Numenius phaeopus*	X	X	X	CR
White wagtail	*Motacilla alba*	X	X		CR
White-crowned sparrow	*Zonotrichia leucophrys*	X	X	X	CR
White-winged crossbill	*Loxia leucoptera*	X	X		CR
White-winged scoter	*Melanitta deglandi*	X	X	X	CR, CN
Willow ptarmigan	*Lagopus lagopus*	X	X	X	CR, CB
Wilson's snipe	*Gallinago delicata*	X	X	X	All
Wilson's warbler	*Cardellina pusilla*	X	X	X	CR, CB
Winter wren	*Troglodytes hiemalis*			X	
Yellow wagtail	*Motacilla tschutschensis*	X			CR
Yellow warbler	*Setophaga petechia*	X	X	X	CR, CB
Yellow-billed loon	*Gavia adamsii*	X	X	X	CR
Yellow-rumped warbler	*Setophaga coronata*	X	X		CR

Note: *T = ESA-listed threatened.

Sources: USFWS undated (c); Holmes and Black 1973; Cooper and Pogson 1983; USFWS 1986a, 1989b, 1997b; Kinckloe et al. 1988; Petersen et al. 1991; Gibson 1993; 611 ASG 1995e; Day and Stickney 1996; McCaffery and Harwood 1997; McCaffery 2000, 2001; Pardieck et al. 2018. Schick and Frost (ABR Inc.).

H.6 CAPE ROMANZOF LRRS

H.6.1 Location and Area

Cape Romanzof LRRS is 540 miles west of Anchorage on a small peninsula that extends into the Bering Sea (Table H-1). The installation consists of two camps, which are connected by a gravel road (Figure H-50 and Figure H-51). Top Camp contains the MAR tower and Lower Camp contains the main support facilities, airfield, barge landing area, and communications facilities. The installation is accessible only by air or boat. The 4,900-acre installation is located within the Yukon Delta NWR. The LRRS is centrally located in the western Askinuk Mountains and is bordered by native corporation lands (McCaffery 1994).

Figure H-50. Aerial Views of Cape Romanzof LRRS
(*Top*: Upper Camp; *Bottom Left*: Lower Camp; *Bottom Right*: Looking northeast from Kokechik Bay with Lower Camp/Barge Landing Area in foreground and Airfield in middle background)

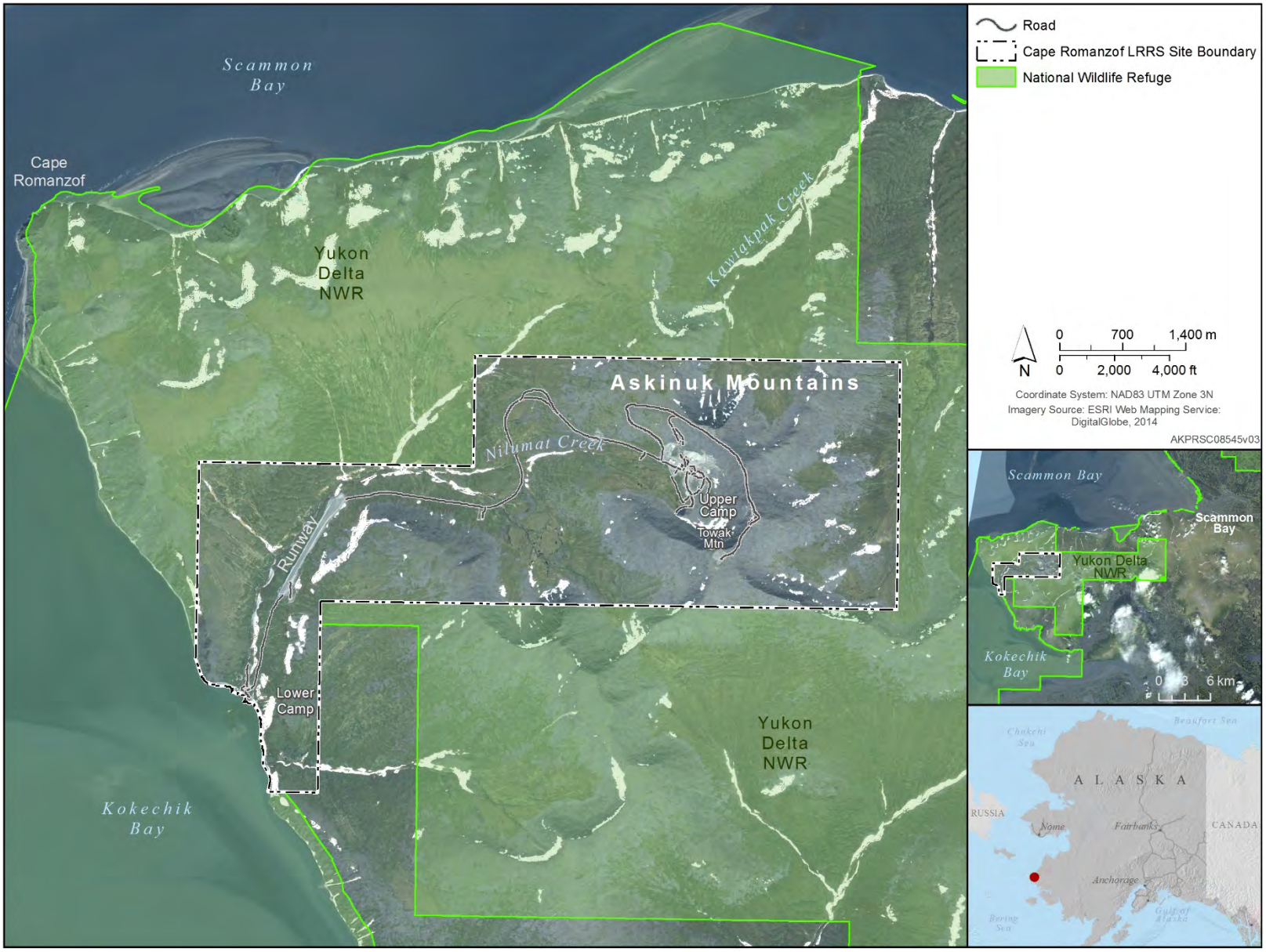

Figure H-51. Overview of Cape Romanzof LRRS

H.6.2 Installation History

Cape Romanzof LRRS was one of 12 original AC&W sites built as part of the air defense system constructed in Alaska during the early 1950s. Installation construction was finished in 1952, and operations began in 1953. Communications were initially provided by high frequency radio. A WACS was activated at the site in 1958 to replace the high frequency radio system. Cape Romanzof LRRS has been operated by a government contractor since 1977. In 1979 the WACS was replaced with a satellite system. A MAR system was installed in the mid 1980s, which remains active today, and other modifications were made to remotely operate and maintain the radar from Elmendorf Region Operations Control Center. These improvements resulted in a reduction in staff, which at one time included 95 military personnel, to 2 operations and maintenance contractor personnel at present. Inactive structures were demolished in 2003 (Argonne National Laboratory and CEMML 2013; 611 CES 2019).

H.6.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. Two contractor personnel are responsible for the operation, maintenance, and support of the MAR year-round (611 CES 2019).

H.6.4 Surrounding Communities

The nearest towns to Cape Romanzof LRRS are Scammon Bay (population 598, 2018 estimate) and Hooper Bay (population 1,225, 2018 estimate) (State of Alaska 2018), which are located 15 miles to the east and south, respectively. These communities are not accessible from Cape Romanzof by road. However, winter access to Scammon Bay by snowmachine is possible. The populations of Scammon Bay and Hooper Bay are primarily Native Alaskan. Commercial fishing and subsistence activities are the primary means of support. Salmon, walrus, beluga, and waterfowl are utilized. Employment is seasonal with peak economic activity in summer. Sources of employment are BLM fire-fighting programs and commercial fishing and associated canneries.

H.6.5 Regional Land Use

The 4,900-acre installation is located within the Yukon Delta NWR and is bordered by native corporation lands (McCaffery 1994).

H.6.6 Local and Regional Natural Areas

Cape Romanzof LRRS lies within the Yukon Delta NWR. Waters of the Yukon and Kuskokwim rivers flow through the Yukon Delta NWR. Almost 70% of this 19 million acre refuge is below 100 ft in elevation and consists of a broad, flat delta stitched through with rivers and streams and dotted with countless lakes, sloughs, and ponds. Bordering this expanse of tundra and wetlands are forest and shrub habitat and uplands with mountains more than 4,000 ft high. Yukon Delta NWR supports one of the largest aggregations of water birds in the world, and it supports one of the most important shorebird nesting areas in the United States. Along the coast of the refuge, the waters of the Bering Sea host a variety of marine mammals (USFWS 2019f).

H.6.7 Physical Environment

H.6.7.1 Climate

Cape Romanzof LRRS has a maritime climate. Through the year, temperatures range from an average low of 5 °F in winter to average highs in the high 40s/low 50s °F in summer (Table H-38). Precipitation is

greatest in late summer, and snow is heaviest from October through April. Winter ice pack and winds often promote severe conditions. The Bering Sea is ice-free from June through October.

Table H-38. Monthly Climate Averages for Cape Romanzof, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	18.3	14.9	20.3	25.9	39.3	48.3	53.0	52.3	46.8	34.3	26.9	18.1
Avg. Low (ºF)	8.3	4.6	9.5	16.1	30.7	39.2	45.1	45.6	40.3	28.2	19.1	8.7
Avg. Precipitation (inches)	1.2	1.0	1.3	0.9	1.3	2.2	2.9	5.0	4.6	2.4	1.5	1.2
Avg. Snowfall (inches)	9.1	6.9	10.4	7.3	3.7	1.4	0	0.1	0.7	9.2	10.0	9.4
Avg. Wind Speed (mph)	10	10	9	9	9	11	10	10	10	10	11	12
Prevailing Wind Direction	NE	NNE	NE	NNE	S	NNE	SSW	N	N	NNE	NE	N

Source: 611 CES 2019.

H.6.7.2 Topography

Cape Romanzof LRRS is located at the western end of the Askinuk Mountains, surrounded by the Yukon-Kuskowin lowlands, a marshy, lake-dotted deltaic plain surrounded by low rounded hills with locally steep slopes. The Askinuk Mountains rise from delta lowlands between Scammon and Kokechik bays, extends about 30 miles from the coast, and is dominated by Towak Mountain where Upper Camp and the MAR are located (McCaffery 1994; Moore 1998).

Cape Romanzof LRRS is located within the valley of Nilumat Creek; the upper part of this valley has very steep sides and a relatively shallow-sloped valley floor. The U-shaped valley cross-section and the stepped longitudinal profile of Nilumat Creek are typical of glaciated valleys. Upper Camp is situated at 2,300 ft MSL at the top of a ridge of Towak Mountain which overlooks a steep-sided valley containing Nilumat Creek. The longitudinal profile of this valley is irregular and stepped, with steep segments followed by flat segments (as at Lower Camp). Surrounding delta lowlands consist of a lake-dotted marshy plain that rises from sea level eastward to a maximum elevation of 300 ft MSL.

H.6.7.3 Geology and Soils

Soils of the region formed in essentially unglaciated residuum. They are very gravelly and stony but occasionally have inclusions of a thin silty mantle on flatter slopes. They are normally well-drained and have discontinuous permafrost. Soils are classified as a complex, Pergelic Cryumbrepts-Histic Pergelic Cryaquepts. On steep upper slopes, the mantle of weathered material is usually shallow, and bedrock outcrops are quite common (HQ AAC/DEPV 1988).

The geology of Upper Camp facilities (located on the narrow ridge above the valley) is characterized by a thin accumulation of angular sand and block residues overlying granitoid bedrock of Towak Mountain. The granitoid rocks appear to have a composition of quartz-monzonite to granodiorite (HQ AAC/DEPV 1988).

Lower Camp and adjacent facilities at the valley margin are underlain by deposits of talus and other colluvial materials that have moved down the steep valley side slopes toward Nilumat Creek. This colluvium consists of granitoid material of a wide range of material sizes, from large granite blocks (1-2 ft, minimum dimension) to fine-to-coarse grained sand, silt, and minor clay. At the base of the steep slope, colluvium forms an apron that extends across part of the low-angle slope on the valley floor adjacent to Nilumat Creek. Lower Camp and the main access road are located at the uphill margin of this apron, near the beginning of the northern steep slope (HQ AAC/DEPV 1988).

Cape Romanzof LRRS is located in a section of western coastal Alaska where thin to moderately thick (to 600 ft) permafrost zones may occur in predominately fine-grained sediments. However, permafrost may be generally absent in glacial cirques and protected hollows at such locations as Cape Romanzof. Permafrost is not known to exist at this installation (HQ AAC/DEPV 1988).

H.6.8 Hydrology

H.6.8.1 General

Surface water drainage is accomplished chiefly by overland flow to Nilumat Creek. Some Upper Camp drainage is directed north and eastward to Kawiakpak Creek and Ekashluak Creek; some drainage may flow south and southwestward to Ekasluktuli River and the unnamed creek referred to as "South Creek" (McCaffery 2000). Surface waters of the Cape Romanzof area generally occur as ephemeral streams that drain to Kokechik Bay, a major surface water feature of the Yukon Delta NWR.

The Cape Romanzof watershed boundary is defined as the continuous line of highest elevation. All surface water and groundwater flow only within the watershed. There is one small lake in the watershed, located about 0.3 mile south of Lower Camp. The lake was formed by a small dam constructed at the head of the valley, upstream of Nilumat Creek.

The most significant groundwater resources are present mostly in unconsolidated alluvial and glacial deposits and in weathered bedrock that underlies the flanks and valley floor of the upper part of Nilumat Creek. Minor amounts of groundwater are available on high valley slopes as local perched water. The Cape Romanzof LRRS water supply well located near the valley axis is 154 ft deep and penetrates a sequence of gravelly clay with boulders (0-43 ft depth) overlying sand and boulders (43-57 ft depth).

H.6.8.2 Floodplains

Surface runoff exits the land quickly by a well-defined drainage pattern. Drainage ditches, natural swales, and Nilumat Creek would contain the 100-year flood. Upper reaches would flow full, but lower reaches would not flow full with a maximum depth of 8 ft. Coastal flooding was estimated to reach 15 ft MSL, based on regional storm levels (Legare 1998).

H.6.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Cape Romanzof LRRS. Attachment 6 contains lists of vascular plants (Table H-34), fish (Table H-35), mammals (Table H-36), and birds (Table H-37) known to occur or potentially occurring in the Cape Romanzof area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Cape Romanzof site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.6.9.1 Ecoregion Classification

The Cape Romanzof site is located in the Yukon-Kuskokwim Delta ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.6.9.2 Vegetation/Habitat

A general vegetation map of the Cape Romanzof LRRS was prepared in 1995 (611 ASG 1995e). Schick et al. (2004) further refined habitat mapping at Cape Romanzof LRRS using 2001 digital aerial photography and Landsat imagery. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Cape Romanzof LRRS. CEMML used the most recent imagery found on Google Earth and, if available, 2009-2010 SPOT-5 satellite imagery. In

2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 5 habitat classes were identified (Table H-39 and Figure H-52).

Table H-39. Habitat Classes at Cape Romanzof LRRS (2017)

Habitat Class	Acres	Proportion
Developed and Barren Land	2,404.9	49.3%
Dwarf Shrub	1,970.8	40.4%
Shrub or Scrub	370.7	7.6%
Deciduous Forest	112.2	2.3%
Open Water	19.5	0.4%
Total	**4,878.1**	

Source: CEMML 2019a.

Vegetation at Cape Romanzof LRRS is characterized by cover types generally described as prostrate dwarf shrub heath, intermixed with areas of dwarf shrub boulder fields that can withstand the extreme wind conditions that predominate over the area. Vegetation at Upper Camp is characteristic of alpine tundra/barren ground communities. Prostrate dwarf shrub heath is found on alpine tundra in relatively dry sites and is characterized by decumbent dwarf shrubs, such as alpine bearberry, Arctic willow, crowberry, alpine azalea, Labrador tea, and lowbush cranberry. Dwarf shrub boulder field is dominated by boulders covered with numerous crustose lichens and bryophytes. Patches of crowberry, narrowleaf Labrador tea, spiraea, and roseroot grow between boulders. Dwarf Shrub meadows with abundant sedges are widespread and dominate the vegetation at Lower Camp. Pockets of mountain avens, lichens, and low-growing herbs, shrubs, and grasses are also found at Lower Camp. Trees are absent. Willow-dominated areas along the streams support lush growths of herbs (i.e., forbs and graminoids) (USFWS 1989a; McCaffery 2000).

Overall, the area is well-drained to moderately well-drained; there are relatively few wet tundra habitats. The site is strongly dominated by shrub/scrub and dwarf shrub habitats, as well as barren land which occurs primarily on mountain slopes and occasionally on better-drained flats (Schick et al. 2004).

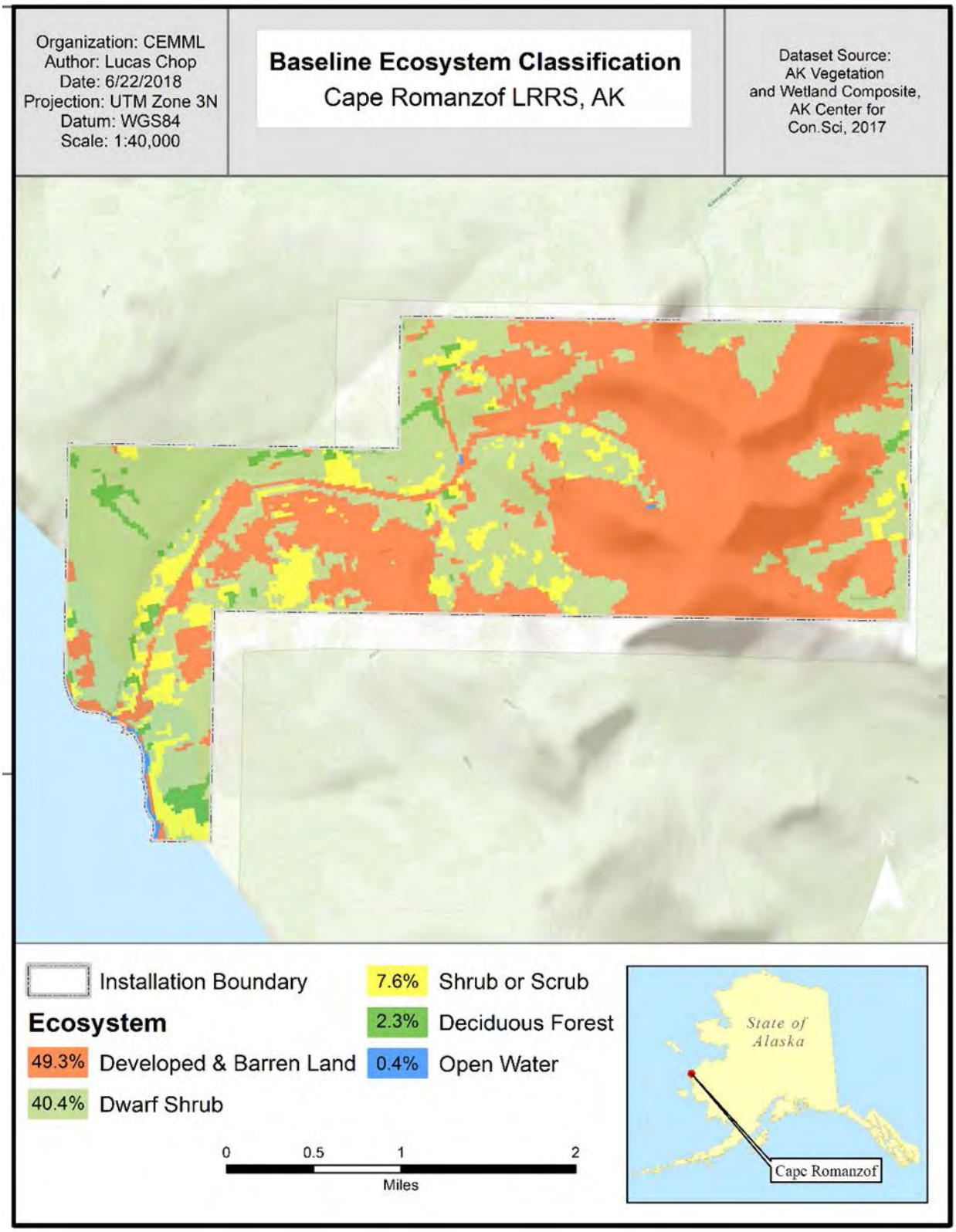

Figure H-52. Cape Romanzof LRRS Habitat Map (2017)
(*Source*: CEMML 2019a)

H.6.9.3 Wetlands

The current mapping of wetlands at Cape Romanzof is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 4,900-acre Cape Romanzof site, 1,962 acres (or 40%) are considered wetlands per the NWI mapping (Table H-40 and Figure H-53). The most common wetland type is freshwater emergent wetland. These areas are moist dwarf scrub habitats and can be saturated, moderately well-drained, or well-drained, depending primarily on soil type, microtopography, and landscape position. Dominant shrub species in these areas include *Empetrum nigrum, Vaccinium uliginosum, V. vitis-idaea, Ledum decumbens, Dryas octopetala, Arctostaphylos alpina,* and *Salix rotundifolia* (Schick et al. 2004).

Table H-40. Cape Romanzof LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	1,582.7	32.4%	5.2	0.1%
Estuarine and Marine Deepwater	1.2	<0.1%	2.8	0.1%
Riverine	20.8	0.4%	2.8	0.1%
Estuarine and Marine	4.2	0.1%	0.9	<0.1%
Freshwater Forested/Shrub	345.7	7.1%	269.9	5.5%
Freshwater Pond/Lake	7.8	0.2%	6.6	0.1%
Wetlands Total	**1,962.4**	**40.2%**	**288.2**	**5.9%**
Upland	2,915.8	59.8%	4,586.7	94.1%
Site Total	**4,878.2**		**4,874.9**	

Notes: *See Figure H-53. †See Figure H-54.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

Wetlands at Cape Romanzof LRRS are strongly dominated by moist sloping areas with fewer wetter areas of seasonal flooding and very few areas of persistent standing water. On mountain slopes and ridges, many well-drained rocky areas are likely to be NWI uplands (Schick et al. 2004).

H.6.9.4 Fish and Wildlife

H.6.9.4.1 Fish

Although few fishery resources are found on the installation, many species occur in the nearshore marine waters (Table H-35). Nilumat Creek provides habitat for resident dolly varden and spawning pink and chum salmon (611 ASG 1995e; Braund and Associates 2004). Pink salmon is the only species listed in the ADFG anadromous stream catalog as occurring within Nilumat Creek (Johnson and Blossom 2019e). Nilumat Creek empties into Kokechik Bay, an important area for subsistence gathering of clams and herring spawn associated with a small commercial herring fishery. Herring are caught by both commercial and subsistence fishermen (611 ASG 1995e; Braund and Associates 2004).

During a 1993 site visit, USAF Natural Resources personnel accompanied ADFG on a sampling trip in nearshore waters. A set net was sampled, and the following species were caught: Pacific tomcod, coastrange sculpin, starry flounder, yellowfin sole, and rainbow smelt (611 ASG 1995e).

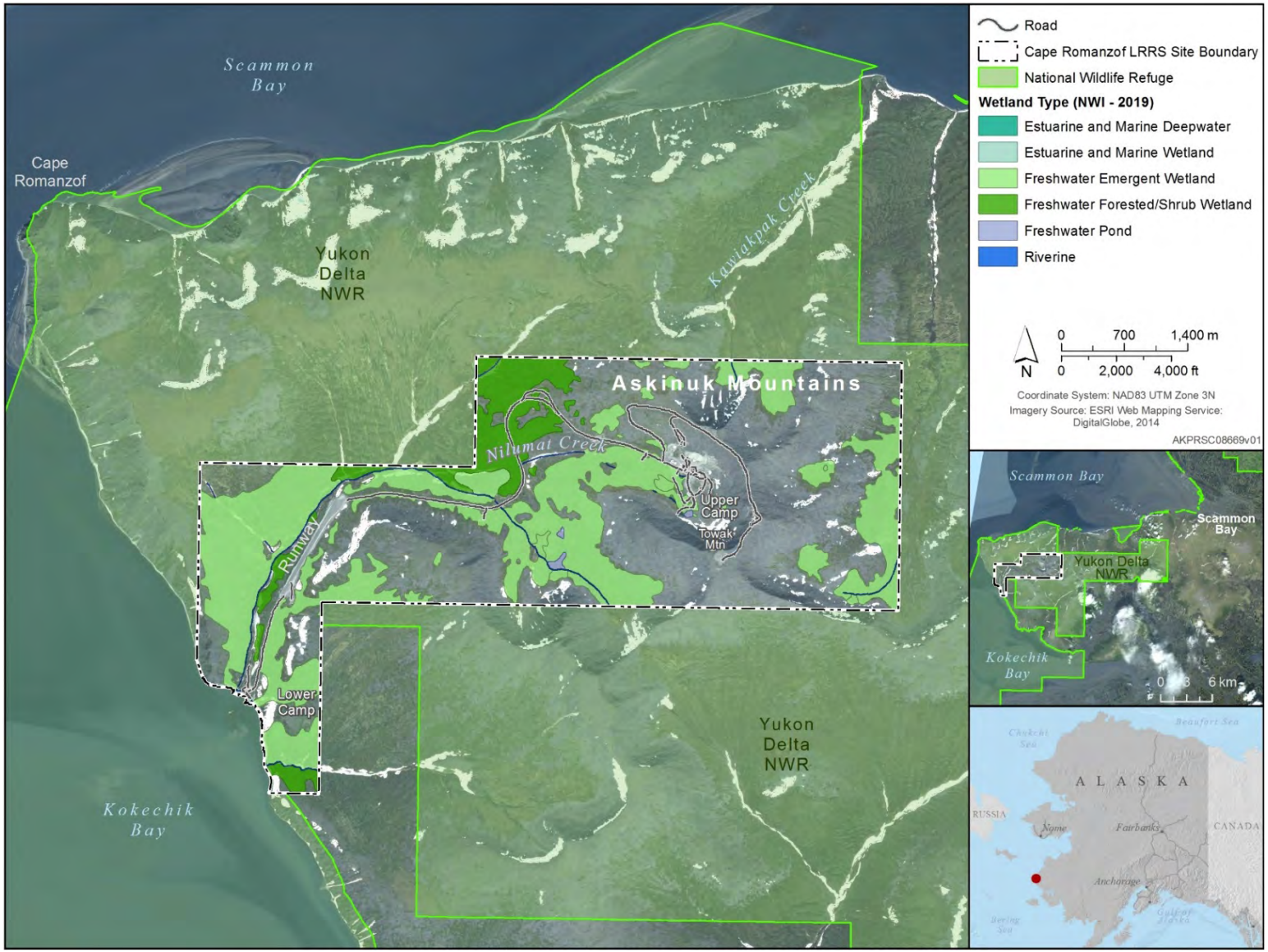

Figure H-53. Cape Romanzof LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

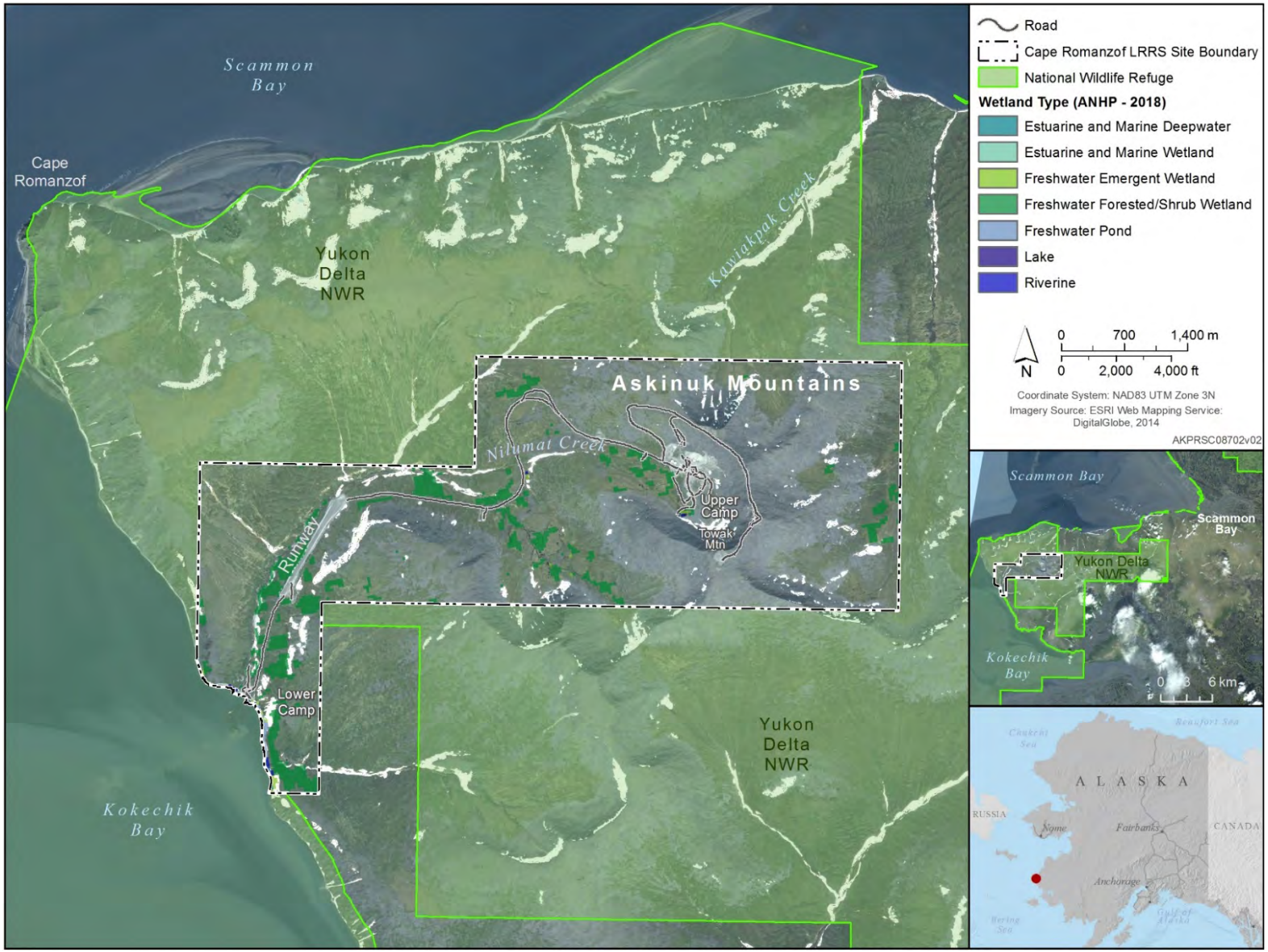

Figure H-54. Cape Romanzof LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.6.9.4.2 Mammals

Terrestrial Mammals

Of the 28 mammal species known or expected to occur on or in the vicinity of the Cape Romanzof site, 15 are terrestrial (Table H-36). Common terrestrial mammals expected to occur in the region include beaver, river otter, Arctic and red fox, voles, mink, muskrat, and Nearctic brown lemming. Beavers regularly use lower Nilumat Creek. American mink of the Yukon-Kuskowin Delta are among the largest in the world. The most common carnivore at the site is the ermine. River otter are abundant along lowland streams and rivers of the refuge. Wolverine and muskox are uncommon throughout the refuge. Other confirmed species include the cinereus shrew, Alaskan hare, northern red-backed vole, root vole, brown lemming, and meadow jumping mouse. (USFWS 1989a; McCaffery 2000).

Muskox are sometimes observed on mountains surrounding the camp. A small group (fewer than 10) of muskox were seen during a 1993 site visit on steep terrain several miles south of the Cape Romanzof LRRS (611 ASG 1995e). In 1996 the musk-ox herd included at least 14 individuals; at least three died prior to spring 1999; two were apparently poached on LRRS property (McCaffery 2000).

Marine Mammals

Of the 13 marine mammals that are known to occur or are expected to occur in the Cape Romanzof area, 5 are cetaceans (whales and porpoise) and 8 are pinnipeds (seals and sea lions) (Table H-36). Marine mammals are discussed in detail in Section H.6.9.5 (ESA- and MMPA-listed Species).

H.6.9.4.3 Birds

Cape Romanzof LRRS provides unique habitats that support a different avifauna, particularly for landbirds, than the rest of Yukon Delta NWR. Almost 160 species have been recorded or are expected to occur within or in the vicinity of the site (Table H-37). Important species that are at or near the edge of their range at Cape Romanzof LRRS include golden eagle, surfbird, Baird's sandpiper, bluethroat, white and yellow wagtail, red-throated pipit, orange-crowned warbler, Wilson's warbler, and northern waterthrush. (McCaffery 2000, McCaffery et al. 1998, McCaffery and Harwood 1997). Orange-crowned warblers, Wilson's warblers, and northern waterthrushes may reach their westernmost point of distribution in North America in willow thickets along Nilumat Creek (personal communication, McCaffery [1993] in 611 ASG [1995e]). Rocky hillsides of Cape Romanzof LRRS provide perching and hunting areas for rough-legged hawk, golden eagle, and gyrfalcon. Rock and willow ptarmigan occur throughout the area (Holmes and Black 1973).

While the LRRS has mostly landbirds using the site, the surrounding Yukon Delta NWR hosts millions of waterfowl that migrate through the area or breed in the refuge. More than half of the North American population of brant nest in the Delta's coastal habitat. All of North America's cackling Canada geese are produced in the coastal lowlands. Large populations of emperor and Pacific white-fronted geese, and tundra swans nest near the coast and on the inland tundra. Duck species that occur on the Delta include the greater scaup, long-tailed duck, northern pintail, black scoter, green-winged teal, mallard, and American wigeon (USFWS 1984).

Shorebirds and seabirds that use the surrounding area include gulls, jaegars, cranes, loons, grebes, plovers, snipes, godwits, sandpipers, and the rare bristle-thighed curlew. Horned and tufted puffins and pelagic cormorants are found in rookeries along the shores of Cape Romanzof LRRS (Sowls et al. 1978; McCaffery and Harwood 1997). The first North American breeding records of slaty-backed gulls and first nests of Caspian terns for Alaska were found near the site (McCaffery et al. 1997a, b).

McCaffery and Harwood (1997) conducted major bird surveys at Cape Romanzof LRRS May-September 1996. They detected 12 species of sea ducks, but only common eider and red-breasted merganser nested on the LRRS. Rough-legged hawks were abundant, but no other species of cliff-nesting raptors were observed nesting. A small breeding colony of horned puffins and tufted puffins was located on the cliff and spires. In addition, 40 species of neotropical migrants, including 22 species of passerines, were found. Of the 10 species of paleotropical migrants, the bluethroat, northern wheatear, and yellow wagtail nested at Cape Romanzof, and the white wagtail and red-throated pipit may nest on or in the vicinity of the Cape in other years. The authors concluded that Cape Romanzof is an oasis of habitat for a surprising diversity and abundance of paleotropical species.

Important Bird Areas (IBAs)

Cape Romanzof LRRS is within the Central Yukon-Kuskokwim IBA (Figure H-47). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The Central Yukon-Kuskokwim IBA been designated by Audubon Alaska as a globally important IBA as the coastal zones support very high densities of waterfowl and shorebirds. The greatest density and diversity of shorebirds using intertidal habitats in Alaska have been recorded in the coastal area from Hazen Bay to Hooper Bay (within the area between Cape Romanzof and Nelson Island). This site is the most important autumn staging area for shorebirds in the Pacific flyway, and only a handful of other sites at comparable latitudes worldwide approach it in significance (Audubon Alaska 2014).

H.6.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Eight ESA-listed species occur or potentially occur on or in the vicinity of the Cape Romanzof LRRS: threatened spectacled and Steller's eider, polar bear, and ringed and bearded seals; and the endangered Steller sea lion, fin whale, and bowhead (Table H-36 and Table H-37).

Steller's and Spectacled Eiders. Steller's and spectacled eiders occur in the offshore waters around Cape Romanzof during migration (Spectacled Eider Recovery Team 1996; McCaffery and Harwood 1997; McCaffery et al. 1998, 1999; USFWS 2019e). Steller's eiders are known to breed to the south of Cape Romanzof and Kokechik Bay on the Yukon-Kuskokwim River Delta and there are no records of the species nesting on Cape Romanzof (Steller's Eider Recovery Team 2002).

Steller Sea Lion. Although not known to haul out at the Cape Romanzof LRRS, Steller sea lions have been observed in the nearshore waters and are known to haul out at the tip of Cape Romanzof (Wynne 1993; 611 ASG 1995e; McCaffery 2000; Huntington et al. 2017).

Bearded and Ringed Seals. Both species have been observed in the offshore waters of Cape Romanzof LRRS (Wynne 1993). In 2014, the marine waters adjacent to the Cape Romanzof site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bowhead and Fin Whale. The bowhead has been observed off the coast of Cape Romanzof LRRS (Wynne 1993; 611 ASG 1995e) and fin whales are also expected to occur off the coast.

Polar Bear. Polar bears are expected to be rare visitors to the Cape Romanzof area (PRSC 2020). Although the Cape Romanzof LRRS has been excluded from polar bear critical habitat designation (USFWS 2010), the nearby barrier islands are considered barrier island critical habitat that also includes a 1-mile no disturbance zone (Figure H-31). In addition, the adjacent marine waters are considered sea ice critical habitat (Figure H-32).

MMPA-listed Species

Whales, Porpoise, and Seals. Several species of whales and porpoises forage within the marine waters off Cape Romanzof and also pass along the coast during migration, including beluga, Dall's and harbor porpoises, common minke whale, and killer whale (Wynne 1993; McCaffery 2000). Beluga are found along the coast from Kuskokwim Bay to the mouth of the Yukon River from spring through autumn. Beluga are also found around Nunivak Island in ice-free months, moving into rivers and bays on the refuge during spring and early summer to feed on fish migrating to spawning grounds, particularly salmon and herring (USFWS 1989a). A spring population of beluga use inshore waters around Cape Romanzof, often within a dozen meters of the shoreline; later in the season they are occasionally found within Kokechik Bay (McCaffery 2000). Ribbon and spotted seals are also known to occur along the coast (Wynne 1993; McCaffery 2000).

Pacific Walrus. Pacific walruses range with the pack ice in the Bering Sea, west of the Yukon Delta NWR. They forage for clams and other benthic organisms off the coast of the refuge, are known to haul out at the tip of Cape Romanzof, and have been observed off the coast of Cape Romanzof LRRS (USFWS 1989a; McCaffery 2000; Huntington et al. 2017).

H.6.10 Other Natural Resource Information

H.6.10.1 Subsistence

Subsistence gathering, including subsistence hunting, but particularly subsistence fishing, occurs in the vicinity of Cape Romanzof by residents of Hooper Bay, Chevak, and Scammon Bay. Subsistence use in the vicinity of the LRRS includes bearded, ringed, and spotted seals; numerous fish species; small mammals; and greens and berries. Marine mammal hunting is carried out mainly to the north, beyond Cape Romanzof and into the Bering Sea. Spring is the most active period for seal hunting (ringed, ribbon, and spotted seals), as it is the time of the most intensive seal migrations and the greatest number and diversity of seals are encountered. Both seal hunting and gathering of seabird eggs typically occur during spring along the southern coast of Cape Romanzof, including the coastal area of the LRRS. Terrestrial resources are harvested in river-accessible areas that include montane environments in the Askinuk Mountains as well as wet tundra, lake, and slough environments. These areas significantly overlap among the four villages (Hooper Bay, Scammon Bay, Chevak, and Paimiut) of the region (Braund and Associates 2004; Huntington et al. 2017).

Subsistence fishing for herring roe occurs annually (depending upon the availability of a tender) in early June by residents of rural villages in the area, primarily Scammon and Hooper bays. Historically, ADFG sets up a camp nearby and adjacent to the installation's barge landing area to regulate the annual spring fishing activity. Three ADFG personnel typically camp for a 1-month period to gather information prior to, during, and following the herring fishing season. Three to five additional ADFG personnel usually join them for up to 1 week. Local Natives use the area for subsistence gathering while engaging in the small herring fishery. Between 150 to 250 helpers and families of fishermen are from the villages of Chevak, Hooper Bay, and Scammon Bay. This temporary population camps along the Kokechik Bay coast, mostly on adjoining Yukon Delta NWR property. Historically 50-80 individuals camped for up to 2 weeks on USAF property along the shore of Kokechik Bay, near the ADFG camp. Camp sites are typically sparse and left clean, as waste is removed or burned, and human waste is disposed in temporary latrine pits (Braund and Associates 2004).

H.6.10.2 Outdoor Recreation

The site provides limited recreational opportunities for personnel assigned to the site and for local inhabitants. Outdoor recreation at Cape Romanzof LRRS consists primarily of non-organized activities, such as hunting, hiking, bird watching, boating, and ATV riding. Although the region provides ample commercial and subsistence fishing opportunities, particularly for herring, little recreational fishing is expected to occur. Most recreation at the site is limited to hiking, boating along the coast in inflatable boats, and wildlife viewing. The USAF cooperated with the USFWS in establishing an observation point for eiders at Cape Romanzof LRRS in 1997 (McCaffery et al. 1998).

H.6.11 Mission and Other Impacts on Natural Resources

H.6.11.1 Land Use

Facilities include buildings, roads, airfield, antenna structures, utility plants, and systems of supply, generation, or disposition of electricity, water, sewage, and refuse. The Upper Camp contains radar equipment, and Lower Camp provides support facilities, including housing, the power plant, and bulk fuel storage. The two camps are connected by a gravel road. The LRRS installed a self-contained sewage treatment system in 1998. This system is similar to those used on large ships and improves the quality of the effluent, which reduces pollution.

USAF has outgrants to the FAA for an Alaskan National Airspace System Interfacility Communications System, one for the Remote Communications Outlet and Remote Communications Air-to-Ground services, and one for support of the CAPSTONE safety-enhancement project for the safety of aircraft operations in Alaska.

Roads. Cape Romanzof LRRS has a network of more than 7 miles of gravel roads. The road to Upper Camp is approximately 2 miles long and it is maintained year-round. Upper Camp access can and always has been difficult, especially during low visibility, high icing, heavy winds, and other extreme weather conditions. Upper Camp can be iced in or snowed in, and may not be accessible for days or weeks at a time (611 CES 2019).

Airfield. The gravel airfield is 3,955 ft long by 135 ft wide, and is equipped with REIL and PAPI light systems and frangible distance remaining indicators. The inclined airfield goes from an elevation of 370 to 465 ft MSL (611 CES 2019).

Barge Landing. Cape Romanzof LRRS is served by ocean-going barges to deliver fuel, construction material and equipment, and other large or heavy equipment/maintenance components. When a barge is due, operations personnel construct a temporary barge landing and use heavy construction equipment to anchor the barge. The temporary barge landing is typically washed away by wave action after each use (611 CES 2019).

H.7 COLD BAY LRRS

H.7.1 Location and Area

Cold Bay is a 175-acre LRRS located near the tip of the Alaska Peninsula on Izembek Lagoon, approximately 625 miles southwest of Anchorage and 85 miles northwest of the community of Cold Bay (Figure H-1 and Figure H-56). The installation is within the Izembek NWR. Cold Bay LRRS has a fenced hilltop site with a MAR Tower (Figure H-55), a vehicle maintenance Building, generator building and living quarters (611 CES 2019).

Figure H-55. MAR Tower at Cold Bay LRRS

H.7.2 Installation History

Cold Bay LRRS was originally constructed at Grant Point, north of its current location (Figure H-56) in 1958-59 as part of the extension of the DEW Line into the Aleutians. In 1969 Cold Bay LRRS was converted to a NORAD surveillance installation. Communications were provided by the WACS until the installation of Joint Surveillance System equipment was completed in 1982, enabling radar and beacon data to be transmitted via satellite to the Elmendorf Region Operations Control Center. In early 1985 a MAR was installed at the current LRRS and is currently active. The Grant Point site was demolished in 1987.

H.7.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. One contractor employee is responsible for the operation, maintenance, and support of the MAR year-round (611 CES 2019).

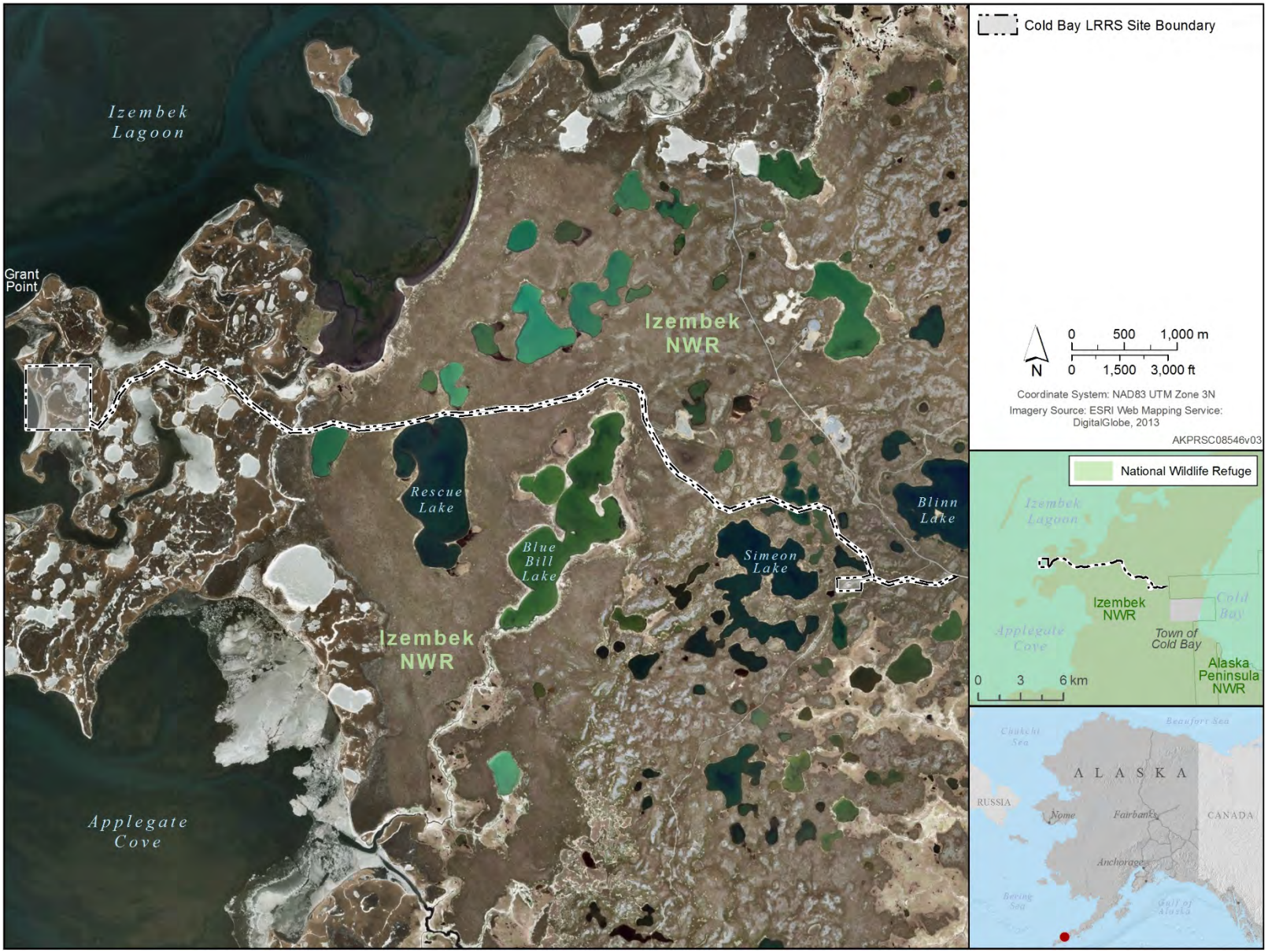

Figure H-56. Overview of Cold Bay LRRS

H.7.4 Surrounding Communities

Access to the facility is by gravel road from Cold Bay. The community of Cold Bay can be reached only by sea or air. Cold Bay has a population of 63 (2018 estimate) (State of Alaska 2018). King Cove is 23 miles southeast, and False Pass is 37 miles southwest of the Cold Bay LRRS.

Cold Bay services the fishing industry and houses a number of federal offices with services focused on Aleutian transportation and wildlife protection. Subsistence and recreational fishing and hunting are a part of the local culture. State and federal government and airline support services provide most local employment. Cold Bay serves as the regional center for air transportation on the Alaska Peninsula and is an international hub for private aircraft. Cold Bay also provides services and fuel for the fishing industry (Braund and Associates 2004).

H.7.5 Regional Land Use

The site is within the Izembek NWR. Residents of nearby communities obtain a significant proportion of protein in their diet from subsistence resources on Izembek NWR. Air Force personnel and civilians use the site for fishing (personal communication, P. Cooley 2007).

H.7.6 Local and Regional Natural Areas

Cold Bay lies within the Izembek NWR, which encompasses approximately 420,000 acres ranging from steep mountain slopes, to lake-dotted tundra, to the salt water Izembek lagoon environment. The lagoon is approximately 9 miles across at its widest point and protrudes inland 25 miles from its headlands (Figure H-56). In addition, the Cold Bay site is located within the Izembek State Game Refuge. Tidal and submerged lands of Izembek Lagoon constitute the Izembek State Game Refuge, a legislatively designated special area established to protect and preserve natural habitat and game populations (especially waterfowl) and is managed by ADFG. The lagoon and intertidal habitats are managed by the State of Alaska as Izembek State Game Refuge, while the surrounding uplands are managed by the USFWS as part of Izembek NWR (ADFG 2019b).

H.7.7 Physical Environment

H.7.7.1 Climate

The climate at Cold Bay LRRS is dominated by a strong marine influence, characterized by frequent but light rains, cool temperatures, and high cloud and fog frequencies. Temperature variation at Cold Bay is minimal with differences of 10 ºF between minimum and maximum temperatures for all months (Table H-41). The mean annual temperature is 38 ºF. Below zero temperatures, occurring November through April, are extremely rare. Mean annual precipitation is about 42 in, and although rarely heavy, measurable precipitation occurs approximately 200 days per year. The average annual snowfall is 55 inches. Wind speeds are typically 15 mph or greater every month of the year.

Table H-41. Monthly Climate Averages for Cold Bay, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	32.7	33.0	34.3	38.2	44.9	50.6	55.0	55.9	52.3	44.8	38.9	34.7
Avg. Low (ºF)	23.4	23.5	24.2	28.6	34.8	41.0	46.0	47.3	43.0	35.2	29.9	25.7
Avg. Precipitation (inches)	2.9	2.7	2.5	2.2	2.5	2.4	2.5	3.7	4.2	4.5	4.5	3.7
Avg. Snowfall (inches)	11.1	10.8	11.2	6.2	1.6	0	0	0	0	2.6	8.2	11.1
Avg. Wind Speed (mph)	16.4	17.3	16.3	16.1	15.6	15.0	14.6	15.1	15.8	16.1	17.2	17.2
Prevailing Wind Direction	SE	SE	SE	SE	SE	SE	SE	W	W	N	SE	N

Source: 611 CES 2019.

Cold Bay's weather is dominated by frequent cyclonic storms crossing the Northern Pacific and Bering seas. These storms are responsible for common occurrences of high winds, low ceilings, and low visibility in the area. The open bay area to the south-southwest of the LRRS and the high mountainous terrain to the southwest create complex wind patterns. The summer season experiences the greatest frequency of fog, with the foggy period extending from mid-July to mid-September. Visibility restriction due to blowing snow is common during winter.

H.7.7.2 Topography

Cold Bay LRRS is surrounded on the landward side by low, rolling tundra with a myriad of freshwater lakes, marsh pools, and interconnecting drainage channels. The area is located within a moraine and outwash-mantled plain. Numerous morainal and thaw lakes dot the wet tundra that surrounds the installation. Elevations range from 5 to 50 ft MSL.

The nearest volcano, Mt. Frosty, adjacent to Cold Bay, has been dormant in historical times. There is no known fault line in the immediate proximity to Cold Bay. Cold Bay is subject to tsunamis that are created by submarine earth movements of earthquakes and volcanic eruptions.

H.7.7.3 Geology and Soils

The geology of Cold Bay LRRS is dominated by coastal deposits consisting of interlayered marine and alluvial sediments of terrestrial origin. These materials consist of silt and sand. Site geology consists of glacial drift and morainal materials, an unsorted, unstratified mixture of clay, silt, sand, gravel, cobbles, and boulders, deposited in an arcuate pattern about Cold Bay. Numerous small lakes dot the uplands underlain by glacial sediment (Boyer 1987).

Volcanic ash, unconsolidated sand, silt, gravel, and decomposed bedrock form most of the parent material for the soil for the Alaska Peninsula. Soils are generally cindery and well drained on slopes but are often sandy or loamy at low elevations. Peat soil is common in lowlands because of poor drainage and the lack of topographic relief (Boyer 1987).

Although there are zones of discontinuous permafrost on the eastern half of the Alaska Peninsula, permafrost is usually absent in the western portion, where the LRRS is located. The depth of seasonal freezing depends on temperature and the amount of insulation provided by snow cover (Boyer 1987).

H.7.8 Hydrology

H.7.8.1 General

Izembek Lagoon is a salt water body and groundwater obtained from shallow aquifers in the general area may be brackish. The facility obtains its water supplies from a 113-ft deep well located on a knoll at 150 ft MSL, adjacent to the site. This well encountered water at 88 ft in predominantly sandy soil (Boyer 1987). The drainage of Cold Bay LRRS land areas is directed to unnamed surface streams and local wetlands, which, in turn, drain to Izembek Lagoon, the principal surface water feature of Izembek NWR.

H.7.8.2 Floodplains

Terrain of the installation is slightly rolling hills, providing adequate water drainage from the site. In general, the installation is above the 100-year flood plain. Small lakes on the site would rise temporarily due to inflow of local runoff; none of these lakes are a flood hazard (Legare 1998).

H.7.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Cold Bay LRRS. Attachment 6 contains lists of vascular plants (Table H-34), fish (Table H-35), mammals (Table H-36), and birds (Table H-37) known to occur or potentially occurring in the Cold Bay area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Cold Bay site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.7.9.1 Ecoregion Classification

The Cold Bay site is located in the Alaska Peninsula ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.7.9.2 Vegetation/Habitat

A general vegetation map of Cold Bay LRRS was prepared in 1995 (611 ASG 1995e). Schick et al. (2004) made significant improvements in vegetation mapping using 2003 QuickBird pan-sharpened natural color imagery, conducting flora and fauna surveys, and mapping wildlife habitat. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Cold Bay using the most recent imagery found on Google Earth. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 5 habitat classes were identified (Table H-42 and Figure H-57). A list of vascular plants recorded from the Cold Bay site can be found in Table H 32.

Table H-42. Habitat Classes at Cold Bay LRRS (2017)

Habitat Class	Acres	Proportion
Grassland and Herbaceous	77.1	44.1%
Developed and Barren Land	38.1	21.8%
Shrub or Scrub	22.7	13.0%
Open Water	20.1	11.5%
Herbaceous Wetland	16.8	9.6%
Total	**174.9**	

Source: CEMML 2019a.

Vegetation at Cold Bay LRRS is generally restricted to low-growing species that can resist cold summer temperatures, strong winds, shallow soils, and a short growing season. Moist and wet tundra are the main plant communities found at the LRRS, with intermixed areas of open low-shrub/graminoid tundra characterized by low rolling coastal heath (*Empetrum nigrum*), with associated shrub willow and alder near stream margins. Crowberry is associated with prostrate willows and forbs, such as avens, dryas, and saxifrage. Sedges, grasses, and herbs, such as geranium, cow parsnip, and monkshood, are common. Moist tundra occurs in areas of somewhat greater relief and better drainage than wet tundra, predominantly on hummocky, hilly, or rolling terrain. Mats of crowberry and other plants are underlain by a thick, acidic layer of peat. Uppermost portions of the peat layer are usually saturated with water, even during prolonged dry periods. Other vegetation of the site includes cranberry, Alaska violet, northern Labrador tea, bunchberry, coltsfoot, lupine, lousewort, wild mustard, Ross avens, mountain heliotrope, coastal paintbrush, and miscellaneous grasses (fescues, beach reedgrass, etc.), mosses, lichens, willows, and alder. Cow parsnip, hemlock parsley, and beach lovage commonly occur with beach rye; groundsel and seabeach sandwort predominate on sandy beaches. (USFWS 1985; Boyer 1987).

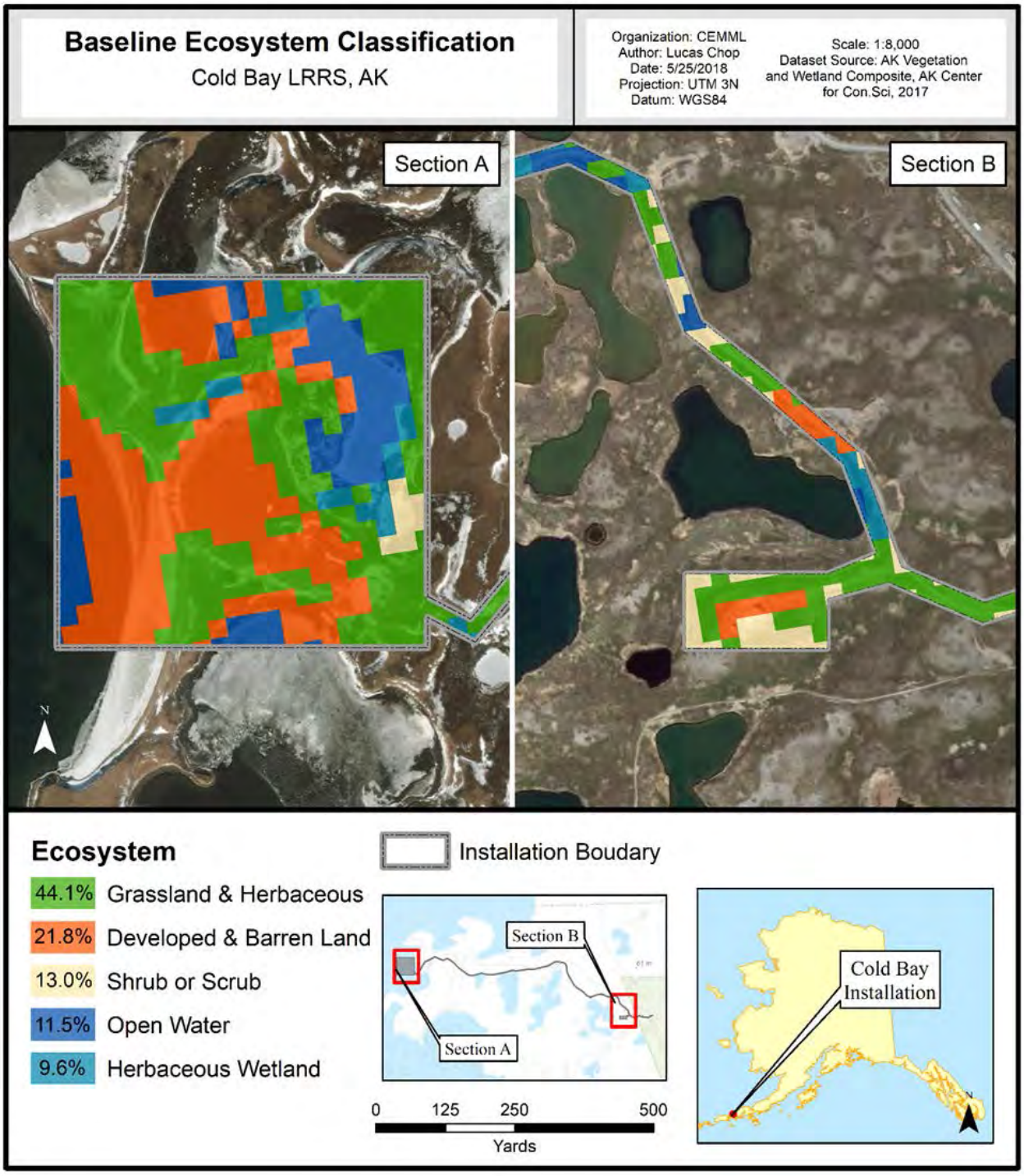

Figure H-57. Cold Bay LRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

H.7.9.3 Wetlands

Of the approximate 171-acre Cold Bay site, 56 acres (or 33%) are considered wetlands per the 2018 ANHP mapping (Table H-43and Figure H-58). The most common wetland type is estuarine and marine deepwater. Wetlands at Cold Bay LRRS are strongly dominated by moist gently sloping areas with far fewer wetter areas of seasonal flooding.

Table H-43. Cold Bay LRRS Wetland Types (2018 ANHP)

Wetland Type	Area (acres)*	Proportion
Estuarine and Marine Deepwater	25.3	14.7%
Freshwater Emergent	16.7	9.7%
Freshwater Lake/Pond	14.2	8.4%
Wetlands Total	**56.3**	**32.8%**
Upland	115.4	67.2%
Site Total	**171.7**	

Note: *See Figure H-58.
Source: Flagstad et al. 2018.

H.7.9.4 Fish and Wildlife

H.7.9.4.1 Fish

Both freshwater and marine fish species occur in the Cold Bay area (Table H-35). Freshwater species include five species of salmon, Dolly Varden, Arctic char, and rainbow trout. Five species of Pacific salmon move through Izembek Lagoon on their way to and from their spawning streams. Pacific herring feed in the lagoon. Walleye pollack, greenling, sculpin, Pacific sand lance, cod, capelin, and smelt provide important prey species for birds, mammals, and other fish. Pacific halibut and flounder inhabit the lagoon as well. At least 34 other species of fish occur in Izembek Lagoon. Most of these species are of little sport or commercial interest, but they are important food sources for aquatic and terrestrial wildlife (USFWS 1985; ADFG 2019b). Blue Bill Lake, just south of the road from the LRRS to the community of Cold Bay, supports rearing coho and sockeye salmon (Johnson and Blossom 2019a).

H.7.9.4.2 Mammals

Terrestrial Mammals

A total of 16 species of terrestrial mammals have been recorded at Cold Bay LRRS (Table H-36). Brown bear and caribou are the most conspicuous terrestrial mammals. In spring bears search the coastline for carrion and early spring vegetation, and in summer they move to salmon streams. In fall bears alternate between salmon streams and tundra, where they forage for berries. Winter denning is usually in mountainous areas, not within the LRRS area (USFWS 1985; 611 ASG 1995a). Other land mammals in the area include red fox, river otter, American mink, wolverine, and wolf, which are all occasionally sought by trappers. Arctic ground squirrels are abundant all summer. Ermine, Alaskan hare, red-backed and root voles, brown lemming, and porcupines also occur throughout the area (Boyer 1987).

Marine Mammals

Only two marine mammals are known or expected to occur at the Cold Bay site, both ESA-listed species: northern sea otter and Steller sea lion (Table H-36). Marine mammals are discussed in detail in Section H.7.9.5 (ESA- and MMPA-listed Species).

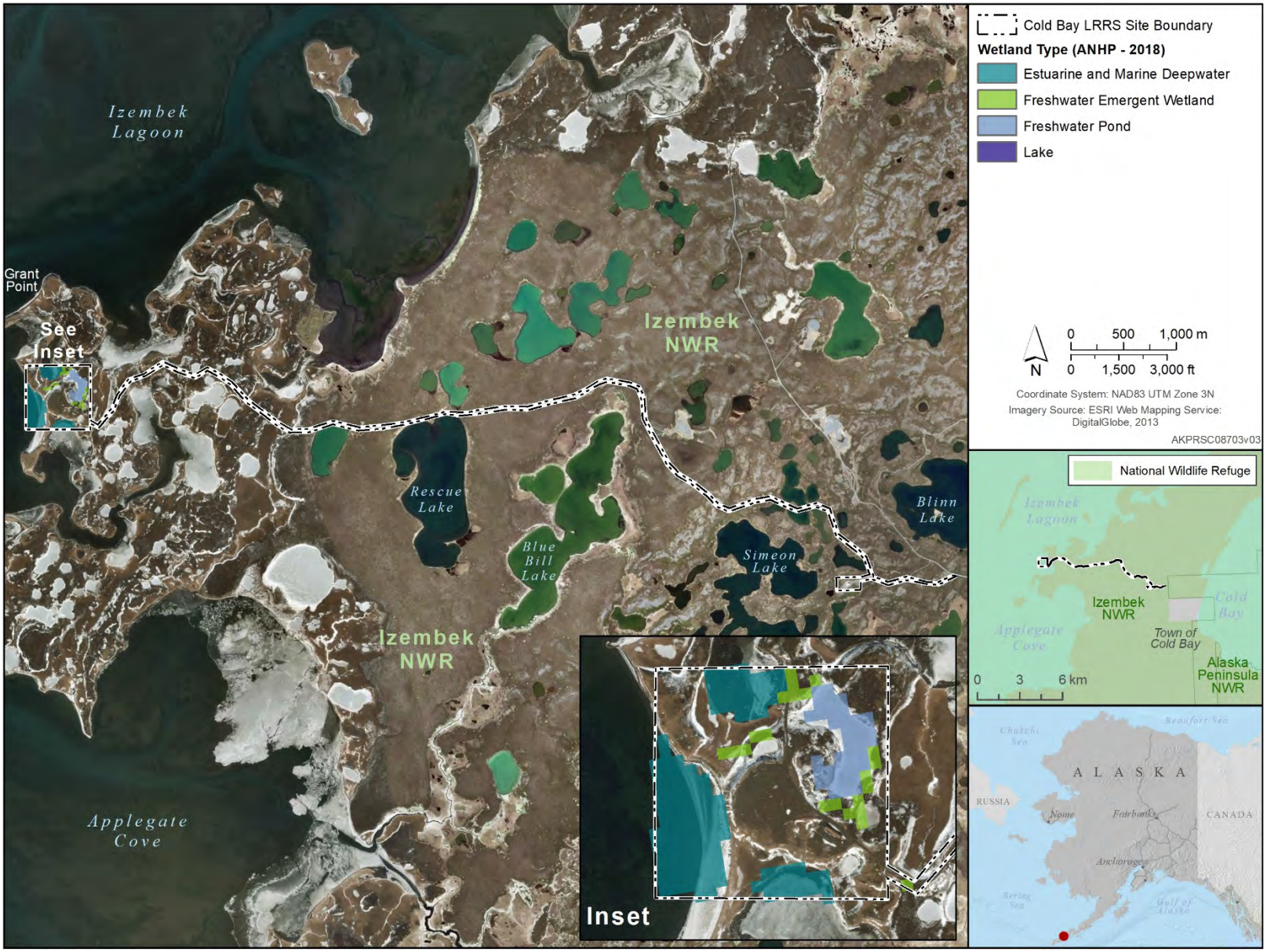

Figure H-58. Cold Bay LRRS Wetlands (2018 ANHP)

H.7.9.4.3 Birds

A total of 131 avian species have been recorded on or have the potential to occur in the vicinity of the Cold Bay site (Table H-37). The Cold Bay/Izembek NWR area supports one of the greatest concentrations of migrating waterfowl in the world. Izembek Lagoon offers the world's largest eelgrass beds, feeding grounds that serve as a crossroad for several waterfowl and shorebird migration routes. Birds from Asia, the mid-Pacific, and the North American Pacific Flyway funnel through this area en route to and from nesting grounds in the Arctic. As a major migratory staging area for most of the world's population of black brant, emperor geese, and Steller's eiders, and host to thousands of northern pintails, mallards, long-tailed ducks, harlequin ducks, and scoters, the area has received worldwide recognition as a "Wetland of International Importance." In the fall, black brant arrive to feast on the abundant eelgrass within the lagoon while Taverner's and cackling Canada geese feed on both eelgrass and crowberries. The Taverner's geese also stop by the tens of thousands at Izembek Lagoon in the fall. Emperor geese feed on eelgrass and crowberries and also graze on invertebrates and mussels from the shoreline at low tide. After the geese and dabbling ducks depart for wintering grounds, king, Steller's, and common eiders, black and white-winged scoters, and red-breasted mergansers remain to winter in the ice-free waters of the lagoon. Shorebirds, including large numbers of dunlin and short-billed dowitchers, are most numerous in the fall when they probe vast intertidal expanses of mud and sand for food at low tide. Rock sandpipers are among the most common and can be seen year-round (Kinchloe et al. 1988; ADFG 2019b).

Several raptor species are found in the area, including bald eagle, rough-legged hawk, northern harrier, gyrfalcon, peregrine falcon, short-eared owl, and snowy owl. The bald eagle is a common, year-round resident and are regularly viewed along the shore (USFWS 1985).

Important Bird Areas (IBAs)

The Cold Bay LRRS is immediately adjacent to the Izembek Lagoon and Bechevin Bay IBA (Figure H-59). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The area has been designated an IBA because the location of Izembek Lagoon along avian migration routes and the presence of an abundant food resource (eelgrass) make this site one of the most important migratory bird staging and wintering habitats in the world. The site is especially critical for the many species of waterfowl and shorebirds that undertake transoceanic flights to wintering habitats on the lower North Pacific coast or southern Pacific islands. The area regularly supports more than 90% of the eastern Pacific coast population of brant, more than half the world population of emperor geese, and a significant percentage of the world populations of Steller's eider and Taverner's cackling goose (Audubon Alaska 2014).

H.7.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Although no ESA-listed species occur within the Cold Bay LRRS, 13 species potentially occur in adjacent marine waters: endangered short-tailed albatross; threatened Steller's and spectacled eiders; threatened northern sea otter; endangered Steller sea lion; endangered humpback, North Pacific right, sperm, blue, and fin whales; and threatened ringed and bearded seals. All of the mammals are also listed under the MMPA.

Short-tailed Albatross. The albatross may occur in offshore waters during the non-breeding season.

Steller's and Spectacled Eiders. Adjacent to the Cold Bay site, Izembek Lagoon is one of the primary molting areas for Steller's eiders (Kinchloe et al. 1988; ADFG 2019b; USFWS 2019e). Given the importance of Izembek Lagoon as a molting area for Steller's eiders, it was designated as critical habitat in 2001 (Figure H-60) (USFWS 2001a). The spectacled eider is expected to be a rare visitor to offshore waters.

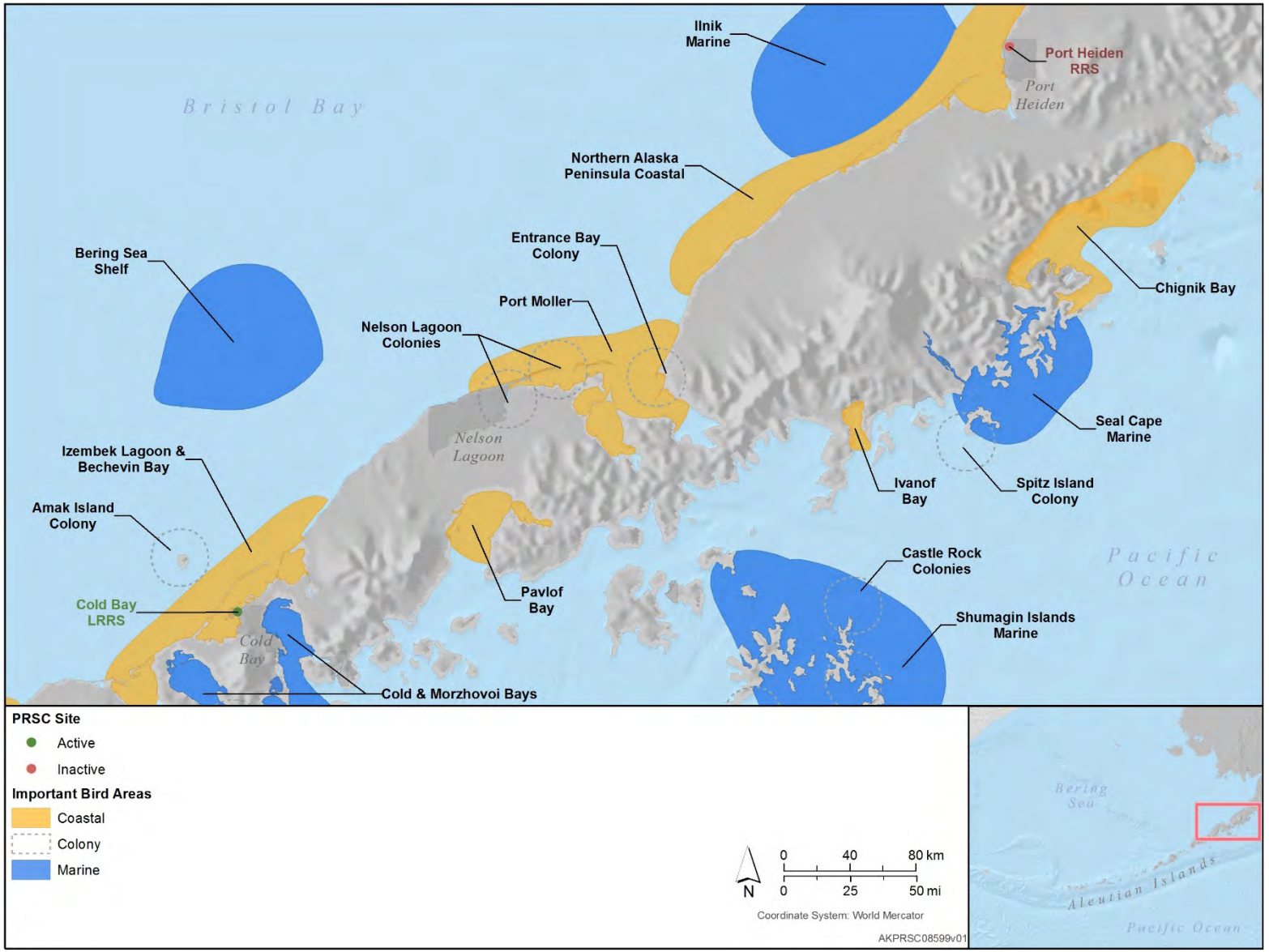

Figure H-59. Important Bird Areas (IBAs) within the Vicnity of Cold Bay LRRS and Port Heiden RRS
(*Source*: Audubon Alaska 2014)

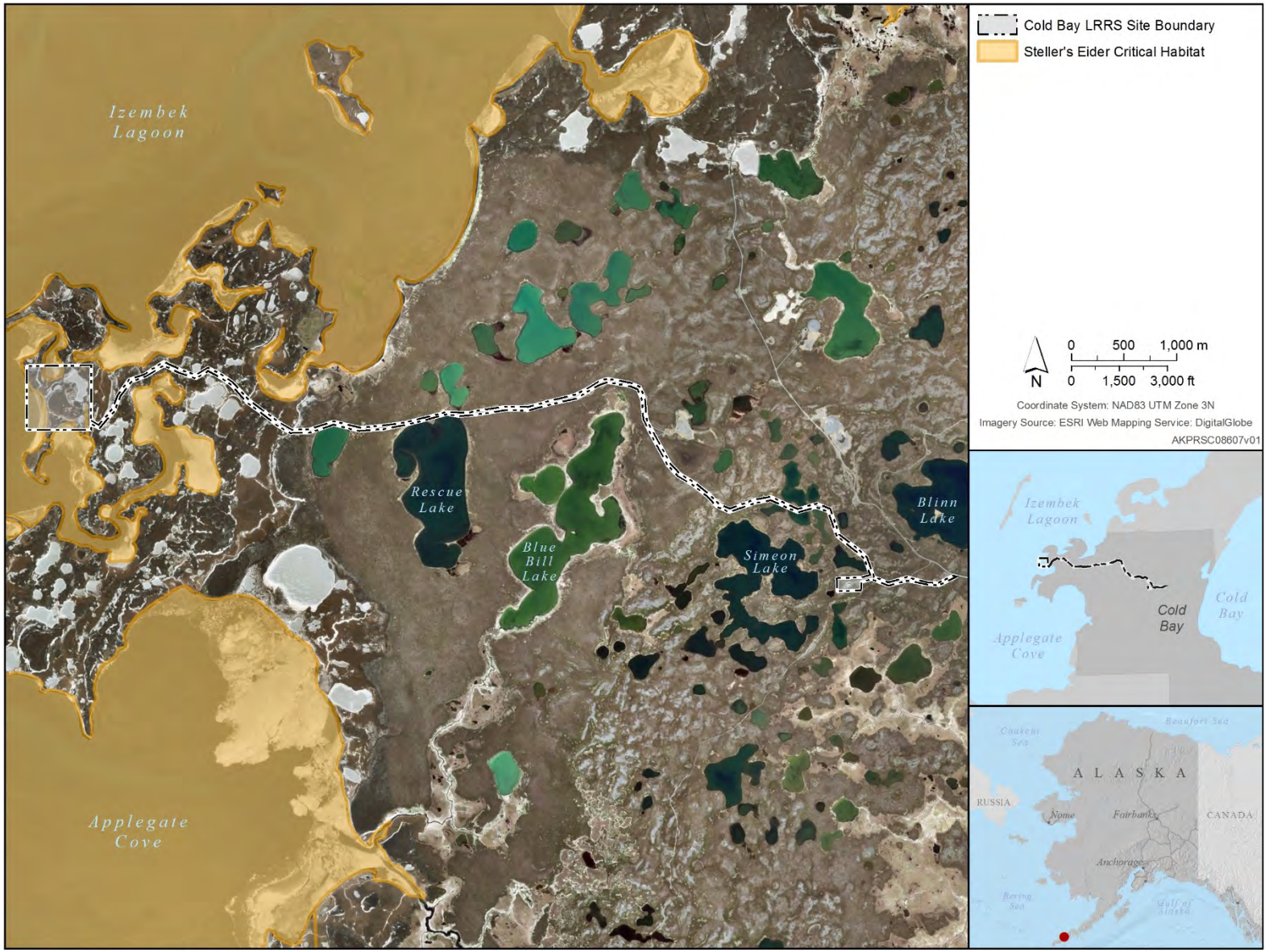

Figure H-60. Steller's Eider Critical Habitat within the Vicinity of the Cold Bay LRRS
(*Source*: USFWS 2009c)

Northern Sea Otter. The northern sea otter is known to occur within Izembek Lagoon and the offshore waters of Bristol Bay. In 2009, the USFWS designated the waters to the west of Cold Bay LRRS (Applegate Cove, Izembek Lagoon, and Moffet Lagoon) as sea otter critical habitat (Figure H-61). Critical Habitat Subunit 4b (Izembek Lagoon) includes all nearshore waters within 100 m from the mean high tide line of the Alaska Peninsula, to the barrier islands (Glen, Operl, and Neumann islands) to the west (USFWS 2009c). In 2015, the USAF funded the USFWS to analyze existing sea otter data to determine the location of significant "hotspots" near PRSC installations. This effort revealed a small but significant hotspot approx. 3 miles west of the Cold Bay LRRS (USFWS 2015). In 2016, the USAF funded the USFWS to conduct aerial surveys of the waters surrounding Cold Bay LRRS; this effort confirmed the presence of 1,087 individuals within 60 miles of the installation boundary (USFWS 2016).

Steller Sea Lion. A major Steller sea lion rookery and haulout site occurs on Amak Island, approximately 25 miles west of the Cold Bay LRRS. The Steller sea lion may potentially occur within Izembek Lagoon and the nearshore wates and shoreline of the Cold Bay site. In 1993, NMFS designated all Steller sea lion rookeries and major haulouts as critical habitat (NMFS 1993). Critical habitat includes terrestrial, aerial, and aquatic zones associated with rookeries and haulouts. The terrestrial zone extends 3,000 ft landward from each major rookery and haulout. Aquatic zones extend 20 NM seaward from the major rookeries and haulouts. Lastly, critical habitat also includes air zones extending 3,000 ft above these terrestrial and aquatic zones. The 20-NM aquatic zone surrounding Amak Island includes the waters of Izembek Lagoon west of the Cold Bay LRRS (Figure H-62).

Humpback, North Pacific Right, Sperm, Blue, and Fin Whales. These species may be rare visitors to offshore waters.

Arctic Ringed and Bearded Seals. As the Aleutians are at the southern-most extent of their range, ringed and bearded seals are expected to be rare within the vicinity of the Cold Bay LRRS.

Other MMPA-listed Species

Pacific Walrus. Although Pacific walrus are not expected to occur at the Cold Bay LRRS, there is the potential for them to occur in the nearshore marine waters. A major walrus haulout supporting between 100 and 1,000 individuals during April-December is approximately 3.5 miles to the northeast of the LRRS (Fischbach et al. 2016) (Figure H-63).

H.7.10 Other Natural Resource Information

H.7.10.1 Subsistence

Native people have harvested fishery resources of Izembek NWR for thousands of years. Today, many people living in the area depend seasonally on commercial fishing for their livelihood. Residents of Cold Bay use Izembek NWR for much of their subsistence activity. Cold Bay residents generally hunt caribou and waterfowl in fall and harvest salmon in summer and fall (Braund and Associates 2004).

H.7.10.2 Outdoor Recreation

The most popular recreational activity near the Cold Bay site within the Izembek NWR is bear, caribou, and waterfowl hunting, all tightly controlled by ADFG. Another form of outdoor recreation in the Cold Bay area is recreational fishing. Cold Bay provides excellent wildlife viewing opportunities, particularly during spring and fall migrations of waterfowl. However, because of Cold Bay's remote location and generally severe weather conditions, wildlife viewing primarily involves local residents.

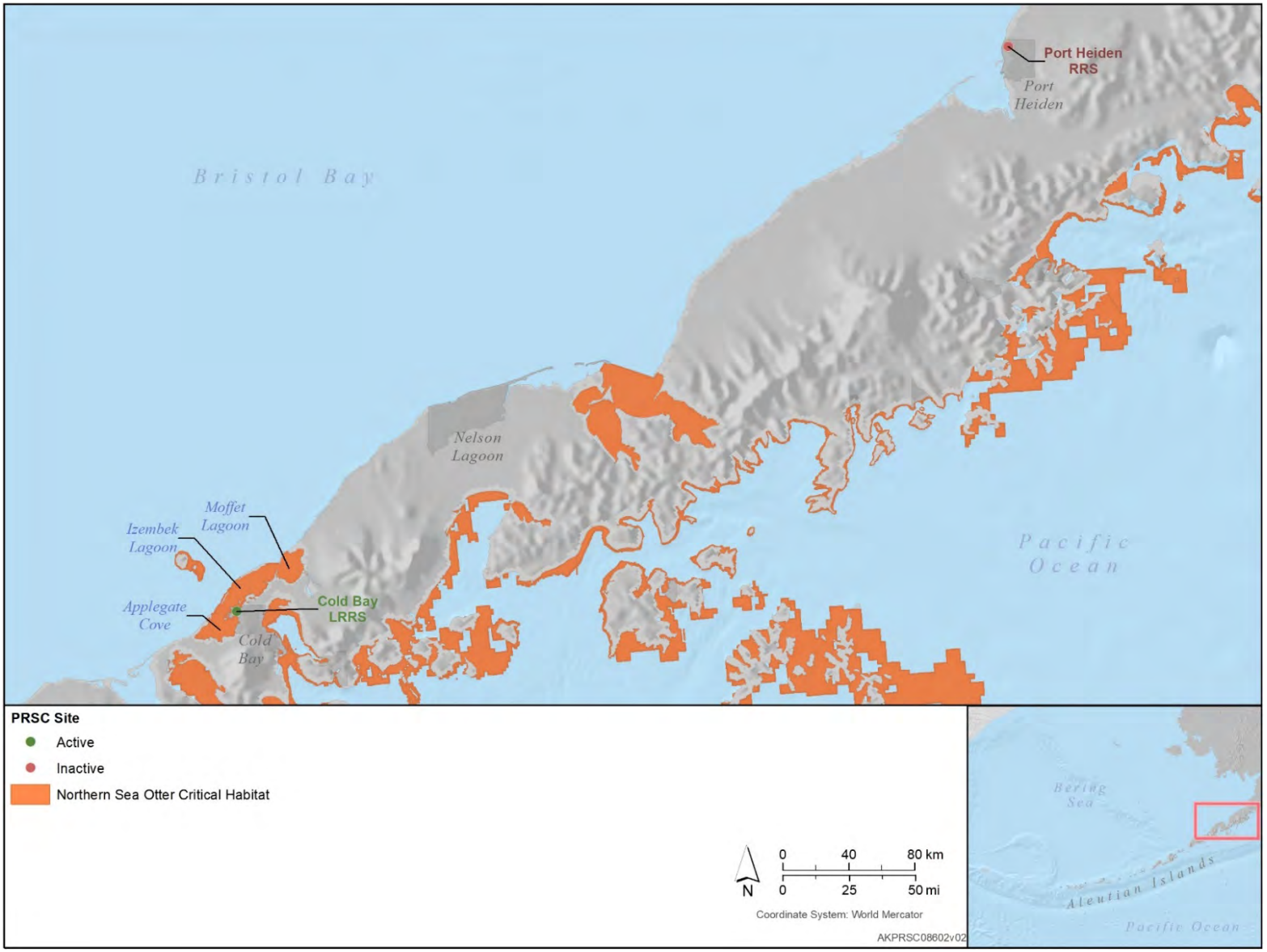

Figure H-61. Northern Sea Otter Critical Habitat within the Vicinity of Cold Bay LRRS and Port Heiden RRS
(*Source*: USFWS 2009c)

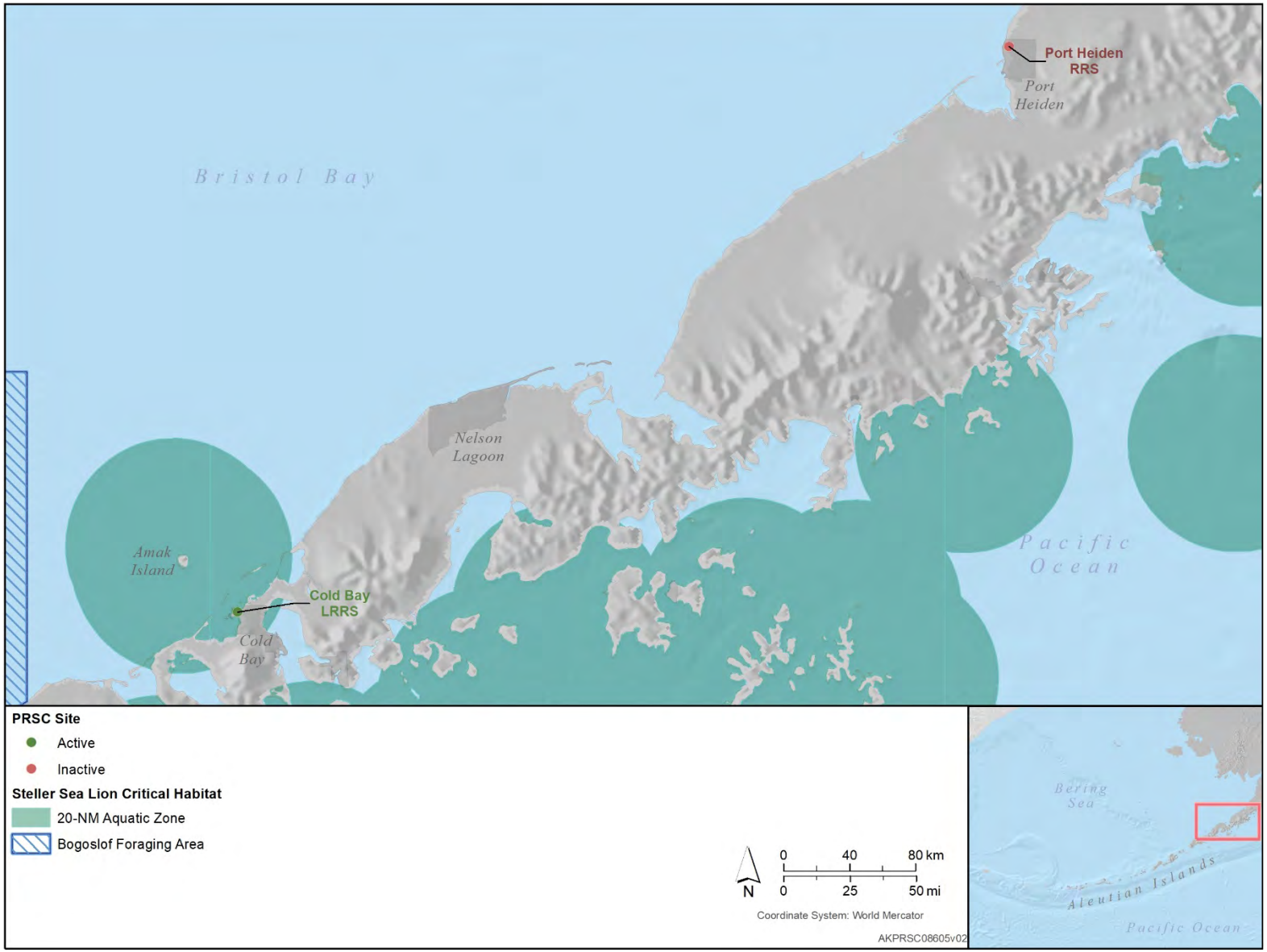

Figure H-62. Steller Sea Lion Critical Habitat within the Vicinity of Cold Bay LRRS and Port Heiden RRS
(Source: NMFS 1993)

Figure H-63. Pacific Walrus Haulout within the Vicinity of the Cold Bay LRRS
(*Source*: Fischbach et al. 2016)

H.7.11 Mission and Other Impacts on Natural Resources

H.7.11.1 Land Use

The LRRS is approximately 8 miles northwest of the community of Cold Bay, is accessible via public gravel roads, and obtains electrical power from the local utility. Roads are maintained by the Alasks Department of Transportation and Public Facilities. Land use issues at Cold Bay LRRS are minimal particularly since the area within the perimeter fence is less than 2 acres and acreage outside of the perimeter fence has been left in its natural condition to contribute to the wildlife habitat of the NWR. Minor gullying of gravel slopes outside of the perimeter fence and some washing of the access road just outside of the gate has been noted in the past. These problems are addressed through routine maintenance activities at the site. The Air Force has a Right-of-Way Permit from the FAA.

H.8 FORT YUKON LRRS

H.8.1 Location and Area

Fort Yukon LRRS is located on a 197-acre site, upstream of the confluence of and between the Porcupine and Yukon rivers, approximately 0.5 mile east of the village of Fort Yukon and about 140 miles northeast of Fairbanks (Figure H-64 and Figure H-65). The site is at an elevation of 435 ft MSL and is accessible only by air and water. An abandoned WACS site, encompassing 9 acres, is just west of the LRRS on a separate tract of land. WACS facilities were demolished in 1999.

Figure H-64. Aerial View of Fort Yukon LRRS Looking Southwest

H.8.2 Installation History

Fort Yukon LRRS was established in 1954 as a USAF AC&W site. In 1957 a WACS facility was added to the installation. Operation Bluegrass added a 50-kilowatt forward propagation tropospheric scatter system between Fort Yukon and Barter Island, tying North Coastal facilities into the main WACS system (611 CES/CEVR 1995). In 1980 the WACS was deactivated at Fort Yukon and replaced by a commercial satellite earth terminal. The staff at Fort Yukon originally consisted of about 100 persons, which was reduced to approximately 30 in 1977. In 1984 a MAR unit was activated. The area was also used in the 1980s for launching experimental commercial rockets and for studies of the aurora borealis by the University of Alaska Fairbanks (Argonne National Laboratory and CEMML 2013).

H.8.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. The Fort Yukon LRRS is currently maintained by 4 contractor personnel, 3 of which reside on-site and 1 resides in Fort Yukon (611 CES 2019).

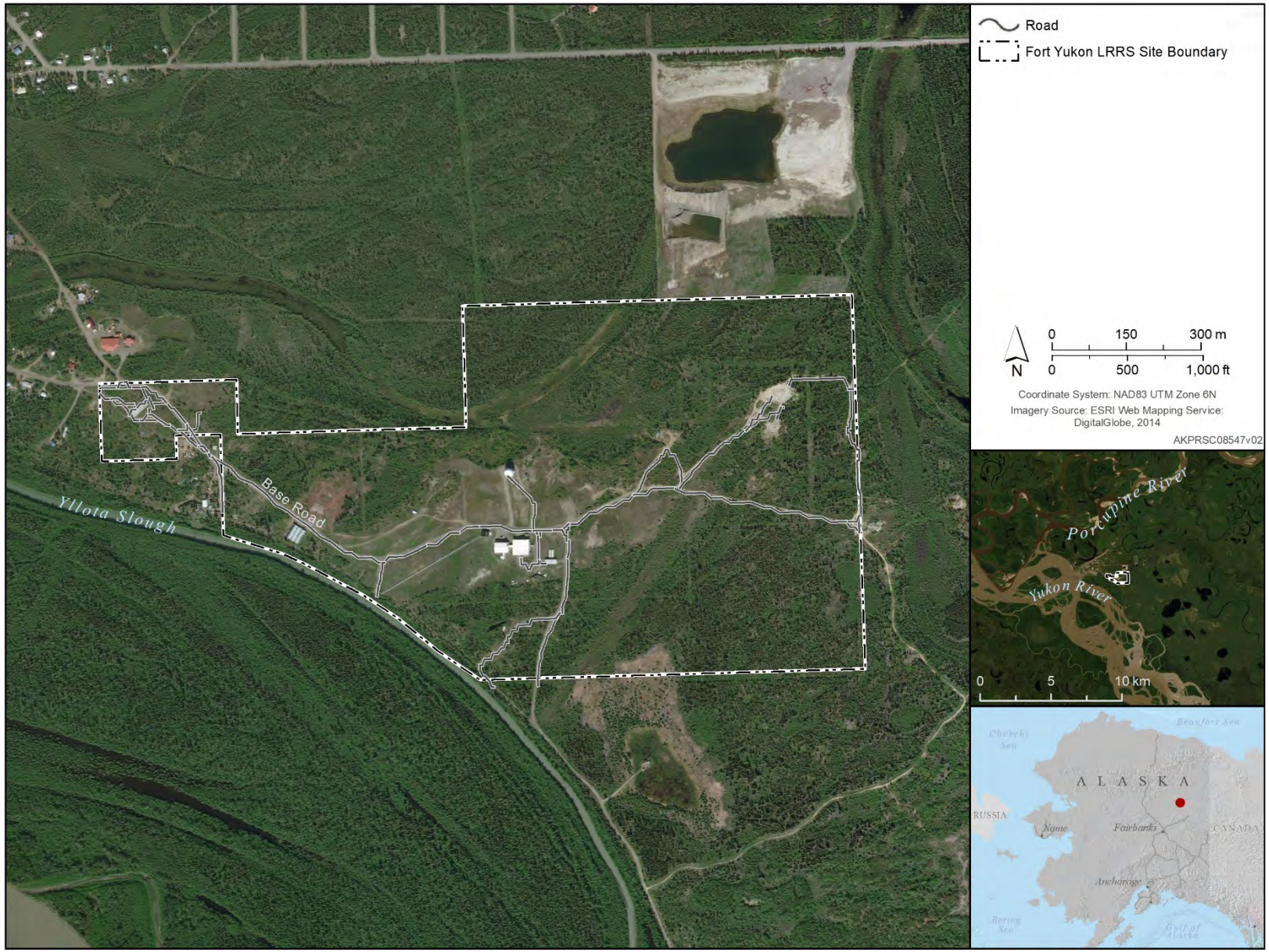

Figure H-65. Overview of Fort Yukon LRRS

H.8.4 Surrounding Communities

The community of Fort Yukon is about 0.5 mile west of the LRRS and is connected by gravel road to the installation. The population of Fort Yukon is 540 (2018 estimate) with 90% of Fort Yukon residents being descendents of the Yukon Flats, Chandalar River, Birch Creek, Black River, and Porcupine River Gwich'in Athabascan tribes. City, state, and federal agencies and the Native corporation are primary employers in Fort Yukon. The School District is the largest employer. The BLM operates an emergency fire fighting base at the airport. Winter tourism has become increasingly popular, Fort Yukon experiences spectacular aurora borealis displays. Trapping and Native handicrafts also provide income. Residents rely on subsistence foods -- salmon, whitefish, moose, bear, caribou, and waterfowl provide most meat sources (State of Alaska 2018, 2019).

H.8.5 Regional Land Use

The lands surrounding the LRRS are village native corporation lands which are surrounded by the Yukon Flats NWR.

H.8.6 Local and Regional Natural Areas

Fort Yukon LRRS lies within Yukon Flats NWR. Yukon Flats NWR is the third largest conservation area in the NWR system at about 9 million acres. It includes Yukon Flats, a vast wetland basin bisected by the Yukon River. The basin includes a complex network of lakes, streams, and rivers characterized by mixed forests dominated by spruce, birch, and aspen (USFWS 2007a).

H.8.7 Physical Environment

H.8.7.1 Climate

Fort Yukon winters are long and harsh, and summers are short but warm. The Yukon-Tanana Plateau, south of the Yukon Basin, forms a normally effective barrier to the maritime air flow from the North Pacific Ocean. After rivers and marshes freeze, the plateau is a source for cold, continental arctic air. Extended periods of -50 to -60 ºF are common. Daily average high temperatures from December through February are usually below 0 ºF (Table H-44). Summer high temperatures reach the mid-70s ºF. Despite high summer temperatures, daily variations can be extreme; freezing temperatures have been recorded in every month of the year. Approximately 90 days each year are frost-free. The last freeze in spring occurs about the end of May; the first fall freeze about the end of August. There is very little precipitation. Total annual precipitation averages around 7 inches; about half of this occurs from June to September. Most rain is in the form of convection showers. Average winter snowfall is about 42 inches.

Table H-44. Monthly Climate Averages for Fort Yukon, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	-10.9	-3.6	14.7	34.8	56.1	70.9	73.2	66.3	50.6	27.2	1.3	-8.7
Avg. Low (ºF)	-27.8	-23.4	-11.5	9.0	32.1	47.9	51.2	44.7	32.1	12.4	-14.2	-24.6
Avg. Precipitation (inches)	0.5	0.4	0.3	0.2	0.3	0.7	0.8	1.1	0.8	0.6	0.4	0.5
Avg. Snowfall (inches)	6.7	5.1	4.1	2.4	0.6	1.2	0	0	1.7	6.8	6.5	6.7

Note: nd = no data.
Source: 611 CES 2019.

H.8.7.2 Topography

Fort Yukon LRRS is situated within the Yukon Flats physiographic region characterized by meandering channels, oxbow lakes, sloughs, swamps, gently sloping alluvial fans, thaw lakes, sink holes, and sand dunes. The local Fort Yukon area consists of a marshy, lake-dotted flatland rising from 300 ft MSL in the

west to 600 and 900 ft MSL in the north and east, respectively. The area surrounding Fort Yukon LRRS is characterized by low topographical relief and high stream density. The installation sits on a low terrace overlooking the Yukon River, at an elevation of about 440 ft MSL.

H.8.7.3 Geology and Soils

The surficial geology of the Yukon Flats region is dominated by Yukon River alluvial sediments. The region is underlain by more than 300 ft of silt and silty sand deposited when the area was formed. These deposits are overlain by alluvial deposits (clay, silt, sand, and gravel). In some areas sediments are covered by a windblown layer of silty loam, ranging in depth from a few inches to several feet. Fort Yukon LRRS is underlain by permeable alluvium consisting of poor to well-graded sands and gravels, silty sands and gravels, and some interbedded silt.

Permafrost is discontinuous in the Yukon Flats, but in poorly drained areas it may occur to a considerable depth. The maximum depth to the base of permafrost ranges from 18 to 390 ft below grade in the Fort Yukon area. The permafrost table at Fort Yukon LRRS is usually 8+ ft below the surface, and it may be absent close to the river. Riverbank erosion has always been a problem, especially since 1955 when a large amount of gravel was removed from the river for construction of the Air Force site. The increased velocity of the river added to the erosion caused by periodic flooding and permafrost thaw. Along some stretches of the river through Fort Yukon, the bank has been eroded several hundred feet.

H.8.8 Hydrology

H.8.8.1 General

The Yukon Flats region is dotted with lakes, ponds, and swamps and covered by a network of rivers, tributaries, and streams. The Yukon River flows through the flats as an intricately braided stream with many channels. At high water the river overflows from main channels into hundreds of sloughs. The flow rises gradually in the spring to a peak discharge, usually within about 2 weeks of ice break-up, which occurs in mid-May. Precipitation is normally low in the spring, and rain does not contribute significantly to the spring peak. Summer rains throughout the basin serve to maintain river flows at near-average rates.

The LRRS is well-drained to moderately well-drained and is predominantly flat terrain consisting entirely of riverine and lowland physiography. Drainage of the LRRS primarily flows overland to the south to Ylotta Slough, a Yukon River tributary, or northward into adjacent wetlands. Runoff rates are very low due to low precipitation and highly permeable soils.

Thaw lakes and sinks are common. Because of permafrost conditions, there is little groundwater except near streams. Aquifers apparently do not exist, and the yield from wells is low. All water in the area appears to be of the calcium-bicarbonate type categorized as hard water.

H.8.8.2 Floodplains

The 100-year flood plain elevation at Fort Yukon is 435 ft MSL. Two recorded flood levels have reached that level, in 1889 and 1949. Because the LRRS is situated on a low terrace above the Yukon River, flooding is generally not a problem; however, Fort Yukon has experienced floods. Floods resulting from spring runoff are usually aggravated by ice jams. They are characterized by a rapid rise in the water level and last from a few hours to several days. Summer rains have never produced a flood at Fort Yukon (Legare 1998).

H.8.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on

Fort Yukon LRRS. Attachment 7 contains lists of vascular plants (Table H-47), fish (Table H-48), mammals (Table H-49), and birds (Table H-50) known to occur or potentially occurring in the Fort Yukon area. ESA-listed species that may occur at or in the vicinity of the Fort Yukon site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.8.9.1 Ecoregion Classification

The Fort Yukon site is located in the Yukon-Old Crow Basin ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.8.9.2 Vegetation/Habitat

A general vegetation map of Fort Yukon LRRS was prepared in 1995 (611 ASG 1995f). Schick et al. (2004) made significant improvements in vegetation mapping at Fort Yukon LRRS using 2001 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2012, the Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Fort Yukon LRRS using the most recent imagery found on Google Earth and, if available, 2009-2010 SPOT-5 satellite imagery. The most recent vegetation or habitat mapping for Fort Yukon LRRS was prepared using WorldView-2 multi-spectral satellite imagery acquired in 2014, and then supplemented by field visits conducted in July 2015 (611 CES/CEIE 2016). A total of 15 habitat classes were identified (Table H-45 and Figure H-66) (descriptions of the habitat classes and their constituent land-cover types can be found in Appendix 3 of 611 CES/CEIE [2016]).

Table H-45. Fort Yukon LRRS Habitat Classes (2014)

Habitat Class	Area (acres)	Proportion
Lowland Open Mixed Forest	86.7	44.1%
Lowland Low Open Scrub	25.8	13.1%
Lowland Moist Graminoid-Herb Tundra	18.5	9.4%
Lowland Dry Graminoid-Herb Meadow	15.6	7.9%
Lowland Open Broadleaf Forest	12.2	6.2%
Artificial Barrens	10.8	5.5%
Lowland Tall Open Scrub	10.5	5.3%
Lowland Open Needleleaf Forest	4.8	2.4%
Artificially Vegetated/Partially Vegetated	3.8	2.0%
Lowland Non-patterned Wet Meadow	2.7	1.4%
Riverine Tall Open Scrub	2.0	1.0%
Lowland Tall Closed Scrub	1.6	0.8%
River	1.0	0.5%
Lowland Partially Vegetated	0.4	0.2%
Shallow Water	0.1	0.1%
Total	**196.5**	

Source: 611 CES/CEIE 2016.

Much of the vegetation on Fort Yukon LRRS was initially clear-cut, but the site now supports a variety of vegetation types (611 ASG 1996), including taiga, an open mixed-forest type generally consisting of white spruce and paper birch; shrubland, dominated by willows; and wetlands, occurring in sloughs and low areas. Mixed stands of alder and balsam poplar occur as a minor vegetation type. A wide variety of aquatic vegetation, such as duckweed, pondweed, sedge, and horsetail, occur in numerous lakes, ponds, and other surface water bodies around the site. Dominant tree species include stunted spruce, poplar, and birch. Other common species include polar grass, horsetail, fireweed, yarrow, wild rose, bedstraw, ragweed, marsh fleabane, fescue, dandelion, dogwood, willow, goldenrod, Alaska spring beauty, and stickweed (Schick et

al. 2004). Table H-47 provides a list of the vascular plant species observed or potentially occurring on the Fort Yukon site.

H.8.9.3 Wetlands

The current mapping of wetlands at the Fort Yukon LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 197-acre Fort Yukon site, 18 acres (or 9%) are considered wetlands per the NWI mapping (Table H-46 and Figure H-67). Freshwater forested/shrub wetlands make up the majority of the wetlands. Wetlands at Fort Yukon LRRS are strongly dominated by flat, well-drained ancient river levee deposits with few areas of wet seasonal flooding, and very few areas of persistent standing water. Dominant plant species in these areas include *Populus tremuloides* and *Picea glauca* with understory or dominant shrub stand species, such as *Shepherdia canadensis, Salix brachycarpa, S.bebbiana, S. arbusculoides, S. glauca, Arctostaphylos uva-ursi,* and *Festuca saximontana* (Schick et al. 2004). Table H-47 provides a list of the vascular plant species, including wetland species, observed or potentially occurring on the Fort Yukon site.

Table H-46. Fort Yukon LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	**Proportion**	**Area (acres)**	**Proportion**
Freshwater Forested/Shrub	12.3	6.3%	30.5	15.5%
Riverine	0	0	1.0	0.5%
Freshwater Emergent	5.3	2.7%	0.1	<0.1%
Wetlands Total	**17.6**	**9.0%**	**31.6**	**16.1%**
Upland	179.0	91%	165.0	83.9%
Site Total	**196.6**		**228.2**	

Notes: *See Figure H-67. †See Figure H-68.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

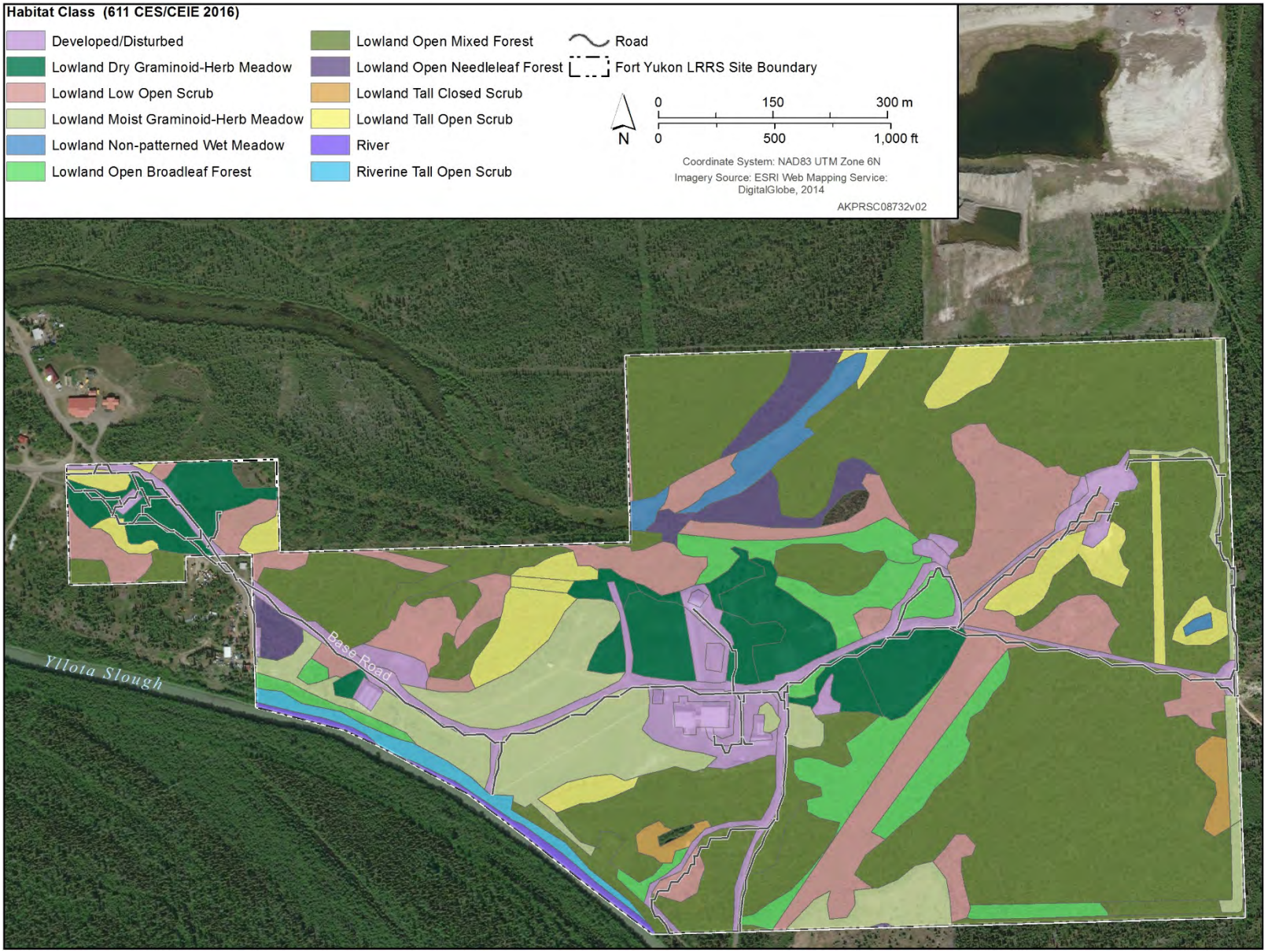

Figure H-66. Fort Yukon LRRS Habitat Classes (2014)

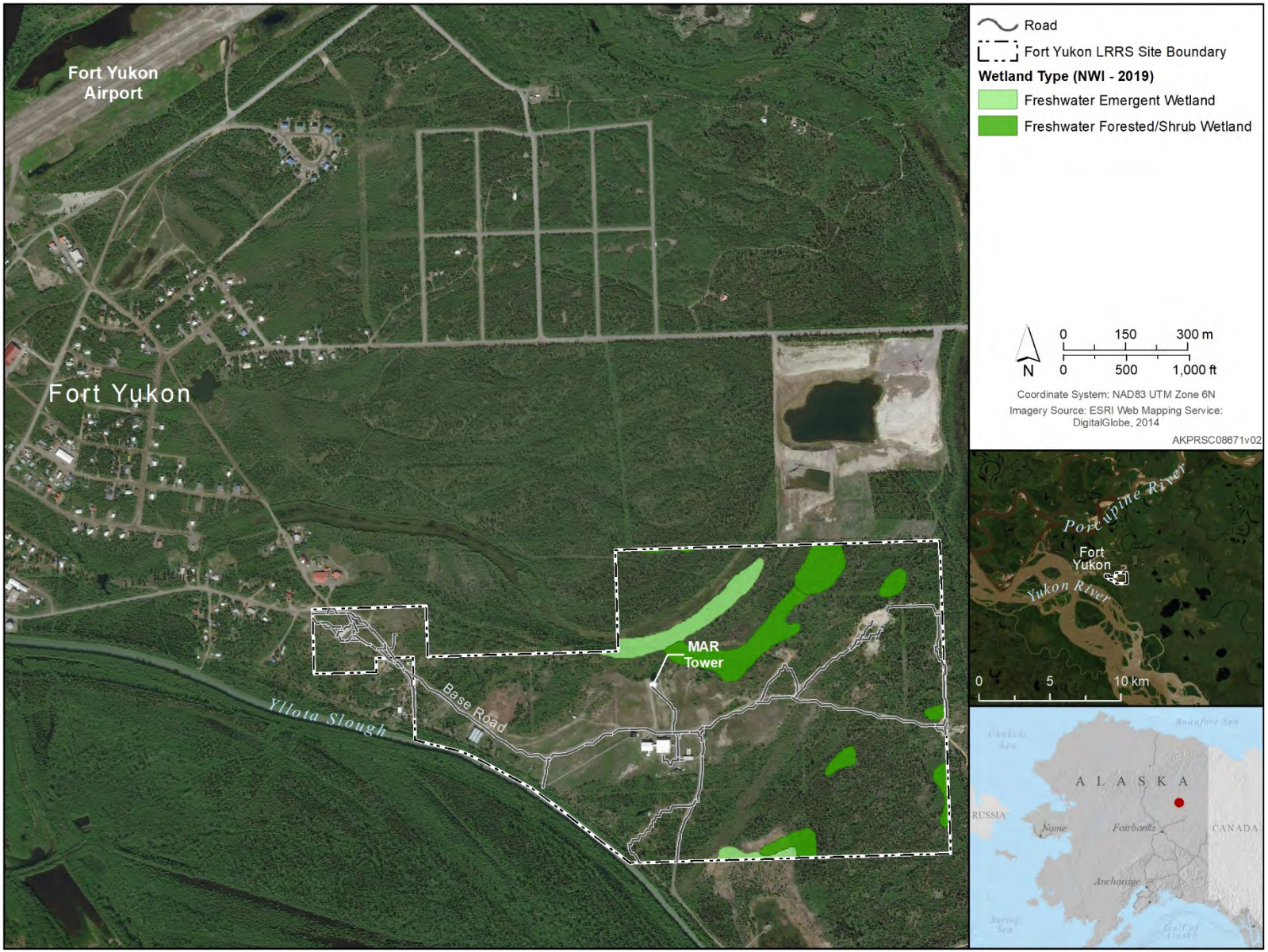

Figure H-67. Fort Yukon LRRS Wetlands (NWI 2019)

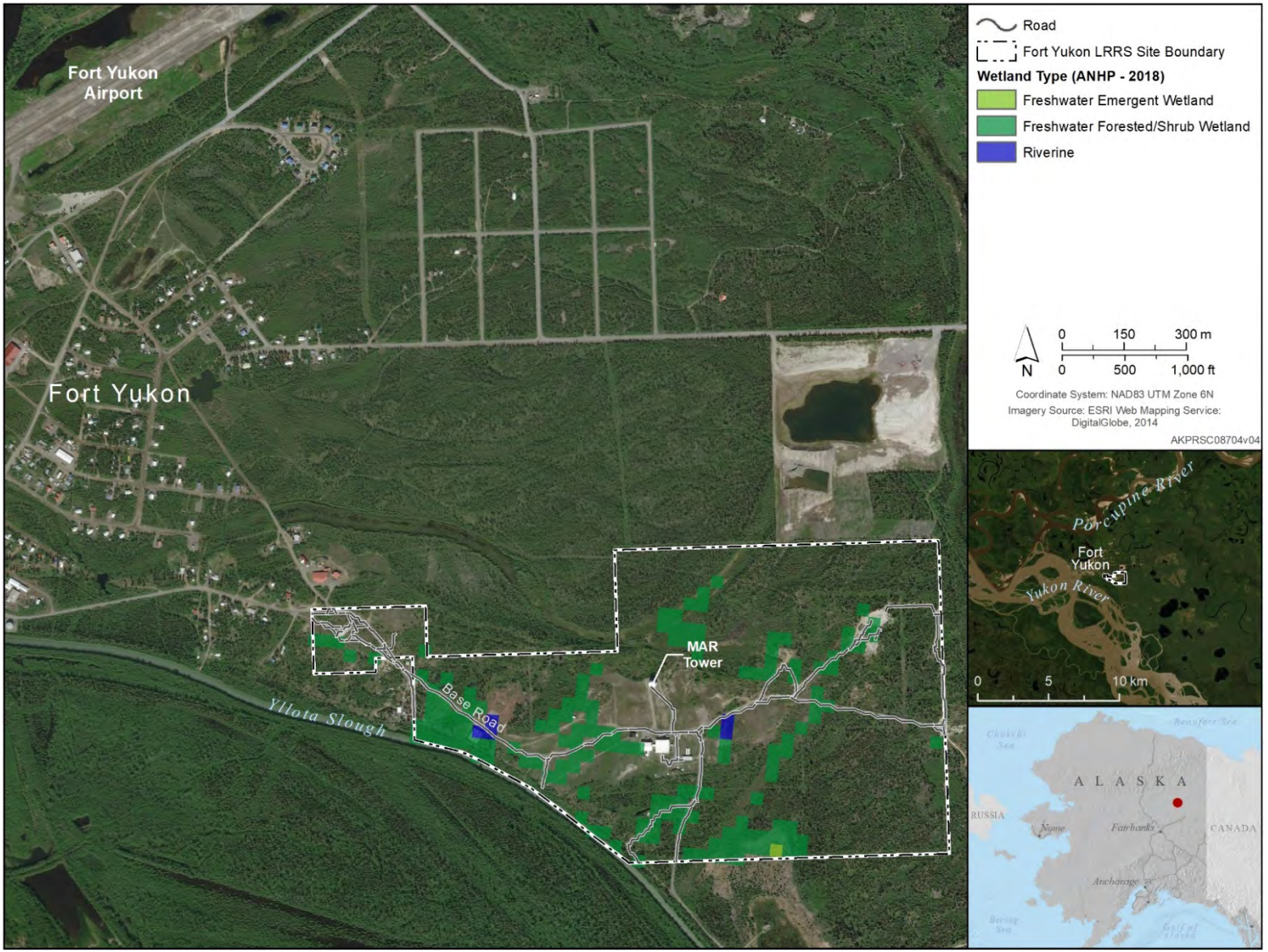

Figure H-68. Fort Yukon LRRS Wetlands (ANHP 2018)
(*Source*: Flagstad et al. 2018)

H.8.9.4 Fish and Wildlife

H.8.9.4.1 Fish

Although there are no streams within the LRRS, the adjacent Yukon River is extremely productive in terms of quantity and diversity of fish species. Eight fish species have been documented within the vicinity of the LRRS, including chinook, coho, and chum salmon; whitefish; northern pike; burbot; Arctic grayling; and inconnu/sheefish (Table H-48). The Yukon River and its tributaries are important spawning, rearing, and migration habitat for many of these species (Johnson and Blossom 2019c).

H.8.9.4.2 Mammals

A total of 25 mammals have been observed, or have the potential to occur, on or in the vicinity of the Fort Yukon LRRS (Table H-49). Common game and furbearer species include black and brown bears, caribou, moose, fox, beaver, river otter, muskrat, marten, American mink, lynx, and weasel (USFWS 1982). Red squirrel, snowshoe hare, Arctic ground squirrel, and western meadow jumping mice were observed during a 2004 site visit (611 CES 2007a).

H.8.9.4.3 Birds

Thirty four bird species have been observed at Fort Yukon LRRS including bald eagle, American kestrel, merlin, Wilson's snipe, olive-sided and alder flycatchers, orange-crowned and yellow warblers, and white-winged crossbills. Nesting was confirmed for sharp-tailed grouse at the LRRS (Table H-50) (611 CES 2007a).

Important Bird Areas (IBAs)

The Fort Yukon LRRS is located on the eastern edge of the Yukon Flats West IBA (Figure H-47) (Audubon Alaska 2014). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program.

H.8.9.5 ESA-listed Species

No ESA-listed species have been reported on or in the vicinity of the Fort Yukon LRRS.

H.8.10 Other Natural Resources Information

H.8.10.1 Subsistence

Subsistence gathering is an important component of the local culture. Fort Yukon residents display a high degree of involvement in the harvest, use, and sharing of fish and wildlife resources. Residents rely on such subsistence foods as salmon, whitefish, moose, bear, caribou, and waterfowl. Chum and chinook salmon and moose accounted for about 78% of the annual subsistence harvest in terms of edible pounds in 1987. Chum salmon compose a larger portion of the overall harvest at Fort Yukon than any other single species (Braund and Associates 2004).

Some activities, such as salmon fishing, generally occur within 10-20 miles of Fort Yukon. However, the overall community use area encompasses a 150-mile stretch of the Yukon River and tributary streams between the communities of Beaver and Circle, as well as the Alaska portion of the Porcupine River drainage and its tributaries (Braund and Associates 2004).

H.8.10.2 Outdoor Recreation

The LRRS is about 0.5 mile east of the village of Fort Yukon, has unfenced boundaries, and is open to local residents. The LRRS is accessible via a public gravel road that passes through the site and is used by the public to access hunting and gathering grounds to the south and east. Thus, the LRRS provides the local community with easy access to recreational and/or subsistence opportunities. Demands for natural resources

near the LRRS include hunting, fishing, and other outdoor recreational activities. Water sports, such as canoeing, kayaking, and river-rafting are also popular. Though subsistence and sport hunting occurs in the area, hunting at the LRRS is not an issue. BOS contract personnel stationed at Fort Yukon, temporary duty personnel during free time, and subsistence hunters from the neighboring area hunt the area, but little or no demand exists by DoD personnel to travel to the site for recreational purposes.

H.8.11 Mission and Other Impacts on Natural Resources

H.8.11.1 Land Use

Real property facilities the the Fort Yukon LRRS include the MAR tower, water pump house, water storage building, incinerator building, wastewater treatment facility, active landfill, and living quarters for support contractors (611 CES 2019). There is a support agreement with the NASA/University of Alaska, Fairbanks Geophysical Institute, who have a building on the LRRS.

ATTACHMENT 7: NATURAL RESOURCES OF THE FORT YUKON, MURPHY DOME, INDIAN MOUNTAIN, TATALINA, AND SPARREVOHN SITES

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
SHRUBS								
Sitka alder	*Alnus sinuata*	X	X	X	X	X	TA, SP	6, 7
Thinleaf alder	*Alnus tenuifolia*	X	X		X	X	All	2, 6, 7
Green alder	*Alnus crispa*	X	X	X	X	X	IM, MD, TA, SP	7
Saskatoon serviceberry	*Amelanchier alnifolia*	X	X					2
Bog-rosemary	*Andromeda polifolia*	X	X	X	X	X	IM, TA, SP	2, 6, 7
Red-fruit bearberry	*Arctostaphylos rubra*	X	X	X			FY, TA	2, 7
Bearberry (kinninnik)	*Arctostaphylos uva-ursi*	X	X	X			FY	2, 7
Alpine bearberry	*Arctostaphylos alpina*	X	X	X	X	X	FY, MD, SP	2, 4, 6, 7
Alaska sagebrush	*Artemisia alaskana*	X	X	X	X	X	MD, IM, SP	2, 7
Fringed sagebrush	*Artemisia frigida*	X	X			X	FY	2, 7
Shrub (resin) birch	*Betula glandulosa*	X	X			X	All	2, 6, 7
Kenai birch	*Betula kenaica*						IM	7
Dwarf Arctic birch	*Betula nana*	X	X	X	X	X	IM, MD, TA, SP	2, 5, 6, 7
Alaska paper birch	*Betula papyrifera* var. *humilis*	X	X	X	X	X	All	2, 5, 6, 7
Hybrid birch	*Betula* hybrids					X	SP	6
Alaska moss heather	*Cassiope stelleriana*					X	SP	6, 7
Four-angled cassiope	*Cassiope tetragona*	X	X	X	X	X	MD, IM, TA,SP	1, 2, 3, 7
Leatherleaf	*Chamaedaphne calyculata*	X	X	X	X	X	IM, TA	2, 5, 7
Marsh five-finger	*Comarum palustre*					X	SP	6
Bunchberry	*Cornus canadensis*	X	X	X	X	X	All	1, 2, 3, 7
Red-osier dogwood	*Cornus stolonifera*	X	X	X	X		FY, IM	2, 4, 5, 7
Dwarf dogwood	*Cornus suecica*					X	MD, TA, SP	6, 7
Diapensia	*Diapensia lapponica*	X	X	X	X	X	MD, IM, TA, SP	2, 3, 7
White mountain-avens	*Dryas integrifolia*					X	FY, SP	6, 7
Eight-petal mountain-avens	*Dryas octopetala*					X	MD, IM, TA, SP	6, 7
Silverberry	*Elaeagnus commutata*	X	X		X			2
Crowberry	*Empetrum nigrum*	X	X	X	X	X	All	2, 6, 7
Large-leaf avens	*Geum macrophyllum*					X	FY, TA, SP	6, 7
Ross' avens	*Geum rossii*						IM	7
Common juniper	*Juniperus communis*	X	X	X			IM	2, 5
American larch	*Larix laricina*		X	X	X	X	TA	2, 7
Narrowleaf labrador tea	*Ledum decumbens*	X	X	X	X	X	All	2, 5, 6, 7
Labrador tea	*Ledum groenlandicum*	X	X	X	X		FY, MD, IM, TA	2, 7
Twin-flower	*Linnaea borealis*	X	X	X	X	X	All	2, 6, 7
Alpine-azalea	*Loiseleuria procumbens*	X	X	X	X	X	All	2, 6, 7
Partridge foot	*Luetkea pectinata*					X	SP	2, 3, 6, 7
Sweet gale	*Myrica gale*	X	X	X	X	X		2
Tundra rose	*Pentaphylloides floribunda*					X	SP	6

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
Aleutian mountain heath	*Phyllodoce aleutica*					X		2
White spruce	*Picea glauca*	X	X	X	X	X	All	2, 5, 7
Black spruce	*Picea mariana*	X	X	X	X		All	2, 5, 7
Balsam poplar	*Populus balsamifera*	X	X	X	X	X	All	2, 5-7
Quaking aspen	*Populus tremuloides*	X	X	X	X		All	2, 5-7
Shrubby cinquefoil	*Potentilla fruiticosa*	X	X	X	X	X	FY, IM, SP	2, 3, 7
Potentilla	*Potentilla hyparctica*				X	X	TA, SP	1, 6
Potentilla	*Potentilla norvegia*					X	FY, MD, TA, SP	6, 7
Potentilla	*Potentilla uniflora*					X	SP	6, 7
Potentilla	*Potentilla villosa*						IM, TA	7
Lapland rosebay	*Rhododendron lapponicum*	X	X					2, 3
Skunk currant	*Ribes glandulosum*		X		X	X	SP	2, 6
Northern black currant	*Ribes hudsonianum*	X	X	X	X	X	FY, TA	2, 7
Swamp gooseberry	*Ribes lacustre*	X	X					2
Trailing black currant	*Ribes laxiflorum*						SP	7
Northern red currant	*Ribes triste*	X	X	X	X	X	IM, TA, SP	2, 6, 7
Currant	*Ribes* spp.	X	X	X	X	X		1, 4
Prickly wild rose	*Rosa acicularis*	X	X	X	X	X	All	2, 3, 6, 7
Nagoonberry	*Rubus arcticus*	X	X	X	X	X	IM, TA, SP	2, 5-7
Cloudberry	*Rubus chamaemorus*	X	X	X	X	X	MD, IM, TA, SP	2, 4, 5-7
American red raspberry	*Rubus idaeus* var. *strigosus*	X	X	X	X	X	MD, IM, TA	2, 5, 7
Trailing raspberry	*Rubus pedatus*					X	SP	6
Feltleaf willow	*Salix alaxensis*	X	X	X	X	X	All	2, 4, 6, 7
Littletree willow	*Salix arbusculoides*	X	X	X	X	X	FY, MD, TA, SP	2, 6, 7
Dwarf Arctic willow	*Salix arctica*		X		X	X	MD, IM, TA, SP	2, 4, 6, 7
Barclay willow	*Salix barclayi*				X	X	TA, SP	2, 4, 6, 7
Barratt willow	*Salix barrattiana*				X	X		2
Bebb's willow	*Salix bebbiana*	X	X	X	X	X	All	2, 6, 7
Silver willow	*Salix candida*	X	X					2
Chamisso's willow	*Salix chamissonis*						IM	7
Undergreen willow	*Salix commutata*			X		X	IM	1
Long-beaked willow	*Salix depressa*			X			IM	1, 5
Alaska bog willow	*Salix fuscescens*	X	X	X	X	X	SP	2, 6
Grayleaf (northern) willow	*Salix glauca*	X	X	X	X	X	FY, MD, IM, TA	2, 7
Halberd willow	*Salix hastata*	X	X	X	X	X		2
Sandbar willow	*Salix interior*	X	X				FY	2, 7
Pacific willow	*Salix lasiandra*	X	X	X	X	X		2
Park willow	*Salix monticola*	X	X					2
Barren-ground willow	*Salix niphoclada* = *S. brachycarpa niphoclada*	X	X		X	X	FY	2, 4, 7
Oval-leafed willow	*Salix ovalifolia*	X	X					2
Skeleton leaf willow	*Salix phlebophylla*	X	X	X	X	X	MD, IM, TA,SP	2, 6, 7
Diamondleaf willow	*Salix pulchra* = *S. planifolia pulchra*	X	X	X	X	X	MD, IM, TA, SP	1, 2, 4-7

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
Polar willow	*Salix polaris*				X	X	IM, SP	2, 6, 7
Tall blueberry willow	*Salix pseudomyrsinites = S. novaeangliae*	X	X			X	FY, SP	2, 6, 7
Netleaf willow	*Salix reticulata*	X	X	X	X	X	MD, IM, TA, SP	2, 3, 6, 7
Richardson willow	*Salix richardsonii = S. lanata richardsonii*	X	X	X	X	X	SP	2, 7
Least dwarf willow	*Salix rotundifolia*		X			X	MD, IM, TA, SP	2, 6, 7
Scouler willow	*Salix scouleriana*		X		X	X	MD, TA	2, 7
Setchell willow	*Salix setchelliana*				X			2
Buffaloberry	*Shepherdia canadensis*	X	X	X	X	X	FY, SP	2, 6, 7
	Sibbaldia procumbens					X	SP	6
Green mountain ash	*Sorbus scopulina*				X	X	TA, SP	2, 6, 7
Beauverd spirea	*Spiraea stevenii = S. beauverdiana*	X	X	X	X	X	MD, IM, TA, SP	2, 5-7
Trisetum	*Trisetum sibiricum*				X		TA	1
Trisetum	*Trisetum spicatum*				X		IM, TA, SP	1, 7
Bog cranberry	*Vaccinium oxycoccus = Oxycoccus microcarpus*	X	X	X	X	X	MD, IM, TA	2, 7
Alpine blueberry	*Vaccinium uliginosum*	X	X	X	X	X	All	2, 6, 7
Lowbush cranberry	*Vaccinium vitis-idaea*	X	X	X	X	X	All	2, 5-7
Highbush cranberry	*Viburnum edule*	X	X	X	X	X	IM, TA, SP	2, 5-7
HERBACEOUS								
Yarrow	*Achillea borealis*		X	X			FY, MD, TA	1, 3, 7
Yarrow	*Achillea lanulosa*	X					FY	1
Siberian yarrow	*Achillea sibrica*	X	X	X	X		All	1, 4, 7
Monkshood	*Aconitium delphinifolium*	X	X	X	X	X	All	1, 3, 6, 7
Baneberry	*Actaea rubra*		X		X	X		1, 4
Musk root	*Adoxa moschatellina*	X	X	X		X	SP	1, 4, 6
Bent grass	*Agrostis scabra*	X				X	MD, IM, TA, SP	1, 7
Wild chives	*Allium schoenoprasum*	X	X	X				1, 3
Meadow foxtail	*Alopecurus aequalis*						MD	7
Alpine Foxtail	*Alopecurus alpinus*						FY	7
Foxtail	*Alopecurus geniculatus*				X		TA	1
Round leaf orchis	*Amerorchis rotundifolia*	X	X	X	X			1, 3
Rock jasmine	*Androsace chamaejasme*					X	SP	1, 3, 6
Northern jasmine	*Androsace septentrinalis*	X	X		X	X		1, 4
Pasque flower	*Anemone drummondii*	X	X	X				1, 4
Cut leaf anemone	*Anemone multifida*	X	X					1, 3
Narcissus-flowered anemone	*Anemone narcissiflora*	X	X	X	X	X	All	1, 3, 6, 7
Northern anemone	*Anemone parviflora*	X	X	X	X	X		1, 3, 5
Yellow anemone	*Anemone richardsonii*	X	X	X	X	X	TA, SP	1, 3, 6, 7
Wild celery	*Angelica lucida*		X		X	X		1, 4
Pink pussytoes	*Antennaria alborosea*	X	X					1, 4
Frie's pussytoes	*Antennaria friesiana*	X	X	X	X	X	MD, IM, TA,SP	1, 4, 6, 7
Cats paws	*Antennaria monocephala*					X	IM, SP	1, 4, 6, 7
Tall pussytoes	*Antennaria pulcherrima*		X	X				1, 4

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
Rosy pussytoes	*Antennaria rosea*						IM	7
Mayweed	*Anthemis cotula*		X					1, 4
Small-flowered columbine	*Aquilega brevistyla*	X	X					1, 4
Hairy rockcress	*Arabis divaricarpa*		X	X				1, 4
Holboell's rockcress	*Arabis holboelli*		X					1, 4
	Arabis kamchatica					X	SP	6
Lyre-leaf rockcress	*Arabis lyrata, Arabis hirsuta*		X					1, 4
Polar grass	*Arctagrostis latifolia*					X	MD, IM, TA, SP	6, 7
Pendent grass	*Arctophila fulva*	X	X	X	X	X	TA, SP	1, 4, 6, 7
Tall sandwort	*Arenaria cappilaris*	X	X					1, 4
Alpine arnica	*Arnica alpina*	X	X	X	X	X	TA, SP	1, 3, 4
Tall arnica	*Arnica attenuata*	X	X	X				1, 4
Frigid arnica	*Arnica frigida*	X	X	X	X	X	MD, IM, TA, SP	1, 3, 6, 7
Lessing's arnica	*Arnica lessingii*	X	X	X	X	X	IM, TA, SP	1, 4, 7
Arnica	*Arnica* spp.			X			IM	1, 5
Arctic wormwood	*Artemisia arctica*				X	X	MD, IM, TA, SP	1, 6, 7
Arctic wormwood	*Artemisa comata*	X	X	X	X	X		1, 4
Northern wormwood	*Artemisa borealis*	X	X	X	X	X		1, 4
Canada wormwood	*Artemisa canadensis*	X	X					1, 4
Purple wormwood	*Artemisa globularia*				X	X	SP	1, 3, 6
	Artemisia glomerata					X	SP	6, 7
Common wormwood	*Artemisa tilesii*	X	X	X	X	X	MD, IM, TA,SP	1, 4, 6, 7
Goatsbeard	*Aruncus sylvester*					X		1, 3
Rush aster	*Aster junciformis*		X				FY	1, 4, 7
Siberian aster	*Aster sibiricus*	X	X	X	X	X	FY, SP	1, 3, 6, 7
Northern aster	*Aster subspicatus*							1, 4
Alpine milkvetch	*Astragalus alpinus*	X	X	X	X	X	MD	1, 3, 4, 7
American milkvetch	*Astragalus americanus*		X					1, 3, 4
Hairy alpine milkvetch	*Astragalus umbellatus*		X		X	X	SP	1, 3, 6
Lady fern	*Athyrium filix-femina*				X	X	TA, SP	1, 4, 6, 7
Wintercress	*Barbarea orthoceras*		X			X	SP	1, 4, 6
Beckmania	*Beckmannia erucaeformis*	X	X	X	X	X	All	1, 4, 7
Alpine meadow bistort	*Polygonum viviparum*	X	X	X	X	X	SP	1, 4, 6
Broomrape	*Boschniakia rossica*	X	X	X	X	X	SP	1, 3, 6, 7
Moonwort	*Botrychium boreale*	X	X	X		X		1, 4
Moonwort	*Botrychium lunaria*	X	X	X	X	X		1, 4
Alaska boykinia	*Boykinia richardsonii*	X	X	X	X			1, 3
Fringed brome	*Bromus ciliatus*						FY	7
Canola	*Brassica* spp.	X						1, 4
Thoroughwax	*Bupleurum triradiatum*					X	TA, SP	6, 7
Bluejoint grass	*Calamagrostis canadensis*	X	X	X	X	X	All	1, 4, 6, 7
Slim-stem reed grass	*Calamagrostis inexpansa*						FY	7
Lapland reed grass	*Calamagrostis lapponica*					X	MD, SP	6, 7
Reed bent grass	*Calamagrostis* spp.	X	X	X	X	X	All	1, 4

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
Wild calla lily	*Calla palustris*	X	X	X	X	X		1, 3
Marsh marigold	*Caltha palustris*	X	X	X	X	X		1, 3
Fairy slipper	*Calypso bulbosa*			X				1, 3
Bellflower	*Campanula aurita*	X	X					1, 4
Mountain harbell (bluebell)	*Campanula lasiocarpa*	X	X	X	X	X	All	1, 3, 6, 7
Bluebells of Scotland	*Campanula rotundifolia*		X					1, 3
One-flowered harebell	*Campanula uniflora*					X	SP	6
Alpine bittercress	*Cardamine bellidifolia*					X	SP	6
Cuckoo flower	*Cardamine pratensis*	X	X	X	X	X	SP	1, 4, 6
Bittercress	*Cardamine purpurea*	X	X	X	X	X	All	1, 3
Bittercress	*Cardamine umbellata*					X	SP	6
Water sedge	*Carex aquatilis*	X	X	X	X	X	FY, IM, SP	1, 4, 6, 7
Sedge	*Carex atheroides*	X	X	X				1, 4
Sedge	*Carex atrofusca*						FY	7
Sedge	*Carex bigelowii*	X	X	X	X	X	MD, IM, TA, SP	1, 4, 6, 7
Sedge	*Carex brunnescens*					X	SP	6
Sedge	*Carex canescens*					X	SP	6
Sedge	*Carex capillaris*					X	SP	6
Sedge	*Carex lachenalii*					X	SP	6
Sedge	*Carex loliacea*					X	SP	6
Sedge	*Carex macrochaeta*						SP	7
Sedge	*Carex media*					X	SP	6
Sedge	*Carex membranacea*						IM	7
Sedge	*Carex microchaeta*						TA	7
Sedge	*Carex podocarpa*					X	SP	6
Sedge	*Carex scirpoidea*					X	SP	6
Sedge	*Carex spectabilis*						SP	7
Sedge	*Carex utriculata*						FY, TA	7
Sedge	*Carex* spp.	X	X	X	X	X	All	1, 5, 7
Elegant paintbrush	*Castilleja elganus*	X	X		X	X	IM, TA, SP	1, 3, 6, 7
Paintbrush	*Castilleja raupii*				X		TA	1
Paintbrush	*Castilleja* spp.	X	X	X	X	X	FY, SP	1, 3, 7
Bering chickweed	*Cerastium beeringianum*	X	X	X	X	X	IM, TA, SP	1, 4, 6, 7
Tall fireweed	*Chamerion angustifolium* = *Epilobium angustifolium*	X	X	X	X	X	All	1, 3-7
Dwarf fireweed	*Chamerion latifolium* = *Epilobium latifolium*	X	X	X	X	X	IM, TA, SP	1, 3, 6, 7
Pigweed	*Chenopodium album*						FY, IM	7
Strawberry blight	*Chenopodium capitatum*	X	X	X	X	X	FY, TA, SP	1, 3, 7
Chrysanthemum	*Chrysanthemum intregrifolium*	X	X					1, 3
Northern water carpet	*Chrysosplenium tetrandrum*					X	SP	6
Wright's golden-saxifrage	*Chrysosplenium wrightii*						TA, SP	7
Mackenzie water hemlock	*Cicuta virosa*	X	X	X	X	X	FY	1, 3, 7
Alaska spring beauty	*Claytonia sarmentosa*		X	X	X	X	TA, SP	1, 3, 6
Jakutsk snow-parsley	*Cnidium cnidiifolium*						FY	7
Coral root	*Corallorrhiza trifida*	X	X	X	X	X		1, 3
Golden corydalis	*Corydalis aurea*		X		X	X	TA, SP	1, 3
Few-flowered corydalis	*Corydalis pauciflora*					X	SP	6

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
Cushion hawk's beard	*Crepis nana*	X	X		X			1, 3, 4
Parsley fern	*Cryptogramma sitchensis*					X	SP	6
Pink lady slipper	*Cypripedium guttatum*		X		X	X	SP	1, 3, 6
Northern lady's slipper	*Cypripedium passerinum*	X	X	X	X		FY	1, 3, 7
Fragile fern	*Cystopteris fragilis*					X	SP	6
Arctic larkspur	*Delphinium glaucum*	X	X	X	X	X	IM	1, 3, 5
Diapensia	*Diapensia lapponica*					X	SP	6
Frigid shooting star	*Dodecatheon frigidum*	X	X	X	X	X		1, 3
Douglasia	*Dougladia gormanii*		X					1, 3
Northern rockcress	*Draba borealis*					X	SP	6
Smoothing Whitlow-grass	*Draba hirta*	X	X	X				1, 3
	Draba lonchocarpa					X	SP	6
	Draba nivalis					X	SP	6
Anadyr Whitlow-grass	*Draba stenopetala*					X	SP	6
	Draba spp.						SP	7
Long-leaved sundew	*Drosera angelica*		X		X	X		1, 3
American dragonhead	*Dracocephalum parviflora*						FY	7
Yellow dryas	*Dryas drummondii*	X	X		X			1, 3
Arctic (mountain) avens	*Dryas integrifolia*	X	X	X	X	X	IM, SP	1, 3, 5
Eight-petaled dryas	*Dryas octopetala*		X		X	X		1, 3
Spreading wood fern	*Dryopteris expansa = D. dilitata*					X	TA, SP	6, 7
Fragrant wood fern	*Dryopteris fragrans*						MD, TA	7
Slender Wheatgrass	*Elymus trachycaulus*						FY, SP	7
Hornemann's willowherb	*Epilobium hornemannii*					X	TA, SP	6, 7
Marsh willowherb	*Epilobium palustre*						FY, TA	7
Field horsetail	*Equisetum arvense*					X	All	6, 7
Swamp horsetail	*Equisetum fluviatile*					X	FY, TA, SP	6, 7
Meadow horsetail	*Equisetum pratense*						IM, TA	7
Dwarf scouring-rush	*Equisetum scirpoides*						FY	7
Woodland horsetail	*Equisetum sylvaticum*					X	IM, TA, SP	6, 7
Variegated scouring-rush	*Equisetum variegatum*						TA	7
Horsetail	*Equisetum* spp.	X	X	X	X	X	All	1, 5
Erigeron	*Erigeron acris*					X	MD, IM, TA, SP	1, 7
Alaskan fleabane	*Erigeron caespitosus*	X	X					1, 3
Cutleaf fleabane	*Erigeron compositus*	X	X					1, 3
Fringed fleabane	*Erigeron glabellus*	X	X	X			FY	1, 3, 7
Fleabane	*Erigeron humilis*	X	X					1, 3
Arctic fleabane	*Erigeron hyperboreus*	X	X	X				1, 3
Tall cottongrass	*Eriophorum angustifolium*					X	All	6, 7
Russett-bristle cottongrass	*Eriophorum russeolum*						MD, IM, SP	7
White (Arctic) cottongrass	*Eriophorum scheuchzeri*	X	X	X	X	X	All	1, 3, 5-7
Tussock cottongrass	*Eriophorum vaginatum*					X	MD, IM, SP	6, 7
Worm-seed wallflower	*Erysimum cheiranthoides*						FY	7
Arctic forget-me-not	*Eritichum aretioides*	X	X	X	X			1, 3
Rough fescue	*Festuca altaica*					X	MD, SP	6, 7
Short-leaf fescue	*Festuca brachyphylla*					X	MD, SP	6, 7
Red fescue	*Festuca rubra*					X	FY, SP	6, 7

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
Rocky Mountain fescue	*Festuca saximontana*						FY	7
Fescue grass	*Festuca* spp.	X	X	X	X	X	IM	1, 4, 5
Chocolate lily	*Fritillaria camschatcensis*					X	SP	6
Northern bedstraw	*Galium boreale*	X	X	X	X	X	FY, IM, TA, SP	1, 3, 6, 7
Sweet-scented bedstraw	*Galium triflorum*					X	SP	6, 7
Whitish gentian	*Gentiana algida*		X		X	X		1, 3
Glaucous gentian	*Gentiana glauca*	X	X	X	X	X	SP	1, 3, 6, 7
Four-part dwarf gentian	*Gentianella propinqua* = *Gentiana propinqua*						FY	7
False toadflax	*Geocaulon lividum*						FY, IM, TA, SP	7
Bicknell geranium	*Geranium bicknellii*		X					1. 4
Wild geranium	*Geranium erianthum*				X	X	SP	1, 3, 6, 7
Glacier avens	*Geum glaciale*	X		X				1, 3
Ross avens	*Geum rossii*		X		X	X	SP	1,3, 6
Fowl manna grass	*Glyceria striata*						FY	7
Oak fern	*Gymnocarpium dryopteris*					X	TA, SP	6, 7
Alpine sweet-vetch	*Hedysarum alpinum*						FY	7
Boreal sweet-vetch	*Hedysarum mackenzii*						FY	7
Cow parsnip	*Heracleum lanatum*	X	X	X	X	X	All	1, 3, 5-7
Alpine holy grass	*Hierochloe alpina*					X	MD, IM, TA, SP	6, 7
Common mare's tail	*Hippuris vulgaris*						FY	7
Squirreltail (foxtail) grass	*Hordeum jubatum*	X				X	All	1, 6, 7
Fir clubmoss	*Huperzia haleakalae*					X	SP	6
Touch-me-not	*Impatiens noli-tangere*				X	X		1, 3
Wild iris	*Iris setosa*		X		X	X		1, 3, 4
Arctic rush	*Juncus arcticus*	X	X				FY	1, 4, 7
Chestnut rush	*Juncus castaneus*					X	IM, SP	6, 7
Drummond's rush	*Juncus drummondii*						SP	7
	Kobresia myosuroides					X	SP	6
Glaucous weaselsnout	*Lagotis glauca*						IM	7
Blue bur	*Lappula myosotis*		X				FY	7
Vetchling	*Lathyrus palustris*				X			1, 4
Common duckweed	*Lemna minor*						FY	7
	Lepidium densiflorum					X	SP	6
Bladder pod	*Lesquerella arctica*	X	X					1, 4
Lyme (beach) grass	*Leymus mollis*					X	SP	6
Wild lovage	*Ligusticum mutellinoides*						TA	7
Butter and eggs	*Linaria vulgaris*		X					1, 4
Alp lily	*Lloydia serotina*	X	X	X	X	X	SP	1, 3, 6
	Lomatogonium rotatum						FY	7
Alaska spirea	*Luetkea pectinata*					X	SP	1, 3, 7
Arctic lupine	*Lupinus arcticus*	X	X	X	X		MD	1, 4, 7
Nootka lupine	*Lupinus nootkatensis*				X			1, 3
Arctic wood-rush	*Luzula arctica*						IM	7
Curved wood-rush	*Luzula arcuata*					X	IM, TA, SP	6, 7
Northern wood-rush	*Luzula confusa*					X	IM, TA, SP	6, 7

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
	Luzula kjellmaniana					X	SP	6
Common wood-rush	*Luzula multiflora*					X	MD, IM, TA, SP	6, 7
Small-flower wood-rush	*Luzula parviflora*					X	MD, IM, SP	6, 7
	Luzula rufescens					X	SP	6
	Luzula spicata					X	SP	6
	Luzula tundricola						IM, SP	7
Wahlenberg's rood-rush	*Luzula wahlenbergii*						IM, SP	7
Alpine clubmoss	*Lycopodium alpinum*	X	X	X	X	X	MD, SP	1, 4, 6, 7
Stiff clubmoss	*Lycopodium annotinum*					X	MD, IM, TA, SP	6, 7
Common clubmoss	*Lycopodium clavatum*						MD, SP	7
Creeping clubmoss	*Lycopodium complanatum*						MD, TA	7
Fir clubmoss	*Lycopodium selago*						MD, IM, TA, SP	7
Pineapple weed	*Matricaria matricarioides*						IM, TA, SP	7
White sweetclover	*Melilotus albus*						FY	7
Bogbean (buckbean)	*Menyanthes trifoliata*	X	X	X	X	X	IM	1, 4, 7
Bluebells	*Mertensia eastwoodae*					X	SP	6
Chiming bells	*Mertensia paniculata*	X	X	X	X	X	FY, TA, SP	1, 3, 7
Wild snapdragon	*Mimulus guttatus*		X		X	X		1, 3
Arctic sandwort	*Minuartia arctica*		X	X	X	X	IM, TA, SP	1, 4, 5-7
	Minuartia macrocarpa					X	MD, IM, TA, SP	6, 7
Grove sandwort	*Moehringia lateriflora*					X	SP	6
Shy maiden	*Moneses uniflora*	X	X	X	X	X	IM, TA	1, 3, 7
Alpine forget-me-not	*Myosotis alpestris*		X	X	X	X	SP	1, 3, 6
Yellow pond lily	*Nuphar polysepalum*	X	X	X	X	X		1, 4
Dwarf water lily	*Nymphaea tetragona*		X		X	X		1, 3
Sidebells	*Orthilia secunda = Pyrola secunda*						FY, IM, TA, SP	7
Mountain sorrel	*Oxyria digyna*					X	SP	6, 7
Oxytrope	*Oxytropis bryophila*					X	SP	6
Northern yellow oxytrope	*Oxytropis campetris*						IM, TA	7
Maydell's oxytrope	*Oxytropis maydelliana*	X	X	X	X	X	SP	1, 3, 6
Blackish oxytrope	*Oxytropis nigrescens*	X	X	X	X	X	IM, TA, SP	1, 3, 7
Scamman's oxytrope	*Oxytropis scammaniana*					X	SP	6
Boreal oxytrope	*Oxytropis viscida*	X					FY	1, 7
	Packera cymbalaria = Senecio resedifolius						IM, TA	7
Alaska poppy	*Papaver alaskanum*				X	X	TA	1, 3
Arctic poppy	*Papaver lapponicum*	X		X	X		IM, TA	1, 3, 5
Macoun's poppy	*Papaver macounii*				X		IM, TA	1, 7
Grass of Parnassus	*Parnassia kotzebuei*					X	FY, SP	6, 7
Grass of Parnassus	*Parnassia palustris*	X	X	X	X	X	FY, IM, SP	1, 3, 4, 6, 7
Parry's wallflower	*Parrya nudicaulis*					X	SP	6
Capitate lousewort	*Pedicularis capitata*		X		X	X	MD, SP	1, 3, 6, 7
Wooley lousewort	*Pedicularis kanei*					X	MD, IM, TA, SP	6, 7
	Pedicularis labradorica					X	MD, SP	6, 7

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
	Pedicularis langsdorffii					X	IM, TA, SP	6, 7
	Pedicularis parviflora						MD	7
Oeder's lousewort	*Pedicularis oederi*	X	X	X	X	X	IM, SP	1, 3, 5, 6
Fernweed	*Pedicularis sudetica*	X	X	X	X	X	All	1, 3, 5, 7
Bumblebee flower	*Pedicularis verticillata*	X	X	X	X	X	IM	1, 3, 5
Yukon beardtongue	*Pentstemon gormanii*	X		X			IM	1, 3, 5
Arctic coltsfoot	*Petasites frigidus*					X	MD, IM, TA, SP	6, 7
Coltsfoot	*Petasites hyperboreus*						MD, IM	7
Arrowleaf coltsfoot	*Petasites sagittatus*	X	X				FY	1, 4, 7
Siberian phlox	*Phlox sibrica*	X		X	X	X		1, 3
Plantain	*Plantago major*					X	FY, IM, TA, SP	6, 7
Butterwort	*Pinguicila vulgaris*		X			X		1, 3, 4
Northern green orchid	*Platanthera hyperborea*						FY	7
Small northern bog orchid	*Platanthera obtusata*	X	X	X	X	X		1, 3
Alpine blue grass	*Poa alpina*		X		X	X	IM, TA	1, 4, 7
Arctic blue grass	*Poa arctica*					X	TA, SP	6, 7
Blue grass	*Poa brachyanthera*				X	X	TA, SP	1
Canadian blue grass	*Poa compressa*						FY	7
White blue grass	*Poa glauca*						MD, SP	7
Blue grass	*Poa lanata*						MD	7
Blue grass	*Poa malacantha*					X	SP	6
Blue grass	*Poa pratensis*	X	X	X	X	X	All	1, 5, 6
Blue grass	*Poa pseudoabbreviata*					X	SP	6
Blue grass	*Poa* spp.	X	X	X	X	X	All	1, 4, 5, 7
	Podistera macounii					X	SP	6
Tall Jacob's ladder	*Polemonium acutiflorum*	X	X	X	X	X	MD, IM, TA, SP	1, 3, 6, 7
Jacob's ladder	*Polemonium pulcherrimum*	X	X	X				1, 3, 4
	Polygonum alaskanum						MD, IM, TA	7
Pink bistort	*Polygonum bistorta*	X	X	X	X	X	MD, IM, TA, SP	1, 3, 6, 7
	Polygonum lapathifolium						FY	7
Alpine meadow bistort	*Polygonum vivparum*	X	X	X	X	X	MD, IM, TA, SP	1, 4, 6, 7
Silverweed	*Potentilla anserina*	X					FY	1
Two-flowered cinquefoil	*Potentilla biflora*	X	X					1, 3
Silverweed	*Potentilla egedii*	X	X		X			1, 3
Marsh fivefinger	*Potentilla palustris*	X	X	X	X	X	FY, IM, TA	1, 3, 5, 7
One-flowered cinquefoil	*Potentilla uniflora*		X		X	X	SP	1, 3
Wedge-leafed primrose	*Primula cuneifolia*					X	SP	1, 3, 6
Chukchi primrose	*Primula tschuktschorum*						IM, TA	7
Pasqueflower	*Pulsatilla patens*	X	X	X			FY	1, 3, 7
Pink pyrola	*Pyrola asarifolia*	X	X	X	X	X	FY, SP	1, 3, 7
Large-flowered wintergreen	*Pyrola grandiflora*	X	X	X	X	X	SP	1, 3, 6, 7
Pyrola	*Pyrola* spp.						MD	7
Buttercup	*Ranunculus cymbalaria*	X					FY	1, 3
Mountain buttercup	*Ranunculus eschscholtzii*					X	IM, TA, SP	6, 7

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
Lesser yellow water buttercup	*Ranunculus gmelinii*						IM	7
Far northern buttercup	*Ranunculus hyperboreus*					X	SP	6
Lapland buttercup	*Ranunculus lapponicus*						FY	7
Snow buttercup	*Ranunculus nivalis*					X	SP	6
Pygmy buttercup	*Ranunculus pygmaeus*					X	SP	6
Buttercup	*Ranunculus* spp.	X	X	X	X	X		1, 4
Roseroot	*Rhodiola integrifolia* = *Sedum rosea*	X	X	X	X	X	TA, SP	1, 3, 6
Hoary yellowcress	*Rorippa barbareaefolia*					X	SP	6
Bog yellowcress	*Rorippa hispida*				X		FY, IM, TA	1, 7
Yellowcress	*Rorippa* spp.						MD	7
	Rumex acetosa					X	SP	6
Arctic dock	*Rumex arcticus*	X	X	X	X	X	MD, IM, SP	1, 4, 6, 7
Canadian burnet	*Sanguisorba canadensis* = *S. stipulata*					X	SP	1, 7
European great burnet	*Sanguisorba officinalis*	X	X	X	X	X	FY, SP	1, 6, 7
Narrow-leaf saussurea	*Sausserea angustifolia*		X				MD	1, 3, 7
Yellow-spotted saxifrage	*Saxifraga bronchialis*		X	X		X	IM, TA, SP	1, 3, 6, 7
Bublet (nodding) saxifrage	*Saxifraga cernua*		X			X		1, 3
Whiplash saxifrage	*Saxifraga flagellaris*	X	X		X	X		1, 3
Rusty saxifrage	*Saxifraga hieracifolia*		X		X	X	IM, TA, SP	1, 3, 7
Yellow marsh saxifrage	*Saxifraga hirculus*	X	X	X	X	X		1, 3, 4
Red stemmed saxifrage	*Saxifraga lyalii*	X				X		1, 3
Brook saxifrage	*Saxifraga nelsoniana* = *S. punctata*	X				X	MD, IM, TA, SP	1, 3, 6, 7
Snow saxifrage	*Saxifraga nivalis*						IM	7
Purple mountain saxifrage	*Saxifraga oppositifolia*		X		X	X	TA	1, 3
	Saxifraga reflexa					X	IM, TA, SP	6, 7
Alpine brook saxifrage	*Saxifraga rivularis*					X	IM, SP	6, 7
	Saxifraga serpyllifolia					X	SP	6
Spiked saxifrage	*Saxifraga spicata*	X	X	X	X	X		1, 3
Prickly saxifrage	*Saxifraga tricuspidata*						MD	7
Hooded skullcap	*Scutellaria galericulata*						FY	7
Marsh fleawort	*Senecio congestus*	X	X	X	X	X	FY	1, 3, 7
Black-tipped groundsel	*Senecio lugens*	X	X	X	X	X		1, 3
	Senecio ogotorukensis					X	SP	6
	Senecio yukonensis					X	SP	6
Moss campion	*Silene acaulis*	X	X	X	X	X	IM, SP	1, 3, 6, 7
Bladder campion	*Silene uralensis* = *Melandrium apetalum*	X	X	X	X	X	IM, TA, SP	1, 4, 6, 7
Rocky Mountain goldenrod	*Solidago multiradiata*	X	X	X	X	X	SP	1, 3, 6
Mt. Albert goldenrod	*Solidago simplex*						FY	7
Bur-reed	*Sparganium angustifolium*	X	X	X	X	X		1, 4
Ladies' tresses	*Spiranthes romanzoffiana*		X	X	X	X		1, 3
	Stellaria borealis					X	SP	6
	Stellaria calycantha					X	SP	6
	Stellaria longipes					X	SP	6
Twisted stalk	*Streptopus amplexifolius*					X	TA, SP	6, 7
Dandelion	*Taraxacum* spp.	X	X	X	X	X	All	1, 3, 7

Table H-47. Vascular Plant Species Observed or Potentially Occurring on the Fort Yukon (FY), Murphy Dome (MD), Indian Mountain (IM), Tatalina (TA), and Sparrevohn (SP) Sites

Common Name	Scientific Name	Site					Observed	Source
		FY	MD	IM	TA	SP		
	Taraxacum kamtschaticum					X	SP	6
Alpine meadow rue	*Thalictrum alpinum*					X	SP	6
Meadow rue	*Thalictrum sparsiflorum*					X	IM, TA, SP	1, 6, 7
	Thelyperis phegopteris					X	SP	6, 7
False asphodel	*Tofieldia coccinea*					X	MD, TA, SP	6, 7
	Trisetum spicatum					X	SP	6
Star flower	*Trientalis europaea*		X		X	X	FY, IM, TA, SP	1, 3, 6, 7
Star clover	*Trifolium repens*						TA	7
Arrow grass	*Triglochin maritimum*	X	X				FY	1, 4, 7
Bladderwort	*Utricularia intermedia*	X	X	X				1, 4
Capitate valerian	*Valeriana capitata*	X	X	X	X	X	MD, IM, TA, SP	1, 3, 6, 7
White false hellebore	*Veratrum album*						IM	7
False hellebore	*Veratrum escholtzii*					X		1, 3
American false hellebore	*Veratrum viride*					X	SP	6, 7
American brook lime	*Veronica americana*		X			X		1, 4
Purple-white tufted vetch	*Vicia cracca*						TA	7
Yellow (two-flowered) violet	*Viola biflora*		X		X	X	TA, SP	1, 3, 6, 7
Marsh violet	*Viola epipsila*					X	SP	6
Alaska violet	*Viola langsdorffii*					X	SP	1, 3, 6
Violet	*Viola* spp.						IM, TA, SP	7
Arctic flower	*Whilhelmsia physodes*						IM	7
Rusty woodsia	*Woodsia ilvensis*					X	TA, SP	6, 7
Death camass	*Zygadenus elegans*	X	X	X	X		FY	1, 3, 7

Sources:
1. Hulten 1968.
2. Viereck and Little 1972.
3. White 1974.
4. Pratt 1991.
5. Jacobs Engineering Group, Inc. 1995.
6. Parker 2000.
7. ABR Inc. (Boisvert and Frost) during 2004 site visits.

611 ASG 1995f

Table H-48. Fish Species Potentially Occurring on or near the Fort Yukon, Murphy Dome, Indian Mountain, Tatalina, and Sparrevohn Sites

Common Name	Scientific Name	Fort Yukon	Murphy Dome	Indian Mountain	Tatalina	Sparrevohn
Alaska blackfish	*Dallia pectoralis*				X	X
Arctic char	*Salvelinus alpinus*				X	X
Arctic grayling	*Thymallus arcticus*	X	X	X	X	X
Arctic lamprey	*Lethenteron camtschaticum*			X		
Burbot	*Lota lota*	X	X	X	X	X
Chinook salmon	*Oncorhynchus tshaytscha*	X		X	X	X
Chum salmon	*Oncorhynchus keta*	X		X	X	X
Coho salmon	*Oncorhynchus kisutch*	X		X	X	X
Dolly varden	*Salvelinus malma*				X	X
Longnose sucker	*Catostomus catostomus*		X	X	X	X
Northern pike	*Esox lucius*	X	X	X	X	X
Pink salmon	*Oncorhynchus gorbuscha*				X	
Sheefish	*Stenodus leucichthys*	X	X	X	X	X
Slimy sculpin	*Cottus cognatus*			X		
Sockeye salmon	*Oncorhynchus nerka*				X	X
Whitefish	*Coregonus* sp.	X	X	X	X	X

Sources: Gutleber undated (b, c, d); Boyer undated (a, b); Morrow 1980; 611 ASG 1995f; Johnson and Blossom 2019c, e.

Table H-49. Mammal Species Observed or Potentially Occurring on or near the Fort Yukon, Murphy Dome, Indian Mountain, Tatalina, and Sparrevohn Sites

Common Name	Scientific Name	Fort Yukon	Murphy Dome	Indian Mountain	Tatalina	Sparrevohn
Alaskan hare	*Lepus othus*	X			X	
American beaver	*Castor canadensis*	X		X	X	X
American marten	*Martes americana*	X	X	X	X	X
American mink	*Neovison vison*	X	X	X	X	X
Arctic ground squirrel	*Spermophilus parryii*	X	X	X	X	X
Black bear	*Ursus americanus*	X	X	X	X	X
Brown bear	*Ursus arctos*	X	X	X	X	X
Canadian lynx	*Lynx canadensis*	X	X	X	X	X
Caribou	*Rangifer tarandus*	X	X		X	X
Cinereus shrew	*Sorex cinereus*	X	X	X	X	X
Common muskrat	*Ondatra zibethicus*	X		X	X	X
Coyote	*Canis latrans*		X			X
Ermine	*Mustela erminea*	X	X	X	X	X
Least weasel	*Mustela nivalis*	X	X	X	X	X
Meadow jumping mouse	*Zapus hudsonius*	X		X	X	X
Meadow vole	*Microtus pennsylvanicus*	X	X	X	X	X
Moose	*Alces americanus*	X	X	X	X	X
North American porcupine	*Erethizon dorsata*					X
North American river otter	*Lontra canadensis*	X		X	X	X
Northern bog lemming	*Synaptomys borealis*	X	X	X	X	X
Northern red-backed vole	*Myodes rutilus*	X	X	X	X	X
Palearctic collared lemming	*Dicrostonyx torquatus*			X		
Red fox	*Vulpes vulpes*	X	X	X	X	X
Red squirrel	*Tamiasciurus hudsonicus*	X	X	X	X	X
Root vole	*Microtus oeconomus*	X	X	X	X	X
Snowshoe hare	*Lepus americanus*	X	X	X	X	X
Vagrant shrew	*Sorex vagrans*			X	X	X
Wolf	*Canis lupus*	X	X	X	X	X
Wolverine	*Gulo gulo*	X	X	X	X	X

Sources: R.J. Gutleber undated (b, c, d); L. Boyer undated (a, b); Woodward-Clyde, Inc. 1991b; 611 ASG 1995f; 611 CES 2007a; BLM 2019b.

Table H-50. Bird Species Observed or Potentially Occurring on or near the Fort Yukon (FY), Indian Mountain (IM), Murphy Dome (MD), Sparrevohn (SP), and Tatalina (TA) Sites

Common Name	Scientific Name	Seasonal Occurrence*				Breeding†	Observed
		Sp	Su	Fa	Wi		
Alder flycatcher	*Empidonax alnorum*	C	C	C	-	FY-b, IM-b, MD-n, SP-b	All
American dipper	*Cinclus mexicanus*	U	U	U	U		TA
American kestrel	*Falco sparverius*	C	C	C	-		FY, MD
American pipit	*Anthus rubescens*	C	C	C	-	IM-n, SP-n	IM, MD, SP, TA
American robin	*Turdus migratorius*	C	C	C	A	FY-b, IM-b, SP-b	All
American three-toed woodpecker	*Picoides dorsalis*	U	U	U	U		MD
American tree sparrow	*Spizelloides arborea*	C	C	C	A	FY-b, IM-b, SP-b	All
American wigeon	*Mareca americana*	C	C	C	A		FY, MD
Arctic tern	*Sterna paradisaea*	U	U	U	-		FY
Arctic warbler	*Phylloscopus borealis*	C	C	C	-	IM-b, SP-b	IM, SP, TA
Bald eagle	*Haliaeetus leucocephalus*	U	U	U	R		FY
Bank swallow	*Riparia riparia*	C	C	C	-	FY-n	FY, TA, MD
Belted kingfisher	*Megaceryle alcyon*	C	C	C	-		IM, TA
Black-backed Woodpecker	*Picoides arcticus*	R	R	R	R		FY
Black-capped chickadee	*Poecile atricapillus*	C	C	C	C		All
Blackpoll warbler	*Setophaga striata*	U	U	U	-	FY-b, IM-b, SP-b	All
Blue-winged teal	*Spatula discors*	U	R	U	-		FY
Bohemian waxwing	*Bombycilla garrulus*	C	C	C	R		FY, IM, MD, TA
Bonaparte's gull	*Chroicocephalus philadelphia*	U	U	U	-		MD
Boreal chickadee	*Poecile hudsonicus*	C	C	C	C	TA-n	All
Boreal owl	*Aegolius funereus*	C	C	C	C		IM, TA
Brown creeper	*Certhia americana*	R	R	R	R		MD
Bufflehead	*Bucephala albeola*	C	C	C	A		FY, MD
Canada goose	*Branta canadensis*	C	C	C	-		FY, IM, MD
Canada jay	*Perisoreus canadensis*	C	C	C	C	FY-n, IM-n, MD-n, SP-n	All
Canvasback	*Aythya valisineria*	U	U	U	-		FY
Chipping sparrow	*Spizella passerina*	U	U	U	-	FY-b	FY
Cliff swallow	*Petrochelidon pyrrhonota*	C	C	C	-	FY-n	All
Common goldeneye	*Bucephala clangula*	C	C	C	A		FY
Common loon	*Gavia immer*	C	C	C	-	FY-b	FY, MD
Common merganser	*Mergus merganser*	R	R	R	R		SP, TA
Common raven	*Corvus corax*	C	C	C	C		All
Common redpoll	*Acanthis flammea*	C	C	C	C		All
Dark-eyed junco	*Junco hyemalis*	C	C	C	R	FY-b, MD-b, SP-b	All
Downy woodpecker	*Dryobates pubescens*	U	U	U	U		MD
Fox sparrow	*Passerella iliaca*	C	C	C	A	FY-b, IM-n, MD-b, SP-n	All
Glaucous-winged gull	*Larus glaucescens*	-	R	R	-		TA
Golden eagle	*Aquila chrysaetos*	C	C	C	A		IM, SP
Golden-crowned kinglet							MD
Golden-crowned sparrow	*Zonotrichia atricapilla*	U	U	U	A	SP-n	SP
Gray-cheeked thrush	*Catharus minimus*	C	C	C	-	IM-b, SP-n	IM, MD, SP, TA
Gray-crowned rosy-finch	*Leucosticte tephrocotis*	U	U	U	A		IM
Great grey owl	*Strix nebulosa*	R	R	R	R		TA
Great horned owl	*Bubo virginianus*	C	C	C	C		MD
Greater scaup	*Aythya marila*	C	C	C	C		FY

Table H-50. Bird Species Observed or Potentially Occurring on or near the Fort Yukon (FY), Indian Mountain (IM), Murphy Dome (MD), Sparrevohn (SP), and Tatalina (TA) Sites

Common Name	Scientific Name	Seasonal Occurrence*				Breeding†	Observed
		Sp	Su	Fa	Wi		
Greater white-fronted goose	*Anser albiforns*	C	U	C	-		FY, TA
Greater yellowlegs	*Tringa mela*	R	R	R	-		FY
Green-winged teal	*Anas crecca*	C	C	C	-	SP-n, TA-n	All
Hairy woodpecker	*Dryobates villosus*	U	U	U	U		MD
Hammond's flycatcher	*Empidonax hammondii*	C	C	C	-	IM-b, MD-b	IM, MD, TA
Harlequin duck	*Histrionicus histrionicus*	U	U	U	-		TA
Hermit thrush	*Catharas guttatus*	U	U	U	-	MD-b, SP-b	All
Herring gull	*Larus argentatus*	U	U	U	-		FY, TA
Hoary redpoll	*Acanthis hornemanni*	C	R	U	C		SP
Horned grebe	*Podiceps auritus*	C	C	C	-		FY
Horned lark	*Eremophila alpestris*	C	C	C	-	IM-n, SP-b	IM, SP
Lapland longspur	*Calcarius lapponicus*	C	C	C	-		TA, SP
Lesser scaup	*Aythya affinis*	C	C	C	A		FY
Lesser yellowlegs	*Tringa flavipes*	C	C	C	-		FY, IM, TA, MD
Lincoln's sparrow	*Melospiza lincolnii*	C	C	C	-	FY-b, SP-b	FY, MD, SP, TA
Long-tailed jaeger	*Stercorarius longicaudus*	C	C	C	-		IM
Mallard	*Anas platyrhynchos*	C	C	C	R	SP-n	FY, MD, SP, TA
Merlin	*Falco columbarius*	U	U	U	A		FY, IM, TA
Mew gull	*Larus canus*	C	C	C	-		FY, IM, MD, TA
Northern flicker	*Colaptes auratus*	C	C	C	A		FY, MD
Northern goshawk	*Accipiter gentilis*	U	U	U	U		TA
Northern harrier	*Circus hudsonius*	U	U	U	A		MD, SP
Northern hawk owl	*Surnia ulula*	C	C	C	C		IM, TA
Northern pintail	*Anas acuta*	C	C	C	A		FY, MD
Northern shoveler	*Spatula clypeata*	C	C	C	A		FY, MD
Northern waterthrush	*Parkesia noveboraxensis*	C	C	C	-	FY-b, IM-b, SP-n	FY, MD, SP, TA
Northern wheatear	*Oenanthe oenanthe*	U	U	U	-	IM-b	IM
Olive-bided Flycatcher	*Contopus cooperi*	U	U	U	-	IM-b, SP-b	IM, SP, TA
Orange-crowned warbler	*Oreothlypis celata*	C	C	C	-	FY-b, IM-b, SP-b	All
Parasitic jaeger	*Stercorarius parasiticus*						FY
Peregrine falcon	*Falco peregrinus*	R	R	R	-		FY, IM, SP
Pine grosbeak	*Pinicola enucleator*	U	U	U	U	IM-b, SP-b	IM, SP, TA
Red-breasted merganser	*Mergus serrator*	R	R	R	R		TA
Red-necked grebe	*Podiceps grisegena*	C	C	C	-		FY
Red-necked phalarope	*Phalaropus lobatus*	C	C	C	-		FY, MD
Red-tailed hawk	*Buteo jamaicensis*	C	C	C	-		FY, MD, TA
Ring-necked duck	*Aythya collaris*	U	U	U	-		FY
Rock ptarmigan	*Lagopus muta*	C	C	C	C		IM, TA, SP
Ruby-crowned kinglet	*Regulus calendula*		C			FY-b, IM-b, MD-b, SP-b	All
Ruffed grouse	*Bonasa umbellus*	C	C	C	C		TA
Rusty blackbird	*Euphagus carolinus*	U	U	U	R		FY, MD, SP, TA
Sandhill crane	*Antigone canadensis*	C	U	C	-		FY, TA, MD
Savannah sparrow	*Passerculus sandwichensis*	C	C	C	A	FY-b, IM-b, MD-b, SP-b	All
Say's phoebe	*Sayornis saya*	U	U	U	-		FY, IM
Semipalmated plover	*Charadrius semipalmatus*	C	C	C	-		FY, IM, MD
Sharp-bhinned hawk	*Accipiter striatus*	C	C	C	A		MD
Sharp-tailed grouse	*Tympanuchus phasianellus*	U	U	U	U	FY-n	FY
Snow bunting	*Plectrophenax nivalis*	C	U	U	R		SP, TA

Table H-50. Bird Species Observed or Potentially Occurring on or near the Fort Yukon (FY), Indian Mountain (IM), Murphy Dome (MD), Sparrevohn (SP), and Tatalina (TA) Sites

Common Name	Scientific Name	Seasonal Occurrence*				Breeding†	Observed
		Sp	Su	Fa	Wi		
Solitary sandpiper	*Tringa solitaria*	U	U	U	-	FY-b, IM-n, MD-b	FY, IM, MD, SP
Spotted sandpiper	*Actitis macularius*	C	C	C	-		All
Spruce grouse	*Falcipennis canadensis*	C	C	C	C	SP-n, TA	IM, MD, SP, TA
Surfbird	*Calidris virgata*	U	U	U	-	IM-n, SP-b	IM
Swainson's thrush	*Catharus ustalatus*	C	C	C	-	FY-b, IM-b, MD-b, SP-b	All
Tennessee warbler	*Leiothlypis peregrina*					IM-b	IM
Townsend's solitaire	*Myadestes townsendi*	R	R	R	A	IM-b	IM
Townsend's warbler	*Setophaga townsendi*					MD-b	MD, TA
Tree swallow	*Tachycineta bicolor*	C	C	C	-	FY-n, SP-n	All
Trumpeter swan	*Cygnus buccinator*	U	U	U	-		FY
Varied thrush	*Ixoreus naevius*	C	C	C	-	IM-b, MD-b, SP-b	IM, MD, SP, TA
Violet-green swallow	*Tachycineta thalassina*	C	C	C	-	FY-n	All
Whimbrel	*Numenius phaeopus*	C	C	U	-	IM	IM
White-crowned sparrow	*Zonotrichia leucophrys*	C	C	C	A	FY-n, IM-n, MD-n, SP-n	All
White-winged crossbill	*Loxia leucoptera*	U	U	U	U		All
White-winged scoter	*Melanitta deglandi*	C	C	C	-		FY
Willow ptarmigan	*Lagopus lagopus*	C	C	C	C		MD, TA
Wilson's snipe	*Gallinago delicata*	C	C	C	-	FY-n	FY, MD, SP, TA
Wilson's warbler	*Cardellina pusilla*	C	C	C	-	FY-b, IM-b, SP-n	All
Yellow warbler	*Setophaga petechia*	C	C	C	-	FY-b, IM-b, MD-b, SP-b	All
Yellow-rumped warbler	*Setophaga coronata*	C	C	C	-	FY-b, IM-b, SP-n	All

Notes: *Seasonal Occurrence. A = accidental; C = common, Sp = spring, Fa = fall; R = rare, Su = summer, U = uncommon, Wi = winter; - = not expected during season.

†Breeding. b = breeding activities observed (e.g., courtship display, singing male); n = nesting activities observed (e.g., nest, young, adult food delivery or with fecal sac).

All species except for ptarmigan and grouse are protected under the MBTA.

Sources: Gibson 1993; 611 ASG 1995f; Jacobs Engineering Group 1995; Skinner 2000; 611 CES 2007a; Pardieck et al. 2018; 611th Avifaunal Database (https://usfws-mbm-landbirds.shinyapps.io/611thAvifaunalDatabase/); Pohlen et al. 2020.

H.9 INDIAN MOUNTAIN LRRS

H.9.1 Location and Area

Indian Mountain LRRS is located 410 miles north of Anchorage and 195 miles northwest of Fairbanks (Figure H-1, Figure H-69, and Figure H-70). Public Land Orders 1748, 3942, 5164, and 6706 reserve 9,247 acres for military use. Public Land Order 6706 is jointly administered by USAF and BLM under two memoranda of understanding. The 611 CES/PRSC manages 4,226 acres for the operations of the LRRS. This adjoins and overlaps about 130 acres of approximately 5,000 acres the Air Force Technical Application Center‘s seismic monitoring site. While this INRMP is principally for PRSC property, descriptive information, issues, and management measures can be applied to the remaining property. The LRRS is divided into a Top Camp with the MAR facilities and a Lower Camp with the airfield and support facilities. The installation is accessible primarily by air.

Figure H-69. Aerial View of Indian Mountain LRRS, Lower Camp and Runway

H.9.2 Installation History

In 1951 an AC&W facility was constructed at Indian Mountain to cover radar gaps in the interior of Alaska. A high frequency radio system supplied initial communications. The installation became operational as an inland surveillance site in 1953. This system proved unreliable due to atmospheric disturbances, and a WACS was built and activated in 1958. The WACS system became obsolete and was replaced in 1979 by a commercial satellite earth terminal. In 1984 a MAR was installed and remains active (Argonne National Laboratory and CEMML 2013).

H.9.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. Three contractor personnel live onsite and maintain the site year-round (611 CES 2019).

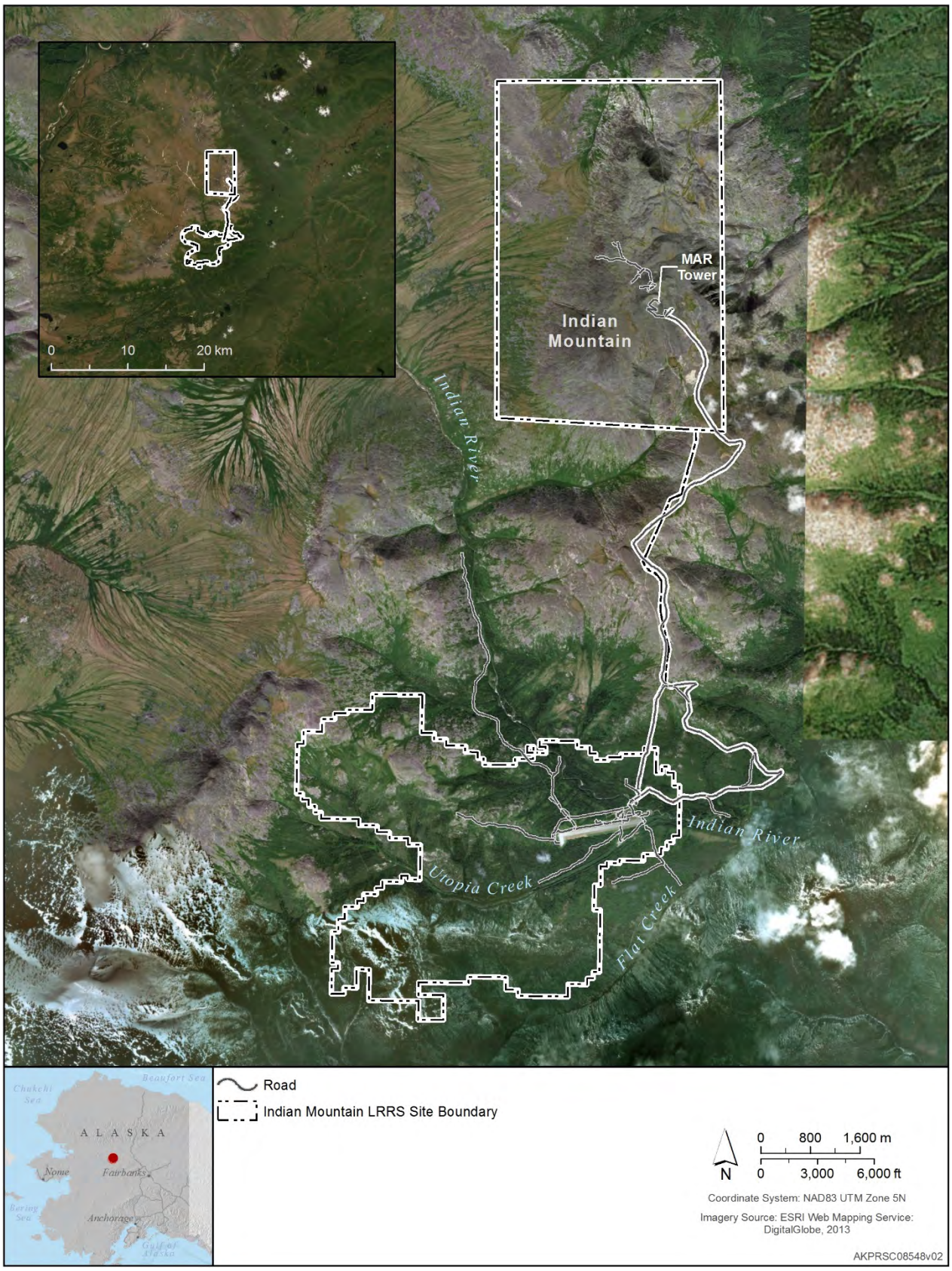

Figure H-70. Overview of Indian Mountain LRRS

H.9.4 Surrounding Communities

Located 15 miles west of the LRRS on the eastern bank of the Koyukuk River, Hughes is the nearest community. Hughes has a population of 104 (2018 estimate). Hughes is a Koyukon Athabascan village and traditional ways of life persist, such as potlatches and dog races, which attract visitors from surrounding river villages. Subsistence is the focus of the local economy. BLM emergency fire fighting, construction work, skin sewing, beadwork, sled building, and trapping also provide seasonal income (State of Alaska 2018, 2019). Hughes is not connected to the LRRS by any roads.

H.9.5 Regional Land Use

Regional land use is primarily centered around subsistence use by native tribes. Villages are usually located on or near major rivers, complemented by many seasonal, family, and group fish camps along the rivers and interior hunting and trapping camps (Gutleber undated [b]).

H.9.6 Local and Regional Natural Areas

In 1986, through the Record of Decision for the Central Yukon Planning Area Resource Management Plan (CYRMP), the BLM designated 158,000 acres of the Indian River watershed as the Indian River Area of Critical Environmental Concern (ACEC). The Indian River ACEC was designated due to the presence of sensitive and valuable aquatic resources, particularly important chum and chinook salmon spawning habitat found within the Indian River drainage (BLM 2015). Approximately 5,045 acres of the Indian Mountain LRRS is within the ACEC (Figure H-71).

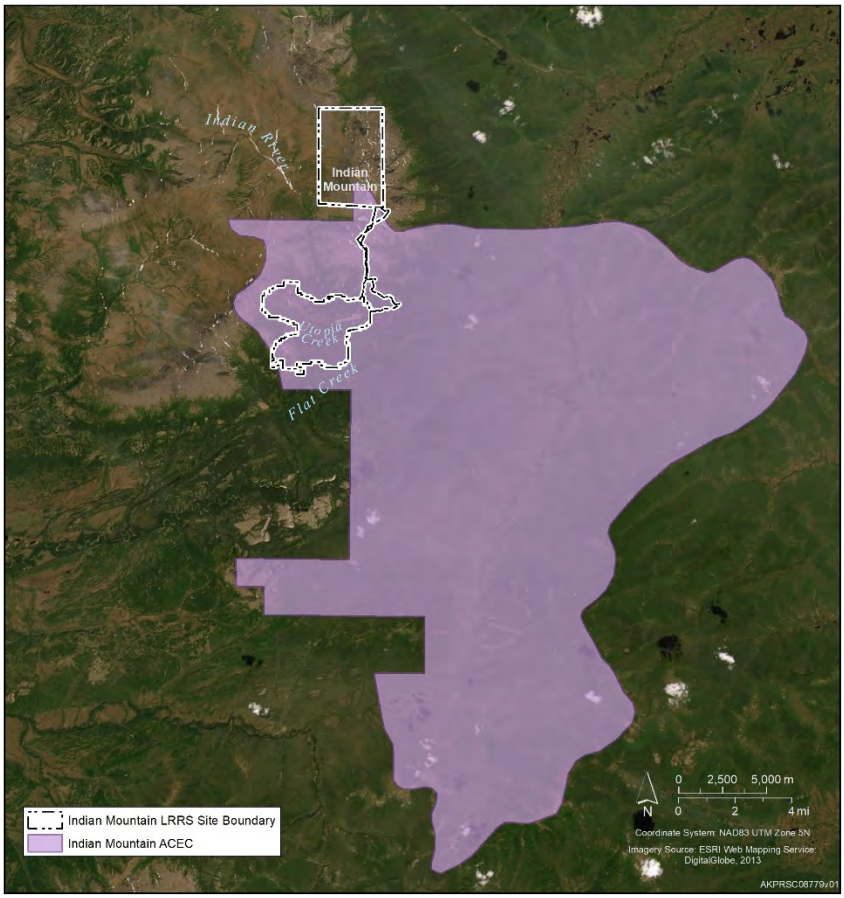

Figure H-71. Indian Mountain LRRS and Indian River ACEC
(*Source*: BLM 2015)

H.9.7 Physical Environment

H.9.7.1 Climate

Indian Mountain lies in a continental climatic zone. Summers are short and rainy, and winters are cold. Temperatures are extreme, although not as extreme as in many other interior Alaska areas. Summer temperatures average in the high 60s °F; the average low during winter is well below 0 °F (Table H-51). Extended periods of -40 °F are common. Average annual precipitation is 19 inches, with 112 inches of snowfall. Winds are light to moderate and are predominantly from the north (Woodward-Clyde, Inc. 1991a).

Table H-51. Monthly Climate Averages for Indian Mountain LRRS, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	0.9	4.4	15.3	30.3	52.5	65.5	67.1	61.2	48.3	26.2	12.2	3.2
Avg. Low (ºF)	-12.3	-10.8	-1.1	13.4	34.0	45.4	48.5	43.6	33.2	14.7	-0.7	-9.3
Avg. Precipitation (inches)	1.2	0.7	1.0	1.1	0.4	1.6	2.6	3.1	2.4	1.6	1.7	1.3
Avg. Snowfall (inches)	15.4	10.3	14.2	13.5	1.0	0.1	0	0	3.0	15.5	22.7	16.9
Avg. Wind Speed (mph)	2.8	3.6	4.9	5.6	6.0	5.3	4.9	4.9	4.9	4.5	3.3	2.6
Prevailing Wind Direction	W	WNW	N	N	W	W	S	S	W	N	N	N

Source: 611 CES 2019.

H.9.7.2 Topography

Indian Mountain is located in the Koyukuk portion of the Yukon Region of Alaska, an area of about 3,000 square miles. This subregion is drained by the Koyukuk River and its tributaries from the divide in the Kokrines-Hodzana highlands and Philip Smith Mountains west to the Nulato Hills. The Indian River Uplands are within a physiographic province which is situated south of the Endicott Mountains and is characterized by alternating lowlands, high hills, and mountains. The Indian Mountains and Purcell Mountains border the Koyukuk lowlands to the north. The surrounding area has significant vertical relief, ranging from 700 ft MSL in lowlands to about 3,400 ft MSL on ridge tops. Located on Indian Mountain, the highest peak in the area, Top Camp is at an elevation of 4,200 ft. Lower Camp is located at the confluence of Indian River and Utipia Creek at an elevation of 1,000 ft (Woodward-Clyde 1991a; Argonne National Laboratory and CEMML 2013).

H.9.7.3 Geology and Soils

The Koyukuk subregion is within the Yukon-Koyukuk basin geologic province, which was formed during Cenozoic subsidence. The Yukon-Koyukuk basin is a volcanogenic province mostly formed by sediments of volcanic origin. Although referred to as a basin, episodes of uplifting have produced hills and ridges of sedimentary rocks throughout the basin. The Indian River Uplands and Purcell Mountains were formed in this manner. The Kobuk Fault, a major Tertiary fault, runs east-west through the Yukon-Koyukuk basin along the Alatna Hills, 509 miles north of Indian Mountain LRRS. This fault is probably still active (Woodward-Clyde 1991a).

Outcrops of bedrock are generally restricted to highlands and crestlines, where weathered rubble has moved downslope. At Indian Mountain LRRS, bedrock material is andesitic (felsic volcanics) with outcrops along steep slopes and eroded mountain surfaces (Woodward-Clyde 1991a).

The surficial geology at Lower Camp is dominated by coarse and fine-grained alluvium eroded from mountain slopes. Recent deposits from Indian River and its tributaries consist of stratified accumulations of silt, sand, and gravel. The maximum thickness is unknown, but it is greater than the water gallery depth of 25 ft (Woodward-Clyde 1991a).

The surface geology of Upper Camp consists of thin deposits of residual sand, gravel, and cobbles overlying bedrock. Northern and northeastern slopes of Indian Mountain have been glaciated. Thin accumulations of outwash sand and gravel have been deposited on steep slopes and eroded mountain surfaces (Woodward-Clyde 1991a).

Permafrost reportedly ranges from thick to thin and is discontinuous in the vicinity of the installation. Permafrost occurrence in this region depends on elevation, soil type, soil depth, slope orientation, and other factors (Woodward-Clyde 1991a). Permafrost has been encountered by IRP investigations at Upper Camp and Lower Camp.

H.9.8 Hydrology

H.9.8.1 General

Surface water bodies in the vicinity of Indian Mountain LRRS include Indian River and Utopia, Sleepy Bear, Colorado, Flat, and Cirque creeks. The general area is drained by the Koyukuk River, which flows into the Yukon River.

Highlands in the Koyukuk subregion have numerous stream and river valleys. Various small lowland areas occur throughout the subregion in broad stream valleys and are characterized by meandering rivers and streams in addition to numerous lakes and marshes (Woodward-Clyde 1991a).

At Lower Camp surface water drainage flows into the Indian River and Utopia Creek. Indian River flows toward Lower Camp from the north, turning to the east below the camp. The overall gradient of the river in this vicinity is about 50 ft per mile (Woodward-Clyde 1991a).

Surface water drainage from Upper Camp is directed toward tributaries of Notoniono Creek and Indian River. Surface flow from northern and eastern slopes of Indian Mountain drains into Notoniono Creek and the Mentanontli River, located in a flat lowland area 20 miles northeast of Upper Camp. Surface flow from western and southern slopes of Indian Mountain is directed towards Indian River, which joins the Koyukuk River about 20 miles southwest of the installation. Most Upper Camp surface runoff flows into Notoniono Creek via Sleepy Bear Creek (Woodward-Clyde 1991a).

Groundwater throughout the region generally occurs in river and stream-bed alluvium, except where affected by permafrost. At Lower Camp, alluvium deposited by Indian River and its tributaries covers the valley floor. In the spring/summer season, the groundwater level in the alluvium is shallow and likely determined by the river stage. During winter the shallow alluvium is frozen and less permeable, and frost layers can redirect groundwater movement. Upper Camp surficial material consists of thin, highly permeable residuum through which groundwater percolates downslope following bedrock contours or the permafrost table (Woodward-Clyde 1991a).

H.9.8.2 Floodplains

Insufficient information is available to determine the 100-year flood plan for Indian River and Utopia Creek, as neither stream are gauged. Both streams will overbank during severe storms and flood low benches adjacent to the streams. Flood flow from a 1994 storm reached the low chord of the bridge crossing Indian River. The 100-year flood would exceed the 1994 flood level by several feet. The Indian River bridge would likely be destroyed by a 100-year flood as would power and communications cables to Top Camp and to Alascom, which are attached to the bridge. The water supply to the installation would be severely threatened by a 100-year flood. Except for the Indian River bridge and water supply intake downstream of the bridge, there is no flood threat to installation structures (Legare 1998).

H.9.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Indian Mountain LRRS. Attachment 7 contains lists of vascular plants (Table H-47), fish (Table H-48), mammals (Table H-49), and birds (Table H-50) known to occur or potentially occurring in the Indian Mountain area. ESA-listed species that may occur at or in the vicinity of the Indian Mountain site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.9.9.1 Ecoregion Classification

The Indian Mountain site is located in the Kobuk Ridges and Valleys ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.9.9.2 Vegetation/Habitat

A general vegetation map of Indian Mountain LRRS was prepared in 1995 (611 ASG 1995f). Schick et al. (2004) made significant improvements in vegetation mapping using 2000 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Indian Mountain LRRS using the most recent imagery found on Google Earth. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 5 habitat classes were identified (Table H-52 and Figure H-72). Table H-47 provides a list of the vascular plant species observed or potentially occurring on the Indian Mountain site.

Table H-52. Habitat Classes at Indian Mountain LRRS and Other Adjoining Withdrawn Lands (2017)

Habitat Class	Acres	Proportion
Shrub/Scrub	4,962.6	51.0%
Forest	1,644.5	16.9%
Developed and Barren Land	1,313.6	13.5%
Open Water	1,196.8	12.3%
Sedge or Herbaceous	613.0	6.3%
Total	**9,730.5**	

Source: CEMML 2019a.

Air Force withdrawn lands (including Indian Mountain LRRS [4,226 acres]) encompass approximately 9,700 acres. The LRRS is separated into two distinct areas; the Lower Camp and runway, which occur in the Indian River Valley that contains riverine, lowland, and upland scrub and forest habitats, and the larger Upper Camp area, which is mostly mountainous alpine terrain with rock, dwarf scrub, and herbaceous tundra. Indian Mountain LRRS is well-drained to moderately well-drained, and there are no wet and few moist tundra habitats. Other riverine, lowland, and upland habitats occur in the Indian Mountain LRRS area, but none cover a significant percentage of area (Schick et al. 2004).

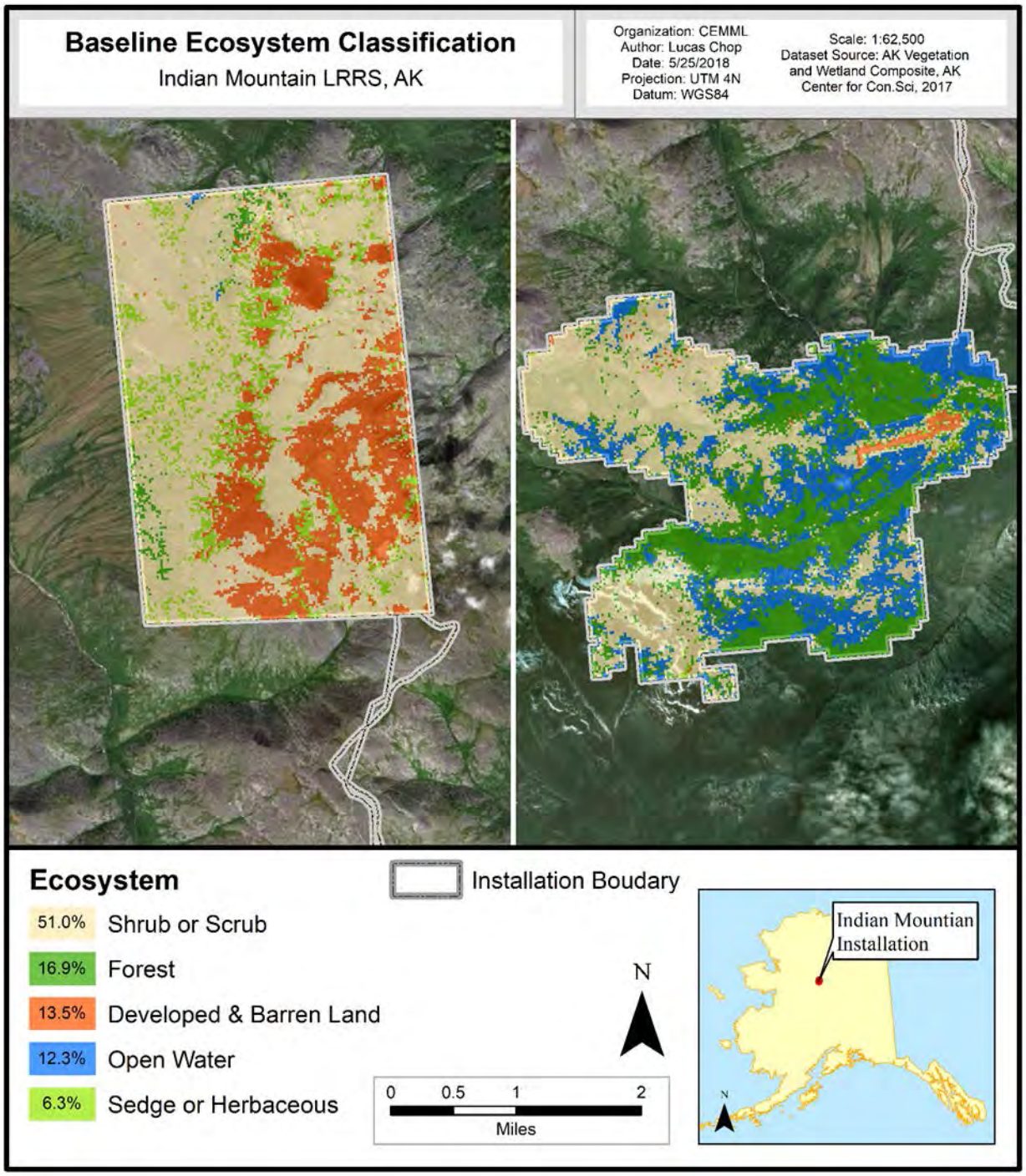

Figure H-72. Habitat Classes for Indian Mountain LRRS and Other Adjoining Withdrawn Lands (2017)
(*Source*: CEMML 2019a)

The vegetation type in the immediate vicinity of the LRRS is upland spruce/hardwood forest, a moderately dense forest of white spruce, birch, aspen, and balsam poplar. Black spruce usually replaces white spruce on north-facing slopes and poorly drained flat areas. White spruce trees, 40-80 ft high and up to 15 inches in diameter, occur in mixed stands on southfacing slopes and well-drained soils and may form pure stands near streams. Tussocks of bentgrass and sphagnum moss are also found in this area. Undergrowth in

spruce/hardwood forest normally consists of mosses and grasses on drier sites and brush on moist slopes. Typical undergrowth species are willow, alder, ferns, rose, high-bush cranberry, lingonberry, raspberry, currant, Labrador tea, and horsetail. Grasslands at the LRRS are primarily artificial, a result of past mowing and brush cutting activities. White spruce becomes sparse among high brush, which includes dwarf and resin birch, and willows as the treeline is approached. Upper Camp (at 4,200 ft elevation) is above treeline, and the sole vegetation consists of lichens (Gutleber undated [b]).

H.9.9.3 Wetlands

The current mapping of wetlands at Indian Mountain LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 9,700-acre Indian Mountain site, 1,976 acres (or 20%) are considered wetlands per the NWI mapping (Table H-53 and Figure H-73). Freshwater forested/shrub wetlands make up the majority of the wetlands. Wetlands at Indian Mountain LRRS are strongly dominated by well-drained, steep-sloping areas that are classified as jurisdictional uplands, although moist sloping areas of wetter saturated or seasonal flooding and of persistent standing water do occur. Dominant dwarf scrub species in these areas include *Empetrum nigrum, Vaccinium uliginosum, V. vitis-idaea, Ledum decumbens, Dryas octopetala, Arctostaphylos alpina*, and *Salix rotundifolia*. Dominant forest species include *Betula papyrifera* and *Picea glauca*, and associated species include *Alnus crispa, Calamagrostis canadensis, Galium triflorum, Linnaea borealis, Mertensia paniculata, Trientalis europaea, Artemisia tilesii*, and *Rosa acicularis* (Schick et al. 2004).

Table H-53. Indian Mountain LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Forested/Shrub	1,649.6	17.0%	3.6	<0.1%
Freshwater Emergent	302.4	3.1%	2.7	<0.1%
Riverine	22.5	0.2%	0.9	<0.1%
Pond	1.4	<0.1%	0	0
Freshwater Bryophyte	0	0	0.6	<0.1%
Wetlands Total	**1,975.9**	**20.3%**	**7.8**	**0.1%**
Upland	7,754.6	79.7%	9,734.9	99.9%
Site Total	**9,730.5**		**9,742.7**	

Notes: *See Figure H-73. †See Figure H-74.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

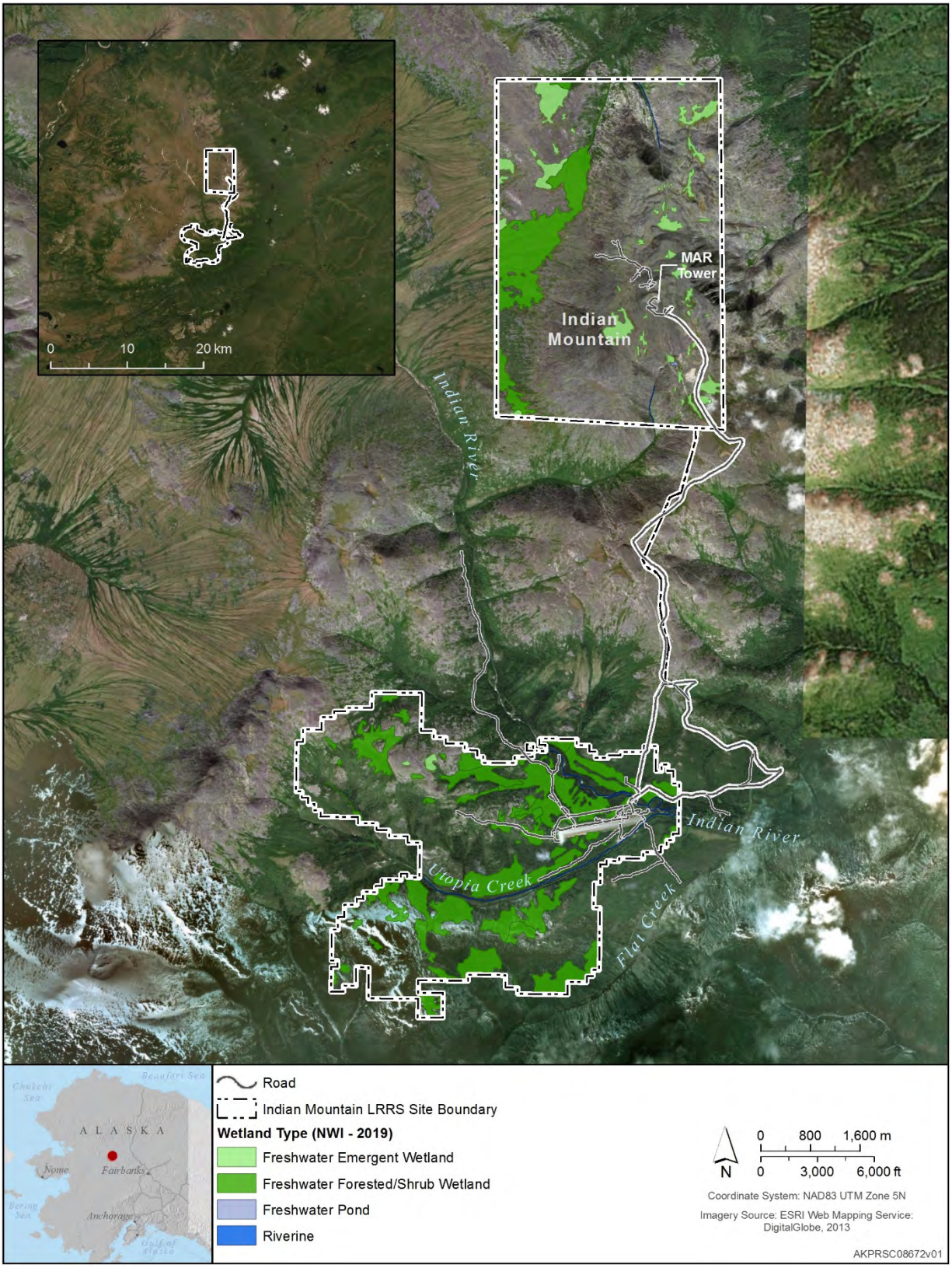

Figure H-73. Indian Mountain LRRS and and Other Adjoining Withdrawn Lands Wetlands (NWI 2019)

(*Source*: USFWS 2019d)

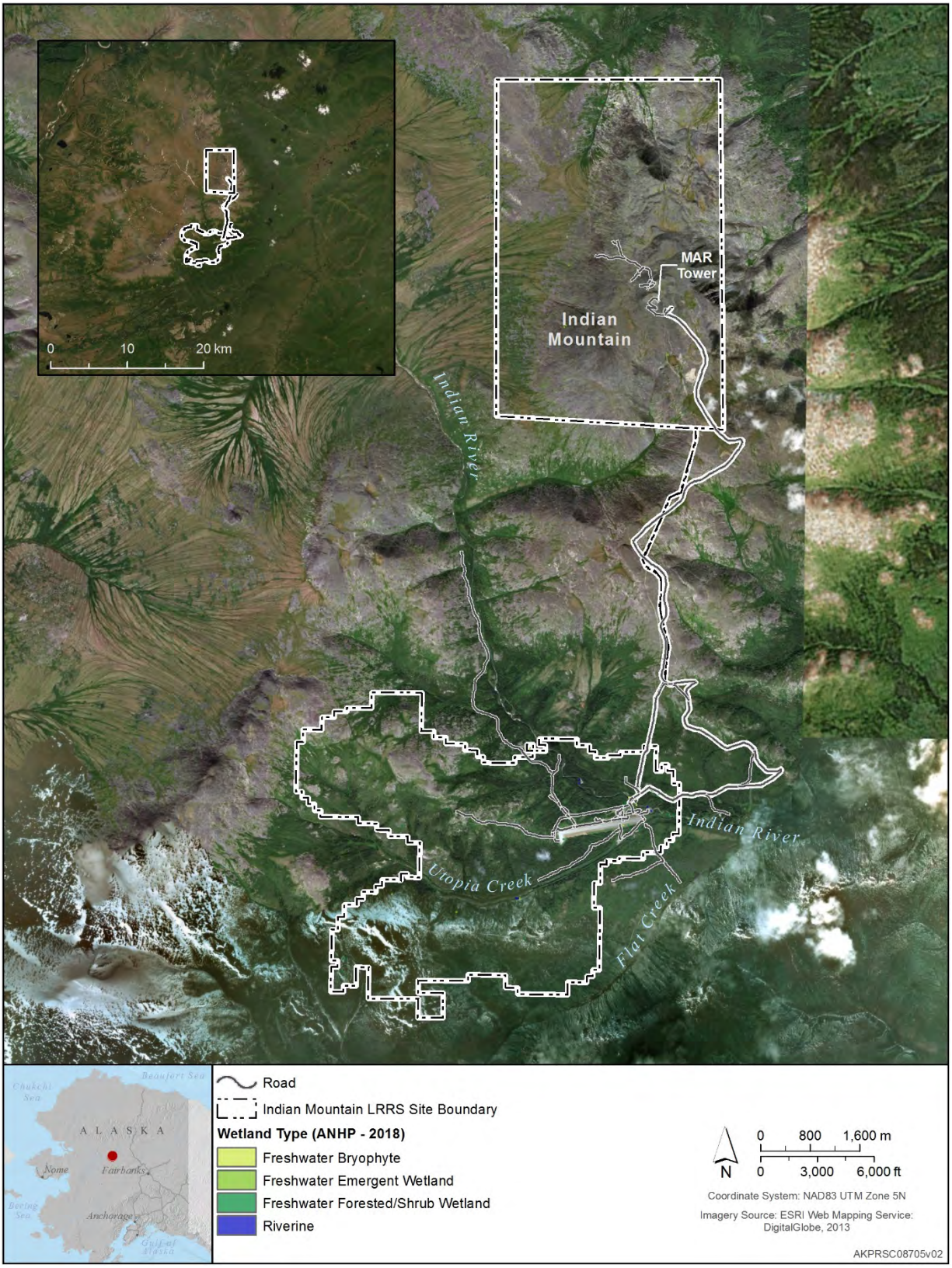

Figure H-74. Indian Mountain LRRS and and Other Adjoining Withdrawn Lands Wetlands (ANHP 2018)

(*Source*: Flagstad et al. 2018)

H.9.9.4 Fish and Wildlife

H.9.9.4.1 Fish

Eleven fish species potentially occur on or in the vicinity of the Indian Mountain installation (Table H-48). The ADFG anadromous fish catalog only lists chinook and chum salmon as spawning in the Indian River (Johnson and Blossom 2019c). Gutleber (undated [b]) states that grayling occur in Indian River and Utopia Creek at the installation.

H.9.9.4.2 Mammals

The rolling hills and mountains that surround Indian Mountain LRRS are primarily covered with upland spruce/hardwood forest and support the typical mammalian community for the region. A total of 25 mammal species occur or potentially occur on or in the vicinity of the Indian Mountain site (Table H-49). Smaller mammals that inhabit the region include the shrews, lemmings, voles, marten, weasel, American mink, red squirrel, porcupine, and snowshoe hare. Beaver, muskrats, and river otter use various waterways and wetlands of the area (Gutleber undated [b]).

The broad river valleys, covered with mixed spruce/hardwood and muskeg/bog vegetation, and river islands, covered with young willows, provide excellent year-round moose habitat. Caribou seen in the area are probably from the Western Arctic Caribou Herd. Typically, less than 100 caribou move through the site in winter. However, during winter 1992/1993 approximately 2,000 caribou moved through the area, many staying on exposed ridge tops and slopes at Upper Camp for an extended period (Gutleber undated [b]).

Brown bears of the area tend to favor open slopes and mountainous areas along the lower Yukon-Innoko-Koyukuk drainages and elsewhere throughout the area. In fall they feed on salmon along tributaries of the Koyukuk River (e.g., Indian River) as the fish migrate upstream to their spawning area. Black bears range throughout forested valleys, showing a preference for open, mixed forests. Other large carnivores found in the area include wolf, wolverine, red fox, and lynx (Gutleber undated [b]).

H.9.9.4.3 Birds

A total of 35 bird species have been recorded at Indian Mountain LRRS including rock ptarmigan; lesser yellowlegs; spotted sandpiper; Say's phoebe; Swainson's thrush; dark-eyed junco; hermit thrush; yellow, yellow-rumped, and orange-crowned warblers; and savannah, fox, and white-crowned sparrows. Species commonly found nesting in the area include Swainson's and gray-cheeked thrushes, Wilson's and yellow warblers, common redpoll, white-crowned and fox sparrows, dark-eyed junco, white-winged crossbill, solitary sandpiper, surfbird, and common raven. Raptor species that are found in the area include bald and golden eagles; red-tailed, rough-legged, sharp-shinned, Cooper's, and Swainson's hawks; northern harrier; osprey; American kestrel; and short-eared, great gray, snowy, and northern hawk owls. The northern goshawk and great horned owl are common year-round residents in valleys. Although most species are migratory, a few hardy species, such as common raven, Canada jay, and black-capped and boreal chickadees, remain in the area all winter (Gutleber undated [b]; 611 CES 2007a) (Table H-50).

H.9.9.5 ESA-listed Species

No ESA-listed candidate species have been reported on or within the vicinity of the Indian Mountain LRRS.

H.9.10 Other Natural Resources Information

H.9.10.1 Subsistence

Residents of Hughes harvest salmon, freshwater fish, moose, caribou, black bear, rabbits, waterfowl, and berries. Two species, chum salmon and moose, accounted for about 84% of the annual harvest in terms of edible pounds in 1982. Fishing activities at Hughes focus on the Koyukuk River and its tributaries. Hughes residents concentrate hunting activities along the Koyukuk River from the mouth of the Kanuti River to the mouth of Hogatza River (Braund and Associates 2004).

H.9.10.2 Outdoor Recreation

Outdoor recreation in the Indian Mountain area consists of activities such as hunting, fishing, trapping, and gold panning. BOS contract personnel stationed at Indian Mountain, temporary duty personnel during free time, and subsistence hunters from Hughes hunt the area, but little or no demand exists by DoD personnel to travel to the site for recreational purposes. Subsistence and recreational fishing and hunting are part of the local culture by members of the village of Hughes.

H.9.11 Mission and Other Impacts on Natural Resources

H.9.11.1 Land Use

Indian Mountain LRRS is divided into two camps connected by a steep winding gravel road that is 10 miles long and terminates at the summit of Indian Mountain at 4,234 ft MSL. Lower Camp includes a 4,100-ft long by 150-ft wide gravel airstrip, bulk fuel storage, and other facilities which support operations for both camps. The only structures at Upper Camp are the MAR tower/building, generator building, diesel fuel tank, an AT&T facility, and an FAA Alaskan National Airspace System Interfacility Communications System (ANICS) (611 CES 2019).

H.10 KOTZEBUE LRRS

H.10.1 Location and Area

Located on the tip of Baldwin Peninsula and bordering Kotzebue Sound, the 627-acre Kotzebue LRRS is 545 miles northwest of Anchorage and 445 miles west-northwest of Fairbanks (Figure H-75 and Figure H-76).

Figure H-75. Kotzebue LRRS, Prior to Demolition of Most Facilities

H.10.2 Installation History

Kotzebue LRRS was originally built as a temporary AC&W site to fill a radar coverage gap while the Cape Lisburne and Tin City sites were being built. Kotzebue LRRS was equipped with lightweight search radar when first activated in 1950. In 1954 the site was converted to a permanent station. Kotzebue operated as a ground-controlled intercept site from 1958-1973 when satellite communications systems began being used at the site. Communications for Kotzebue LRRS were provided by WACS from 1957 until 1979 when it was replaced by a commercial satellite earth terminal. In 1977, personnel at Kotzebue LRRS were reduced from 85 to 16, and in 1984 to only 2 technicians to maintain the MAR system, which was installed in 1985. The only remaining structures at Kotzebue LRRS are the MAR tower/building and a generator building (Argonne National Laboratory and CEMML 2013).

H.10.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. One contractor employee, who resides in Kotzebue, is responsible for the operation, maintenance, and support of the MAR year-round (611 CES 2019).

Figure H-76. Overview of Kotzebue LRRS

H.10.4 Surrounding Communities

The community of Kotzebue is 4 miles north of the LRRS. Kotzebue has a population of 3,266 (2018 estimate) comprised primarily of Inupiat Eskimo (approximately 75%). Subsistence activities are an integral part of the lifestyle. Each summer the North Tent City fish camp is set up to dry and smoke the season's catch. Kotzebue is the service and transportation center for all villages in the northwest region. It has a healthy cash economy, a growing private sector, and a stable public sector. Most income is directly or indirectly related to government employment, such as the School District, Maniilaq Association, and the city and borough. The Cominco Alaska Red Dog Mine is a significant regional employer. Commercial fishing permits are held by 115 residents in 2010. Most residents rely on subsistence to supplement income (State of Alaska 2018, 2019). The Kotzebue Electric Association has a wind farm immedtiatly to the east of the LRRS (Figure H-76). The current wind farm is made up of 17 turbines with a maximum capacity of 1.14 MW (Kotzebue Electric Association 2019). The wind farm has not affected operations at Kotzebue LRRS.

H.10.5 Regional Land Use

Kotzebue is home to the NANA Regional Corporation, one of 13 Alaska Native Regional Corporations created under the Alaska Native Claims Settlement Act (ANCSA) in settlement of Alaska Native land claims. It has grown as a transportation hub for river travel along the Noatak, Kobuk, and Selawik rivers, as well as a hub for air travel to northern Alaska. Kotzebue is a gateway to Kobuk Valley National Park, Selawik NWR, and other natural attractions of northern Alaska.

H.10.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Kotzebue LRRS.

H.10.7 Physical Environment

H.10.7.1 Climate

Kotzebue is located in the Transitional Climactic Zone, which is characterized by long, cold winters and cool summers. The coastal area experiences a predominantly maritime climate. The climate is strongly influenced by the seasonable coverage of sea ice in Kotzebue Sound. Average summer high temperatures are in the high 50s ºF, while average winter low temperatures typically range between -7 and -10 ºF. Average annual precipitation is approximately 10 inches, with most occurring between July and October. Snowfall averages 54 inches annually, falling mainly between October and April. Prevailing winds average 12 mph all year and are easterly in winter and westerly in summer (Table H-54). Surface waters generally freeze-up between early and mid-October, and break-up occurs in mid to lateMay. (Tetra Tech, Inc. 1995).

Table H-54. Monthly Climate Averages for Kotzebue, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	3.8	4.2	8.4	21.4	38.0	50.7	59.2	56.5	46.9	28.2	14.0	5.5
Avg. Low (ºF)	-9.5	-10.2	-7.9	4.3	25.1	38.8	48.8	47.1	37.3	19.0	3.4	-7.3
Avg. Precipitation (inches)	0.5	0.5	0.4	0.4	0.4	0.6	1.5	2.1	1.5	0.8	0.6	0.6
Avg. Snowfall (inches)	7.8	7.5	5.8	5.3	1.4	0.1	0	0	1.0	6.6	9.4	9.3
Avg. Wind Speed (mph)	12.0	12.4	10.4	10.6	10.2	10.6	11.4	12.0	12.2	12.9	13.3	12.6
Prevailing Wind Direction	E	E	E	E	W	W	W	W	E	E	E	E

Source: 611 CES 2019.

H.10.7.2 Topography

Kotzebue LRRS is located on the Baldwin Peninsula within the Kobuk-Selawik Lowland section of coastal western Alaska. This physiographic section is characterized by broad river flood plains and lowlands forming deltas along seaward margins. Kotzebue is located on a recurved spit, which is about 3 miles long and ranges in width from 1,100 to 3,600 ft. A shallow, narrow-mouthed, brackish lagoon separates the spit from the highland edge of the Baldwin Peninsula. The lagoon freezes solid each winter. The LRRS is situated on remnants of an eroded moraine on Baldwin Peninsula. Topographic relief at the LRRS is about 155 ft from Kotzebue Sound to the top of the hill at the facility (Boyer undated [a]).

H.10.7.3 Geology and Soils

The geology of the area is dominated by glacial moraine and drift deposits, overlain locally by thin, sandy beach deposits. These deposits include mixed clay, silt, sand, and gravel of uncertain thickness. Soil characteristics of the spit at Kotzebue vary greatly within short distances. Generally, the seaward side is underlain by a gravel bench while the inland side facing the slough is underlain by gravel covered with silts and very fine sand (Boyer undated [a]).

Permafrost is continuous under Kotzebue and present at shallow depths. Polygonal ground is visible wherever the surface has not been disturbed by grading, indicating that vertical ice lenses are common in frozen silts. Permafrost is moderately thick and has been reported to a depth of 238 ft below grade. The permafrost is underlain by fine-grained sediments containing brackish water, and salinity has been reported to increase with depth (Boyer undated [a]). The presence of permafrost beneath beach sands is uncertain.

H.10.8 Hydrology

H.10.8.1 General

Runoff originating from Kotzebue LRRS is directed either west to Kotzebue Sound or east to adjacent wetlands. Runoff draining east eventually reaches the LRRS lake (former LRRS water supply). The hydrogeology of Kotzebue LRRS is dominated by glacial moraine and drift deposits. Permafrost is generally encountered within several feet of the ground surface, and brackish water is contained in the fine-grained sediments underlying the permafrost. Flow is relatively slow because of the low permeability of silt soils and seasonal soil freezing. Suprapermafrost groundwater is derived from snowmelt and rainfall and is likely fresh. The salinity of groundwater reportedly increases with depth below the land surface. Groundwater of unknown quality occurs seasonally or intermittently above permafrost in the active zone at Kotzebue LRRS, moves at very slow rates below the tundra, and has no identified beneficial use to the LRRS.

Two general subsurface flow regimes at Kotzebue LRRS include (1) the tundra hill and surrounding areas and (2) the Kotzebue Sound beach area. The tundra hill and surrounding areas generally have near-surface silts extending to permafrost. Shallow, seasonal groundwater in this area may flow east toward the former water supply lake or west toward Kotzebue Sound, depending on site location with respect to the hill at the facility. Recharge to the active zone is limited by the low average annual precipitation. The Kotzebue Sound beach area contains coarse sands and gravel. Shallow groundwater along the beach likely flows towards the Sound at relatively high rates because of high soil permeability. Groundwater along the beach is probably saline and influenced by tidal activity.

H.10.8.2 Flood Plains

Flooding is not known to be a problem, although the USACE indicates the site has been designated by the Federal Insurance Administration as located within a coastal flood hazard zone. The combination of high

tides and high shoreward winds periodically floods local beaches and adjacent low-lying areas. The 100-year flood elevation of Kotzebue Sound at Kotzebue is 10.4 ft MSL. There are no installation facilities within the flood plain. The level of the unnamed lake is not recorded, so no estimation could be made of its 100-year flood plain. However, its maximum rise should be less than 3 ft (Legare 1998).

H.10.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Kotzebue LRRS and the surrounding area. Attachment 5 contains lists of vascular plants (Table H-27), fish (Table H-28), mammals (Table H-29), and birds (Table H-30) known to occur or potentially occurring in the Kotzebue area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Kotzebue site are discussed in in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.10.9.1 Ecoregion Classification

The Kotzebue site is located in the Kotzebue Sound Lowlands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.10.9.2 Vegetation/Habitat

A general vegetation map of the Kotzebue LRRS was prepared in 1995 (611 ASG 1995d). Schick et al. (2004) made significant improvements in vegetation mapping using 1998 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Kotzebue LRRS using the most recent imagery found on Google Earth. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 3 habitat classes were identified (Table H-55 and Figure H-77). A list of vascular plants known to occur or potentially occurring in the Kotzebue area is provided in Table H-27.

Table H-55. Habitat Classes at Kotzebue LRRS (2017)

Habitat Class	Acres	Proportion
Shrub or Scrub	529.7	84.5%
Sedge or Herbaceous	93.4	14.9%
Open Water	3.8	0.6%
Total	**626.9**	

Source: CEMML 2019a.

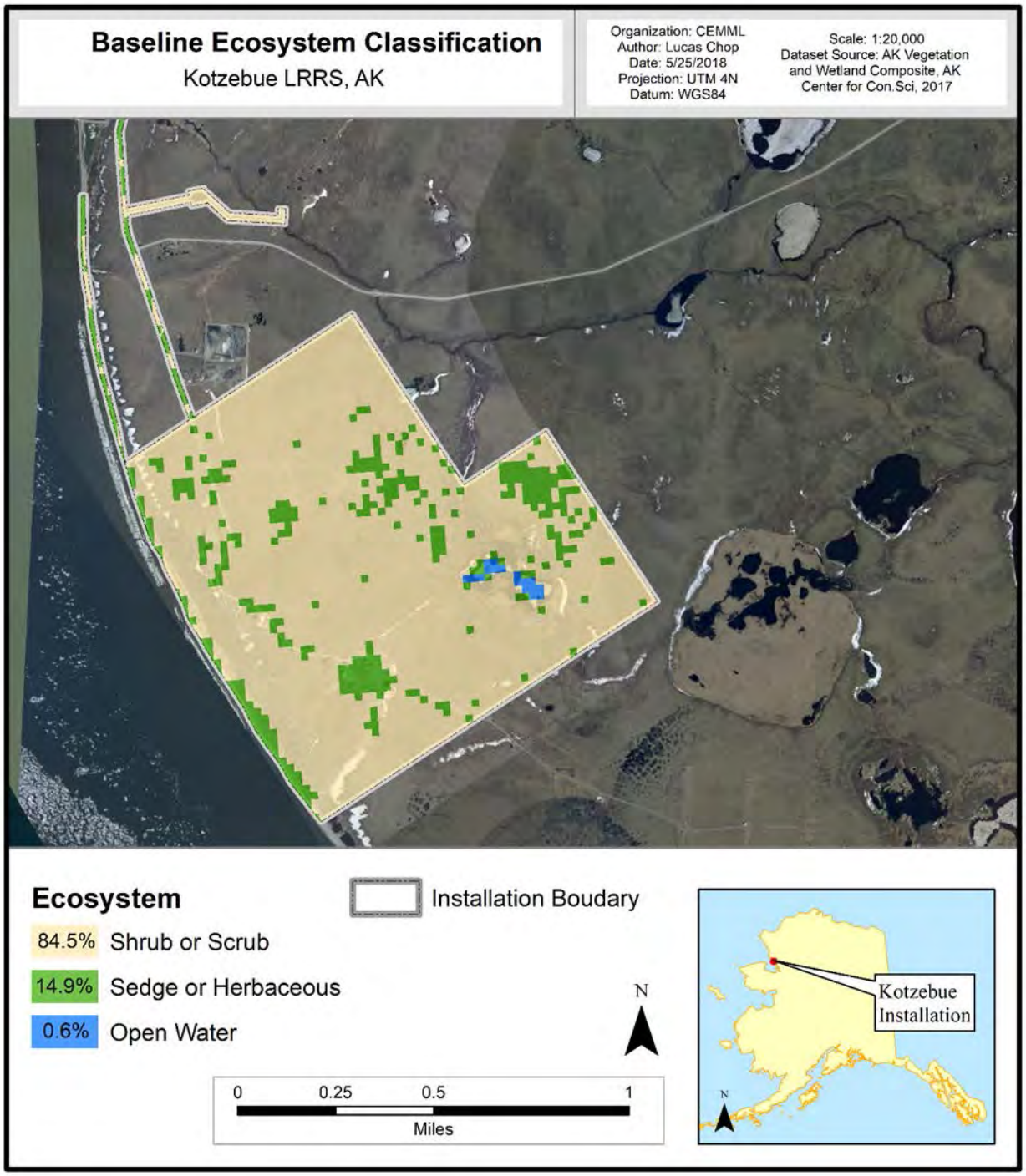

Figure H-77. Kotzebue LRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

Kotzebue LRRS encompasses 627 acres of very gently rolling moist tundra terrain. Cottongrass tussocks and dwarf shrubs usually completely cover the ground. The soil is commonly saturated, and mosses and lichens grow in channels between tussocks. Frost conditions may create small frost polygons supporting grass and forbs. Common plants occurring on Kotzebue LRRS include cottongrass, dwarf birch, willows, Labrador tea, mountain avens, bistort, and saxifrages (Boyer undated [a]). The moist tundra in the Kotzebue area is very sensitive, and recovery of natural vegetation of disturbed plant communities may take years.

One large, deep lacustrine lake, located in the central portion of the LRRS, accounts for most lacustrine waters in the area. The lake has small tundra islands and may provide preferred habitat for nesting and brood-rearing waterbirds. The bulk of the LRRS, however, is composed of upland scrub/shrub vegetation. Of note is the presence of a lowland shrub-sedge bog at the site. This area is a mixture of raised shrub islands and wet sedge tundra (Schick et al. 2004).

H.10.9.3 Wetlands

The current mapping of wetlands at the Kotzebue LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 627-acre Kotzebue site, 522 acres (or 83%) are considered wetlands per the NWI mapping (Table H-56 and Figure H-78). The most common wetland type at the Kotzebue LRRS is freshwater forested/shrub. These areas are typically moist scrub and tundra habitats and are either saturated or somewhat welldrained depending on micro-topography and landscape position. Dominant shrub species in these areas include *Betula nana*, *Salix pulchra*, and *Alnus crispa*. Some upland tall scrub habitats at the site may, in fact, not be classified as wetlands depending on soil drainage (Schick et al. 2004).

Table H-56. Kotzebue LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Forested/Shrub	400.9	63.9%	368.5	57.8%
Freshwater Emergent	85.2	13.6%	35.9	5.6%
Freshwater Lake/Pond	28.5	4.5%	3.7	0.6%
Estuarine and Marine Deepwater	7.1	1.1%	0	0
Wetlands Total	**521.7**	**83.2%**	**408.1**	**64.0%**
Upland	105.2	16.8%	229.9	36.0%
Site Total	**626.9**		**638.0**	

Notes: *See Figure H-78. †See Figure H-79.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

H.10.9.4 Fish and Wildlife

H.10.9.4.1 Fish

A variety of fish inhabit coastal waters of the Kotzebue area, and 13 species potentially occur within the nearshore waters of the LRRS (Table H-28). All five species of salmon are found in Kotzebue Sound, but only chum salmon occur in substantial numbers. Species important to subsistence fishing in the area include whitefish and Arctic char. Other species found in the area include tomcod, Arctic cod, rainbow smelt, flounder, ninespine stickleback, and herring (Boyer undated [a]). The closest anadromous steam to the LRRS is Sadie Creek, located 3 miles south, and supports broad whitefish, humpback whitefish, and least cisco (Johnson and Blossom 2019b).

Figure H-78. Kotzebue LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

Figure H-79. Kotzebue LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.10.9.4.2 Mammals

Terrestrial Mammals

Terrestrial mammals inhabiting moist tundra habitats include several species of voles, shrews, and lemmings; tundra hare; Arctic ground squirrel; and Arctic and red fox (Table H-29). Larger species, such as caribou, brown bear, wolf, and moose, typically do not range into the Baldwin Peninsula (Boyer undated [a]; Tetra Tech, Inc. 1995).

Marine Mammals

A total of 11 marine mammal species are known to or potentially occur within the vicinity of the Kotzebue LRRS: four species of seal, five species of whale, harbor porpoise, and polar bear (Table H-29). Marine mammals are discussed in detail in Section H.10.9.5 (ESA- and MMPA-listed Species).

H.10.9.4.3 Birds

A total of 72 bird species have been recorded at the Kotzebue LRRS and an additional 56 species potentially occur (Table H-30). Species occurrence records for the area are based on a BBS route conducted just to the east of the village of Kotzebue and 4 miles north of the LRRS; the Kotzebue Monitoring Avian Productivity and Survivorship (MAPS) station, administered by the NPS, located within 6 miles of the LRRS; and area and site-specific surveys (personal communication, C. Eberly, DoD Partners in Flight with G. Augustine; 611 ASG 1995d; Andres and Brann 1997; Andres et al. 1999; 611 CES 2007a; Pardieck et al. 2018). Waterfowl, shorebird, and seabird species observed on or in the vicinity of the site include red-throated loon, northern pintail, green-winged teal, greater scaup, sandhill crane, whimbrel, long-billed dowitcher, western sandpiper, ruddy turnstone, Wilson's snipe, long-tailed jaeger, Arctic tern, and glaucous gull. Breeding species observed in the vicinity include yellow wagtail, yellow warbler, northern waterthrush, Wilson's warbler, American tree sparrow, white-crowned sparrow, fox sparrow, and common and hoary redpolls. Other birds observed at Kotzebue LRRS include bank swallow, common raven, and savannah sparrow.

H.10.9.5 ESA- and MMPA-listed Species

Six ESA-listed species are expected to occur on or in the vicinity of the Kotzebue site: threatened spectacled and Steller's eiders, polar bear, and ringed and bearded seals; and endangered bowhead (INRMP Section 2.3.4, Table 6).

ESA-listed Species

Spectacled and Steller's Eiders. Spectacled and Steller's eiders may occur in offshore waters during migration but are not expected to occur on the LRRS site.

Ringed and Bearded Seals. Ringed and bearded seals are expected to occur within the vicinity of the LRRS site but have not been recorded on the site. Both species are harvested by the local native community (Wynne 1993). Because the peninsula lies within the relatively protected waters of Kotzebue Sound, marine mammals that follow the pack ice (e.g., bearded seal, polar bear, walrus) typically occur within the Sound only for a short period in spring when leads open in the sea ice (Tetra Tech, Inc. 1995). In 2014, the marine waters adjacent to the Kotzebue site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bowhead. The bowhead is expected in offshore marine waters (Table H-29).

Polar Bear. Polar bears occur infrequently in the Kotzebue area (PRSC 2020). In 2010, the marine waters adjacent to the Kotzebue site were designated as sea ice critical habitat for polar bears (USFWS 2010) (Figure H-32).

Other MMPA-listed Species

Whales and Porpoise. Common minke, gray, and killer whales, beluga, and harbor porpoise are expected in offshore marine waters (Table H-29).

Pacific Walrus. The Pacific walrus occurs infrequently in the Kotzebue area (PRSC 2020). Because the peninsula lies within the relatively protected waters of Kotzebue Sound, marine mammals that follow the pack ice (e.g., walrus, bearded seal, polar bear) typically occur within the Sound only for a short period in spring when leads open in the sea ice (Tetra Tech, Inc. 1995).

Ribbon and Spotted Seals. Ribbon and and spotted seals are expected to occur within the vicinity of the LRRS site but have not been recorded on the site. Both species are harvested by the local native community (Wynne 1993).

H.10.10 Other Natural Resource Information

H.10.10.1 Subsistence

Approximately 97% of Kotzebue's population engages in subsistence activities. Traditional subsistence activities in the Kotzebue area have revolved principally around caribou and marine mammals, especially bearded seals, and a variety of fish species. Waterfowl, moose, furbearers, berries and "greens" have also been important although secondary. Five species (caribou, salmon, bearded seal, sheefish, and moose) account for about 80% of Kotzebue's annual subsistence harvest in terms of edible pounds in 1991 (Braund and Associates 2004).

H.10.10.2 Outdoor Recreation

Outdoor recreation at Kotzebue LRRS consists primarily of such activities as beachcombing and ATV riding along trails and beaches. Extensive ATV tracks on tundra vegetation are evident in the Kotzebue area; however, ATV use on the LRRS is restricted to designated roads. BOS contract personnel stationed at Kotzebue, temporary duty personnel during free time, and subsistence gatherers from the neighboring area may hunt or fish in the general area. No interest exists by DoD personnel to travel to the site for recreation purposes.

H.10.11 Mission and Other Impacts on Natural Resources

H.10.11.1 Land Use

Kotzebue LRRS is used solely as a MAR site and maintains no active housing facilities or military presence. Facilities include the MAR tower/building and a generator building. The active site, including the MAR and storage building, is completely fenced and secured. The Air Force leases space to the FAA, the Kikiktagruk Inupiat Corporation has a right-of-way for a road access to an adjacent wind farm. And the Kotzebue Electric Association's easement for a wind farm has not been renewed (611 CES/CEIA 2020).

H.11 MURPHY DOME LRRS

H.11.1 Location and Area

The 862-acre Murphy Dome LRRS is situated on top of Murphy Dome at an elevation of 2,920 ft MSL approximately 20 miles west-northwest of Fairbanks; the site is accessible by road from Fairbanks (Figure H-80 and Figure H-81).

Figure H-80. Aerial View of Murphy Dome LRRS

H.11.2 Installation History

Murphy Dome LRRS was the North Alaska Control Center as well as one of the original 12 AC&W sites constructed to establish a permanent air defense system in Alaska. Site construction was completed in 1951, and the facility became operational in spring 1952. In 1960 a WACS facility was constructed at Murphy Dome. The WACS was deactivated in 1979 and replaced with a commercial satellite earth terminal. A MAR unit was installed in 1986 and remains active (Argonne National Laboratory and CEMML 2013; 611 CES 2019).

H.11.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. One contractor employee, who resides in Fairbanks, is responsible for the operation, maintenance, and support of the MAR year-round (611 CES 2019).

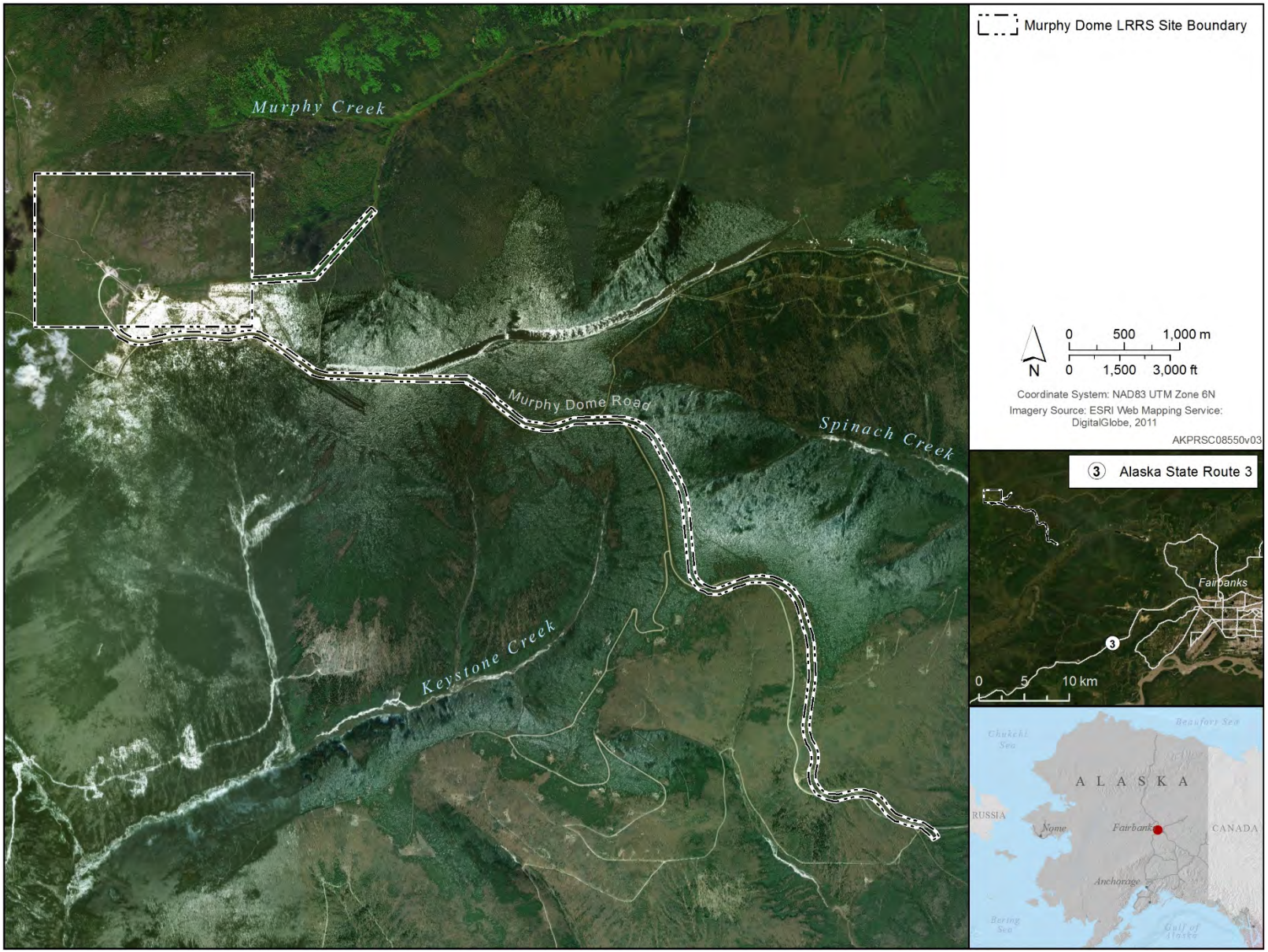

Figure H-81. Overview of Murphy Dome LRRS

H.11.4 Surrounding Communities

Murphy Dome LRRS is located 20 miles from Fairbanks, the second largest city in Alaska. The population of Fairbanks is 31,668 (2018 estimate) and the Fairbanks North Star Borough population is 97,121 (2018 estimate). It is the only major terminus for rail, air, and highways in interior Alaska. Fairbanks offers a diverse economy, including city, borough, state, and federal government services, transportation, communication, manufacturing, financial, and regional medical services. Tourism and mining also comprise a significant part of the economy. The Fairbanks North Star Borough is largely non-industrial and remains primarily dependent on local, state, and federal government employment. Military personnel stationed at several installations in the Borough also contribute heavily to the economy. The University of Alaska Fairbanks is another important employer (State of Alaska 2018, 2019).

H.11.5 Regional Land Use

The Murphy Dome LRRS is surrounded by state lands managed to protect and maintain wildlife and habitat values and associated recreational values. Located on the western edge of Fairbanks, the Murphy Dome area is an important recreation area used for a wide range of summer and winter activities, including hunting, berry picking, hiking, and skiing (Alaska Department of Natural Resources [ADNR] 2014a).

H.11.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Murphy Dome LRRS.

H.11.7 Physical Environment

H.11.7.1 Climate

Fairbanks falls within the continental climate zone, which encompasses most of the central part of the state, and experiences extremely cold winters and warm summers. The climate of Murphy Dome is generally similar to the Fairbanks area (Table H-57). Summer high temperatures generally range in the 70s ºF, and average winter low temperatures are usually below -10 ºF. The area receives measurable precipitation more than 100 days per year with an average annual precipitation of about 11 inches. Only about 60 days per year are frost-free, and snow covers the ground from October through April. Winds are generally from the north and average 5.4 knots (Boyer undated [b]; Woodward-Clyde, Inc. 1993a).

Table H-57. Monthly Climatic Averages for Fairbanks Airport, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	-1.4	8.5	23.7	42.8	60.1	70.8	72.3	66.3	54.7	32.3	11.4	1.7
Avg. Low (ºF)	-19.0	-13.9	-3.4	20.4	37.9	49.3	52.0	46.8	35.7	17.4	-5.0	-15.2
Avg. Precipitation (inches)	0.6	0.4	0.4	0.3	0.6	1.3	2.0	1.8	1.0	0.8	0.7	0.7
Avg. Snowfall (inches)	10.4	8.6	6.0	3.0	0.7	0	0	0	1.3	10.3	12.6	12.2
Avg. Wind Speed (mph)	2.4	3.0	4.6	5.8	6.4	5.8	5.3	5.1	4.9	4.0	2.8	4.4
Prevailing Wind Direction	NNE	NE	NNE	N	N	W	W	N	N	N	N	NE

Note: As weather data for Murphy Dome is not available, data summary is for Fairbanks. It may not be fully indicative of weather conditions at Murphy Dome LRRS, which differs significantly due to difference in location and elevation.
Source: 611 CES 2019.

H.11.7.2 Topography

Murphy Dome LRRS is located in the Yukon-Tanana Uplands, an area of ridges and valleys lying between the Brooks Range to the north and Alaska Range to the south. The Tanana River Valley separates the Alaska Range from Yukon-Tanana Upland mountain groups. The mountains have summits reaching to

6,000 ft MSL. Principal physiographic features of the area are rounded, gently sloping ridges and domes. Murphy Dome LRRS is located 2,930 ft MSL and is the highest point in the vicinity of Fairbanks (Boyer undated [b]; 611 CES 2019).

H.11.7.3 Geology and Soils

The geology of the Murphy Dome area is characterized by thin residual clay, silt, sand, gravel, and cobble deposits overlying metamorphic bedrock. The bedrock is made up of schists of the Yukon-Tanana Complex with minor amounts of granite intrusives and basalt volcanics. Alluvial sand and gravel deposits have accumulated in lowland areas and local stream valleys. The thickness of the alluvium is highly variable. Percolation tests indicate that the soil is highly permeable. Bedrock is shallow, consisting of hard quartzite schist resistant to tungstencarbide drill bits, and lies at depths ranging from 2 to 10 ft. Test pits and borings have found no evidence of any perched aquifers or permafrost above the bedrock on the top of Murphy Dome. Underlying bedrock crops out along steep slopes and eroded mountain surfaces (Woodward-Clyde 1993a).

H.11.8 Hydrology

H.11.8.1 General

Surface water runoff from Murphy Dome LRRS flows north and east to unnamed tributaries of Murphy and Shovel creeks and flows to the south to Dawson, Keystone, Spinach, and Cache creeks. Goldstream Creek is the final major receiving stream south of the installation (Woodward-Clyde, Inc. 1993a).

Permafrost is discontinuous in the area. Seasonal groundwater occurs in the residuum as a result of the melt and thaw cycle; perennial ground water occurs in stream alluvium. Seasonal groundwater discharge is likely directed downslope to local surface streams. Principal groundwater flow directions probably mirror the area's surface topography; flowing to the north, east, and south (Woodward-Clyde, Inc. 1993a).

Where permafrost exists, groundwater beneath the site would only reach aquifers through unfrozen zones that perforate the permafrost. Groundwater percolating downslope may encounter permafrost and migrate laterally as supra-permafrost water on the slope of the permafrost table until the groundwater surfaces or reaches another unfrozen zone. Groundwater resurfaces where the water table intersects the land surface. The occurrence of bedrock at shallow depths on the dome affects groundwater hydrology in much the same way as permafrost (Woodward-Clyde, Inc. 1993a).

H.11.8.2 Floodplains

The LRRS is well above any floodplain (Legare 1998).

H.11.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Murphy Dome LRRS. Attachment 7 contains lists of vascular plants (Table H-47), fish (Table H-48), mammals (Table H-49), and birds (Table H-50) known to occur or potentially occurring in the Indian Mountain area. ESA-listed species that may occur at or in the vicinity of the Murphy Dome site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.11.9.1 Ecoregion Classification

The Murphy Dome LRRS is located within the Yukon-Tanana Uplands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.11.9.2 Vegetation/Habitat

A general vegetation map of Murphy Dome LRRS was prepared in 1995 (611 ASG 1995f). Schick et al. (2004) made significant improvements in vegetation mapping using 2000 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Murphy Dome LRRS using the most recent imagery found on Google Earth and, if available, 2009-2010 SPOT-5 satellite imagery. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 5 habitat classes were identified (Table H-58 and Figure H-82). Table H-47 provides a list of the vascular plant species observed or potentially occurring on the Indian Mountain site.

Table H-58. Murphy Dome LRRS Habitat Classes (2017)

Habitat Class	Acres	Proportion
Forest	652.4	75.7%
Grassland	134.4	15.6%
Shrub or Scrub	61.2	7.1%
Developed or Barren Land	12.9	1.5%
Open Water	0.9	0.1%
Total	**861.8**	

Source: CEMML 2019a.

The LRRS site is characterized by treeless tundra vegetation at the higher elevations where the facilities are located, and the lower slopes support an upland spruce/hardwood forest vegetation community. This is a fairly dense forest of white spruce, black spruce, paper birch, aspen, balsam poplar, tamarack, green alder, and several species of willow (West and DeWolfe 1974). Undergrowth normally consists of mosses and grasses on drier sites and brush on moist slopes. Typical undergrowth species are willow, alder, ferns, rose, high-bush cranberry, lingonberry, raspberry, currant, Labrador tea, and horsetail. These species are seral, occurring in disturbed areas, as found in and around the installation. Other common species found at the LRRS include Arctic lupine, crowberry, dwarf birch, vaccinium, and several species of lichen and prostrate willow. Mat-forming herbs, such as campion moss, black oxytrope, Arctic sandwort, and several grasses and sedges, are also common. Demolition and burial of abandoned structures in 1988-1989 resulted in a large area of disturbance. This area was reseeded and has achieved fairly good ground cover. Common species in the disturbed vegetation type include yarrow, reedgrass, bluegrass, and several sedge species (Boyer undated [b]).

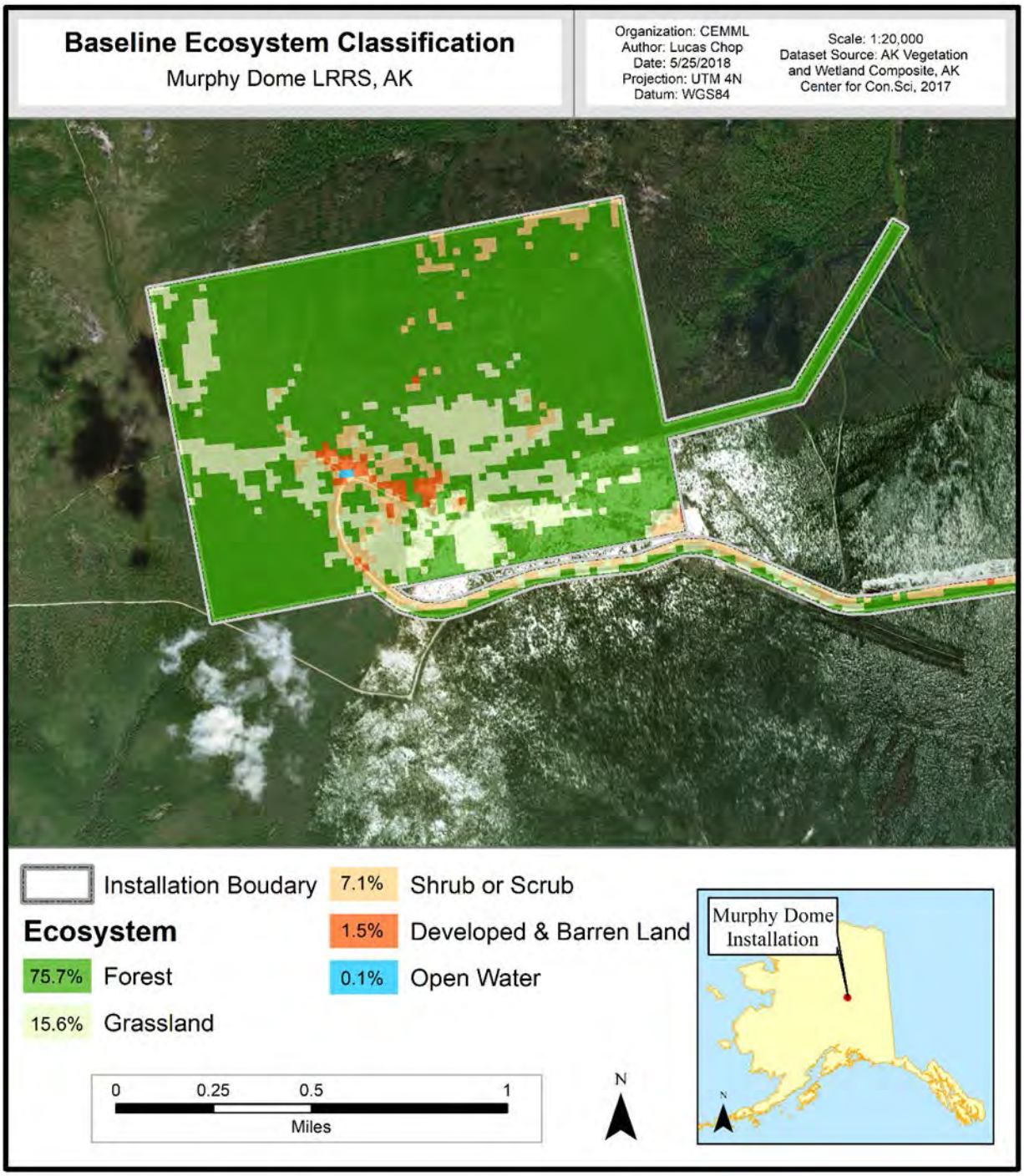

Figure H-82. Murphy Dome LRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

H.11.9.3 Wetlands

The current mapping of wetlands at Murphy Dome LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 862-acre Murphy Dome site, 157 acres (or 18%) are considered wetlands per the NWI mapping (Table H-59 and Figure H-83). Freshwater forested/shrub wetlands are the only wetland type observed on the site. Wetland areas at the Murphy Dome LRRS are moderately well-drained to well-drained, depending primarily on soil type, microtopography, and landscape position. Dominant plant species in these areas include *Alnus crispa, Salix pulchra, S. scouleriana, S. alaxensis, S. arctica, Betula nana, Vaccinium uliginosum, Dryas octapetala, Spirea stevenii [beauverdiana]) B. glandulosa, Dryopteris dilitata, Empetrum nigrum, Calamagrostis canadensis,* as well as tree species *Betula papyrifera, Picea glauca,* and *P. mariana* (Schick et al. 2004).

Table H-59. Murphy Dome LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Forested/Shrub Wetland	157.0	18.3%	134.7	15.6%
Upland	704.8	81.7%	727.2	84.4%
Site Total	**861.8**		**862.0**	

Notes: *See Figure H-83. †See Figure H-84.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

H.11.9.4 Fish and Wildlife

H.11.9.4.1 Fish

Although surface waters occur on Murphy Dome LRRS, Murphy, Spinach, and Keystone creeks and their tributaries are in the vicinity. Fish species likely to be found in these creeks are Arctic grayling, whitefish, northern pike, burbot, sheefish, and longnose sucker (Table H-48) (Boyer undated [b]).

H.11.9.4.2 Mammals

A total of 22 mammal species occur or potentially occur on or in the vicinity of the Murphy Dome LRRS (Table H-49). Common small mammal species include the snowshoe hare, red squirrel, marten, least and short-tailed weasels, American mink, vole and lemming species, Arctic ground squirrel, red fox, coyote, and lynx. Moose and caribou may be occasionally observed in the Murphy Dome area (Boyer undated [b]).

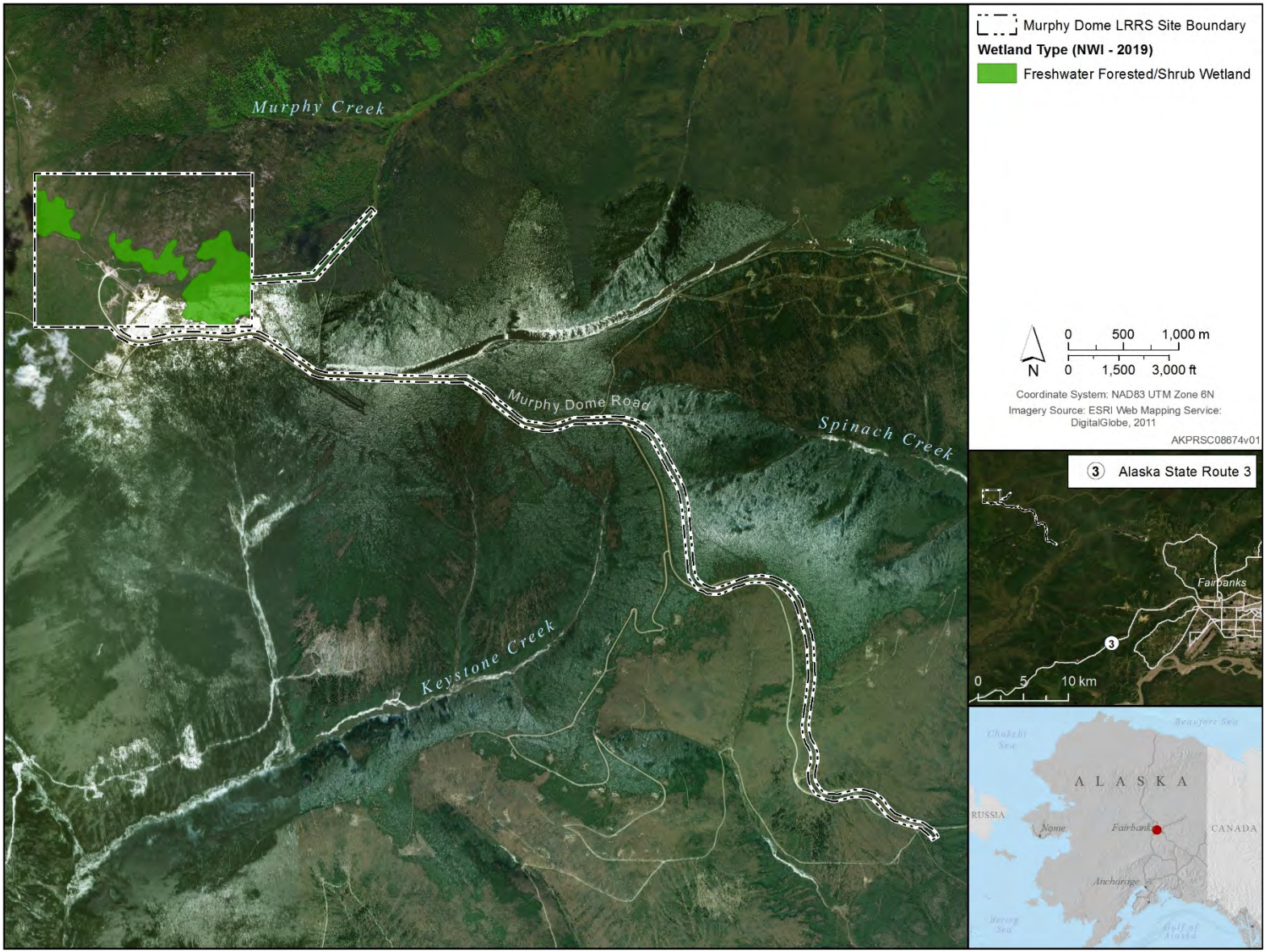

Figure H-83. Murphy Dome LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

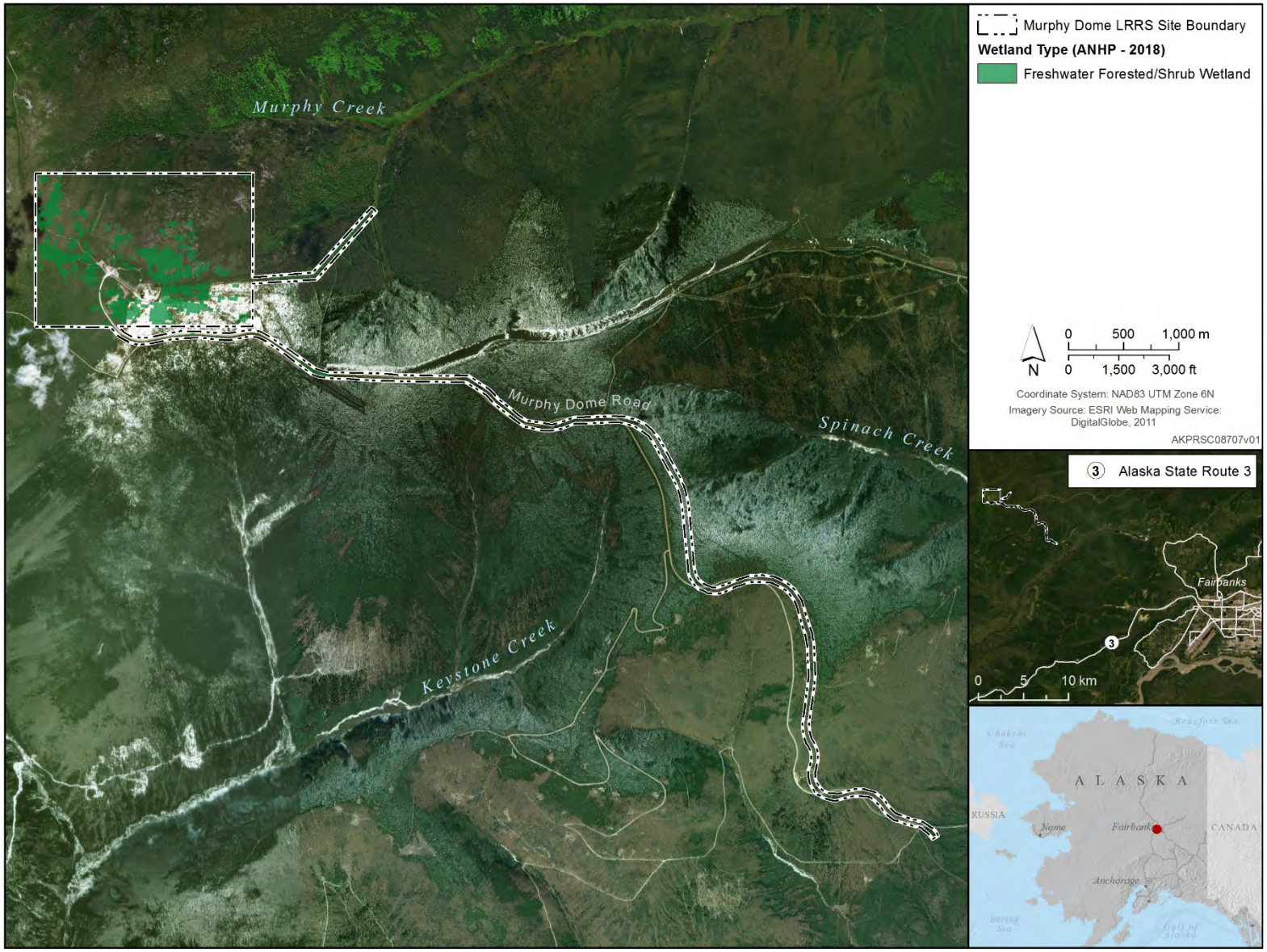

Figure H-84. Murphy Dome LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.11.9.4.3 Birds

The bird community at the Murphy Dome LRRS is typical of interior alpine tundra, low-shrub habitats, and forested areas of interior Alaska and 59 bird species have been observed (Table H-50). Nesting has been confirmed within or immediately adjacent to the site for alder flycatcher, bank and cliff swallows, dark-eyed junco, black-capped chickadee, American pipit, and savannah, fox, and white-crowned sparrows. Raptors in the area include northern harrier, American kestrel, sharp-shinned hawk, and great horned owl. Species potentially occurring at the LRRS include common raven, orange-crowned warbler, varied thrush, rosy finch, snow bunting, and horned lark (Boyer undated [b]; Pardieck et al. 2018).

H.11.9.5 ESA-listed Species

No ESA-listed species have been reported within the boundaries of Murphy Dome LRRS.

H.11.10 Other Natural Resources Information

H.11.10.1 Subsistence

Although Braund and Associates (2004) reported known subsistence information from areas adjacent to PRSC sites, Murphy Dome LRRS was not included. However, subsistence gathering, including hunting and fishing, likely occurs in the vicinity of Murphy Dome LRRS.

H.11.10.2 Outdoor Recreation

The area surrounding the LRRS provides hunting, target shooting, hiking and backpacking, wildlife viewing, and ATV riding opportunities. Most hunting is done by local residents; little hunting or fishing is done by installation personnel. The close proximity of Murphy Dome to the population center of Fairbanks and easy access afforded by public roads to the installation facilitates heavy use of the site by local residents for recreational ATV riding. ATV use has impacted vegetation in some areas. The Murphy Dome area is frequently used for biological and ecological studies by educators from grade school to university level (611 ASG 1995f).

H.11.11 Mission and Other Impacts on Natural Resources

H.11.11.1 Land Use

Murphy Dome LRRS structures include an FAA ground-air-ground (G/A/G) transmitter/receiver (GATR), MAR tower/building, 50-kW solar photovoltaic array, generator building, CONEX, and a 4,000-gal diesel AST. The active site, including the MAR and nearby structures, is completely fenced and secured. The area is used as a parking lot by nearby private landowners, backpackers and hikers, and bird watchers. In 1987 most structures were demolished and buried on site during a general cleanup of the LRRS. An underground fuel storage tank associated with the WACS support building was removed in 1993 (Argonne National Laboratory and CEMML 2013; 611 CES 2019).

Currently, the Air Force leases space to the USACE Cold Region Research Engineering Laboratory and a permit to the FAA is being renewed (611 CES/CEIA 2020).

H.12 OLIKTOK LRRS

H.12.1 Location and Area

Oliktok LRRS is about 400 miles north of Fairbanks and about 160 miles southeast of Barrow (Figure H-85 and Figure H-86). The LRRS occupies 750 acres on a peninsula of the Beaufort Sea adjacent to the Kuparuk and Prudhoe Bay oil fields. It is accessible by air, barge, or by car via the Dalton Highway and then through roadways operated and maintained by oil and gas companies.

Figure H-85. Aerial View of Oliktok LRRS Looking Northeast towards Oliktok Point

H.12.2 Installation History

Oliktok LRRS became operational in August 1957 as part of the northern Alaska DEW Line installations. The radar station was upgraded with a MAR in 1990 and re-designated part of the NWS as an LRRS, being controlled by the Pacific Air Forces 611 ASG (now 611 CES), based at JBER (Denfeld 1993). Demolition and debris removal occurred in 2006-2007. Current facilities consist of a multipurpose dormitory/power generation/radio operations building (Module Train A), a cold storage building/warehouse, vehicle maintenance building, air freight terminal (now used for storage), an abandoned 4,000-ft runway, fuel storage tanks, and several outbuildings (611 CES 2019).

H.12.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. Four contractor personnel who live onsite are responsible for the operation, maintenance, and support of the LRRS (611 CES 2019).

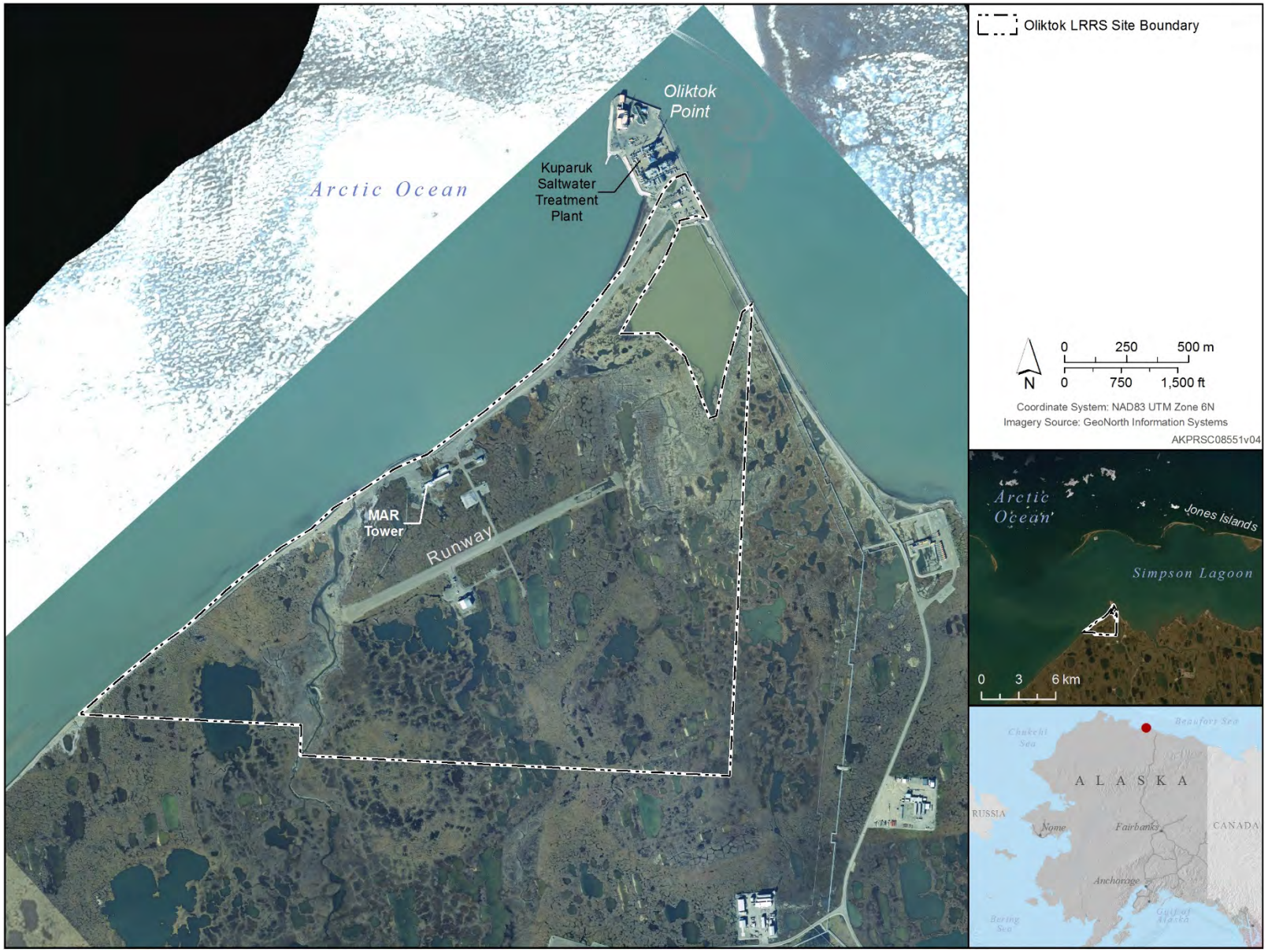

Figure H-86. Overview of Oliktok LRRS

H.12.4 Surrounding Communities

The LRRS is adjacent to the Kuparuk and Prudhoe Bay oil fields and associated support facilities (see the right side of Figure H-86). Oliktok LRRS is 33 miles northeast of the village of Nuiqsut. Nuiqsut has a population of 481 (2018 estimate). The majority of the population is Inupiat Eskimos practicing a traditional subsistence lifestyle. The Kuukpik Native Corporation, school, borough services, and the store provide most year-round employment in the village. Trapping and craft-making provide some income. Caribou, bowhead and beluga, seal, moose and fish are staples of the diet. Polar bears are also hunted. In most winters Nuiqsut is connected to the Oliktok/Kuparuk road system by an ice road (State of Alaska 2018, 2019).

The LRRS is 46 miles northwest of Prudhoe Bay. With a population of 2,174 (2018 estimate), Prudhoe Bay is a large work camp for the oil industry. All residents are employees of oil-drilling or oil-producation and support companies. Living quarters and food are provided to the workforce, and there are a number of recreational facilities (State of Alaska 2018, 2019).

H.12.5 Regional Land Use

The lands surrounding the Oliktok LRRS are state lands leased for oil and gas exploration.

H.12.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Oliktok LRRS.

H.12.7 Physical Environment

H.12.7.1 Climate

Oliktok LRRS is within the Arctic Climatic Zone, which is characterized by cold average temperatures and persistent strong winds. Summer high temperatures at Oliktok average in the mid-40s to mid-50s ºF, while average low winter temperatures range from -11 to -24 ºF. Precipitation averages 4 inches per year, including 32 inches of snow. Winds are generally from the east and average 14 mph for every month of the year (Table H-60) (611 ASG 1995c, Legare 1998).

Table H-60. Monthly Climate Averages for Oliktok, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	-11.9	-10.1	-5.2	10.1	28.8	45.2	55.4	51.0	38.3	21.0	0.9	-6.6
Avg. Low (ºF)	-24.0	-24.3	-20.3	-4.8	19.0	32.7	39.7	37.5	28.9	9.7	-11.0	-19.2
Avg. Precipitation (inches)	0.2	0.2	0.1	0.1	0.1	0.4	0.7	1.1	0.6	0.4	0.2	0.2
Avg. Snowfall (inches)	3.3	2.2	1.8	1.8	1.7	2.3	0	1.0	3.8	7.0	3.2	3.5

Source: 611 CES 2019.

H.12.7.2 Topography

Oliktok is located on the Arctic Coastal Plain and is characterized by low relief with elevations less than 33 ft MSL. The Coastal Plain is characterized by a gently undulating tundra surface mantled with thousands of small thaw lakes, which, along with the polygonal ground pattern, distinguish smaller-scale features of the physiography. Both the undulating tundra surface and polygonal ground pattern are related to permafrost (Wahrhaftig 1965).

H.12.7.3 Geology and Soils

The geology of the area is described in terms of bedrock and surficial components. Bedrock consists of Cretaceous and Tertiary marine shales, mudstones, siltstones, and sandstones. No bedrock outcrops occur

due to the relatively thick (up to 150 ft) mantle of unconsolidated Quaternary sediments (611 ASG 1995c). At Oliktok LRRS these unconsolidated surficial sediments consist of shallow water, marine materials deposited during periods of higher sea levels. Marine deposits are primarily sandy silts containing scattered pebbles and beds or lenses of clay, sand, and fine gravel. Marine sediments are mantled by 6-10 ft of late Pleistocene and Holocene thaw-lake sediments, consisting of peat and muds, commonly with a mixture of coarser pebbles, cobbles, and boulders. Although surficial sediments are unconsolidated, they are perennially bounded by frozen interstitial pore water (i.e., permafrost) (Hopkins and Hartz 1978).

The mainland coast and LRRS consist primarily of low, rapidly eroding tundra cliffs with associated fringing beaches. Accretional landforms occur locally and include small recurve spits, barriers, and deltas. Tundra cliffs are low in height, approximately 6 ft, and contain significant quantities of ice and peat. Coastal retreat rates of 3-6 ft/year are not uncommon on these cliffs (Cannon 1977, Dygas and Burrel 1976), and retreat rates of up to 30 ft/year have been documented (Lewellen 1977).

Dominant soils are wet, cold Inceptisols. Upland soils are poorly drained clayey soils. Soils on south slopes and low moraines are well drained and loamy; lowland soils are deep, wet, and silty (Bailey et al. 1994; McNab and Avers 1994).

H.12.8 Hydrology

H.12.8.1 General

The Arctic Coastal Plain is very poorly drained and consequently is very marshy in summer. Surface drainage on the Arctic Coastal Plain is from south to north and occurs as sheetflow and shallow creek runoff from near the coast. Runoff may also follow natural depressions and improved trenches and ditches. Infiltration may occur to a limited extent down to the upper surface of the underlying permafrost during summer. The presence of permafrost throughout the area precludes the development of groundwater as a drinking water source. As is the case at other northern sites, a large freshwater lake or river with a deep channel provides drinking water. A salt marsh lagoon is northeast of the LRRS (611 ASG 1995c).

The LRRS is located in the eastern drainage basin but near the border of the central or Colville River drainage basin. Located approximately 10 miles west of the LRRS, the Colville River is the largest river in northern Alaska, draining 24,000 miles^2. Flow of the Colville River water over the ice during spring may reach as far east as Oliktok (611 ASG 1995c).

H.12.8.2 Floodplains

There are no data on flooding in this area caused by rainfall. A severe rainfall could inundate all but the highest ground because drainage is poor. The greater flood threat comes from coastal storms. All land readily visible surrounding facilities contained flotsam (driftwood), indicating that it had once been inundated. A 1970 storm washed away several hundred feet of runway at Oliktok, with flood waters as high as 10 ft. A 1975 coastal storm surged to 9.5-10 ft MSL. Due to limited data, no reliable estimate could be made of the 100-year flood level, but it would be at least 10 ft MSL (Legare 1998).

All installation facilities are situated on gravel pads and roads. Wind-driven rains of coastal storms are severe enough to seriously erode these gravel pads and hinder access to and around the installation.

H.12.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Oliktok LRRS. Attachment 4 contains lists of vascular plants (Table H-20), fish (Table H-21), mammals

(Table H-22), and birds (Table H-23) known to occur or potentially occurring in the Oliktok area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Oliktok site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.12.9.1 Ecoregion Classification

The Oliktok site is located in the Beaufort Coastal Plain ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.12.9.2 Vegetation/Habitat

A general vegetation map of the Oliktok LRRS was prepared in 1995 (611 ASG 1995d). Schick et al. (2004) made significant improvements in vegetation mapping using 2000 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. Wells et al. (2010) updated this mapping and data analysis using 2005 QuickBird aerial photos. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 4 habitat classes were identified (Table H-61 and Figure H-87). A list of vascular plants known to occur or potentially occurring in the Oliktok area is provided in Table H-20.

Table H-61. Habitat Classes at Oliktok LRRS (2017)

Habitat Class	Acres	Proportion
Marsh	473.8	63.2%
Developed and Barren Land	212.8	28.4%
Open Water	47.8	6.4%
Shrub or Scrub	15.6	2.1%
Total	**749.9**	

Source: CEMML 2019a.

Over half of the Oliktok site is considered marsh habitat. Although small in area, numerous small freshwater ponds are scattered throughout the LRRS, and this is one of the defining features that separates Oliktok from the other northern coastal LRRS. The most widespread vegetation type found on the site is cottongrass-tussock, which grows along with sedges, dwarf shrubs, lichens, mosses, dwarf birch, Labrador-tea, and cinquefoil. Pendent grass is an important emergent species on the shorelines and in the shallowest zones of ponds (Schick et al. 2004; Wells et al. 2010).

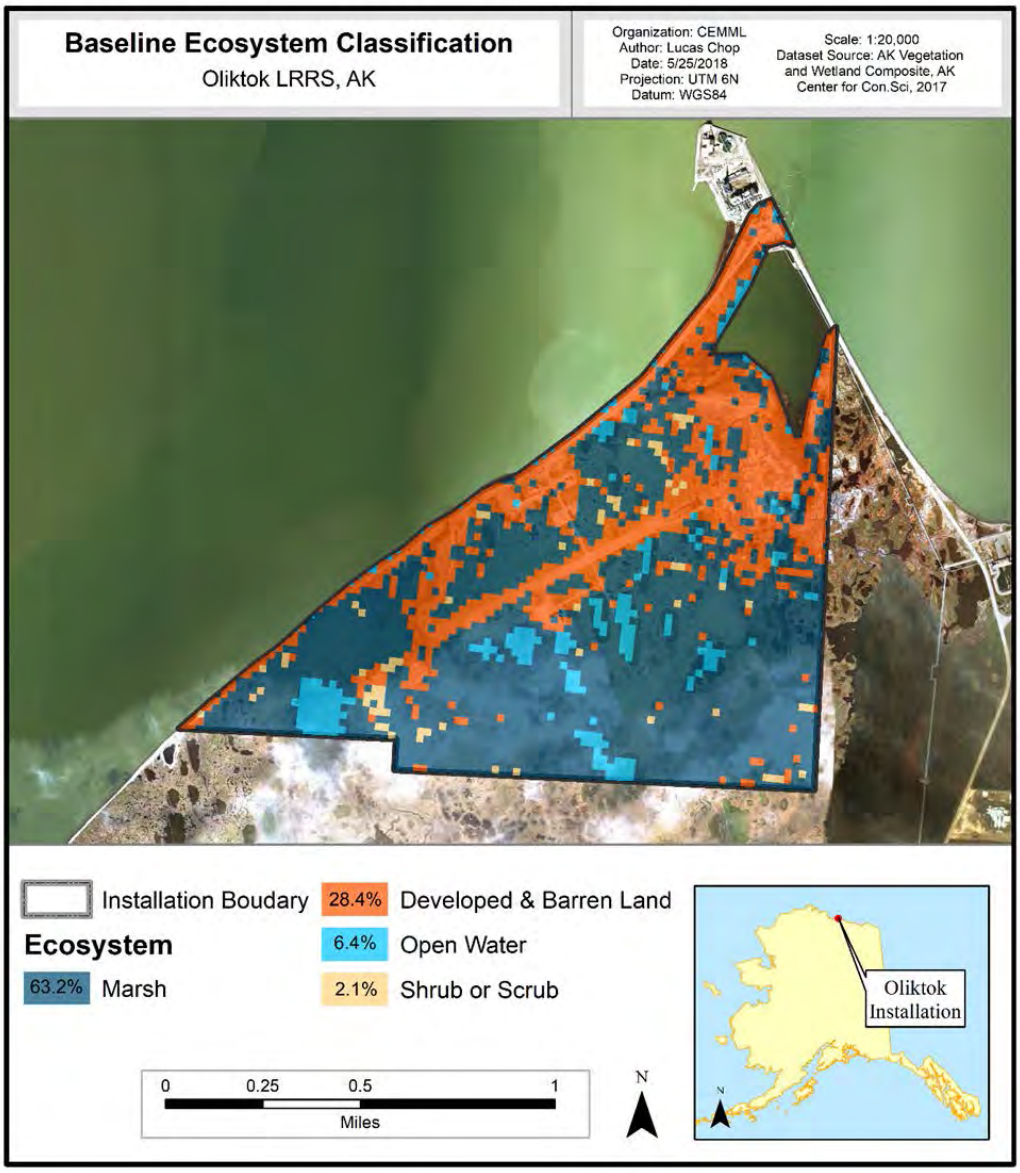

Figure H-87. Oliktok LRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

H.12.9.3 Wetlands

The current mapping of wetlands at the Oliktok LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 750-acre Oliktok site, 718 acres (or 72%) are considered wetlands per the NWI mapping (Table H-62 and Figure H-88). The most common wetland type at the Oliktok LRRS is freshwater emergent. These areas are typically moist and wet tundra, and are either saturated, seasonally flooded or semi-permanently flooded, depending on microtopography and landscape position. These areas are often

dominated by sedges (*Carex* spp.) and cotton grass (*Eriophorum* spp.) Other wetlands include deep or shallow ponds and seasonally flooded emergent areas mixed with mosses and/or lichens. Estuarine habitats are common in the northeastern part of the site and include estuarine, subtidal, unconsolidated bottom areas, bordered by estuarine, intertidal emergent vegetation that is irregularly flooded from storm events (Schick et al. 2004).

Table H-62. Oliktok LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*(1)		2018 ANHP†(2)	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	541.3	72.2%	238.6	31.9%
Estuarine and Marine	114.9	15.3%	9.7	1.3%
Freshwater Pond/Lake	57.4	7.7%	37.6	5.0%
Estuarine and Marine Deepwater	4.0	0.5%	0	0
Riverine	0.5	<0.1%	192.5	25.7%
Wetlands Total	**718.1**	**95.8%**	**478.4**	**63.9%**
Upland	31.8	4.2%	270.7	36.1%
Site Total	**749.9**		**749.1**	

Notes: *See Figure H-88. †See Figure H-89.
Sources: (1)USFWS 2019d. (2)Flagstad et al. 2018.

H.12.9.4 Fish and Wildlife

H.12.9.4.1 Fish

Although there are no surface waters on the LRRS that support fish populations, 18 species of fish have been recorded within the vicinity of the Oliktok site including Arctic char, Arctic cisco, Bering cisco, rainbow smelt, humpback whitefish, fourhorn sculpin, and pink and chum salmon (Table H-21). Anadromous fish use nearshore waters of the Beaufort Sea for feeding and migration. The Ugnuravik River, located 2 miles to the southeast of the LRRS, is the closest anadromous stream and supports broad whitefish, least ciscoe, and other species of whitefish (Johnson and Blossom 2019b).

H.12.9.4.2 Mammals

Terrestrial Mammals

Ten terrestrial mammal species have been observed or potentially occur on or in the vicinity of the Oliktok site (Table H-22). Small mammals include Arctic ground squirrel, brown and collared lemmings, and red and Arctic foxes, as well as ermine and least weasel (611 ASG 1995c). Caribou and muskox are the most conspicuous terrestrial mammals occurring in and around the LRRS. The LRRS and surrounding area have been identified as summer calving and insect relief areas for the Central Arctic caribou herd. Muskox concentrate within the area surrounding the Oliktok site during April-June and October. Although brown bears are considered rare within the vicinity of Oliktok, the area approx. 4 miles south of the LRRS has been identified as a high concentration area (ADNR 2014b).

Marine Mammals

Pacific walrus, three species of seal, five species of whale, and polar bear occur in the region (Table H-22). Marine mammals are discussed in detail in Section H.12.9.5 (ESA- and MMPA-listed Species).

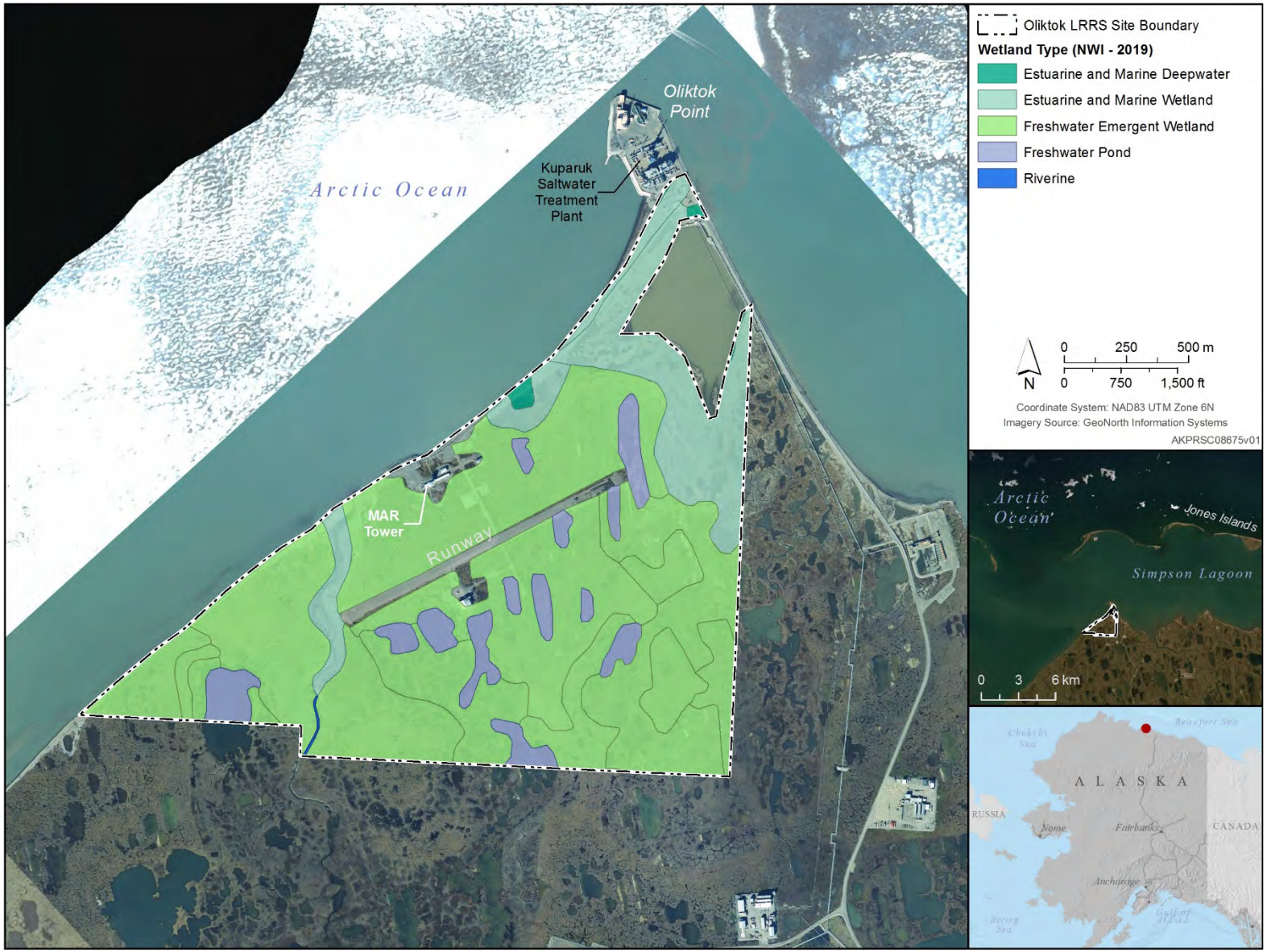

Figure H-88. Oliktok LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

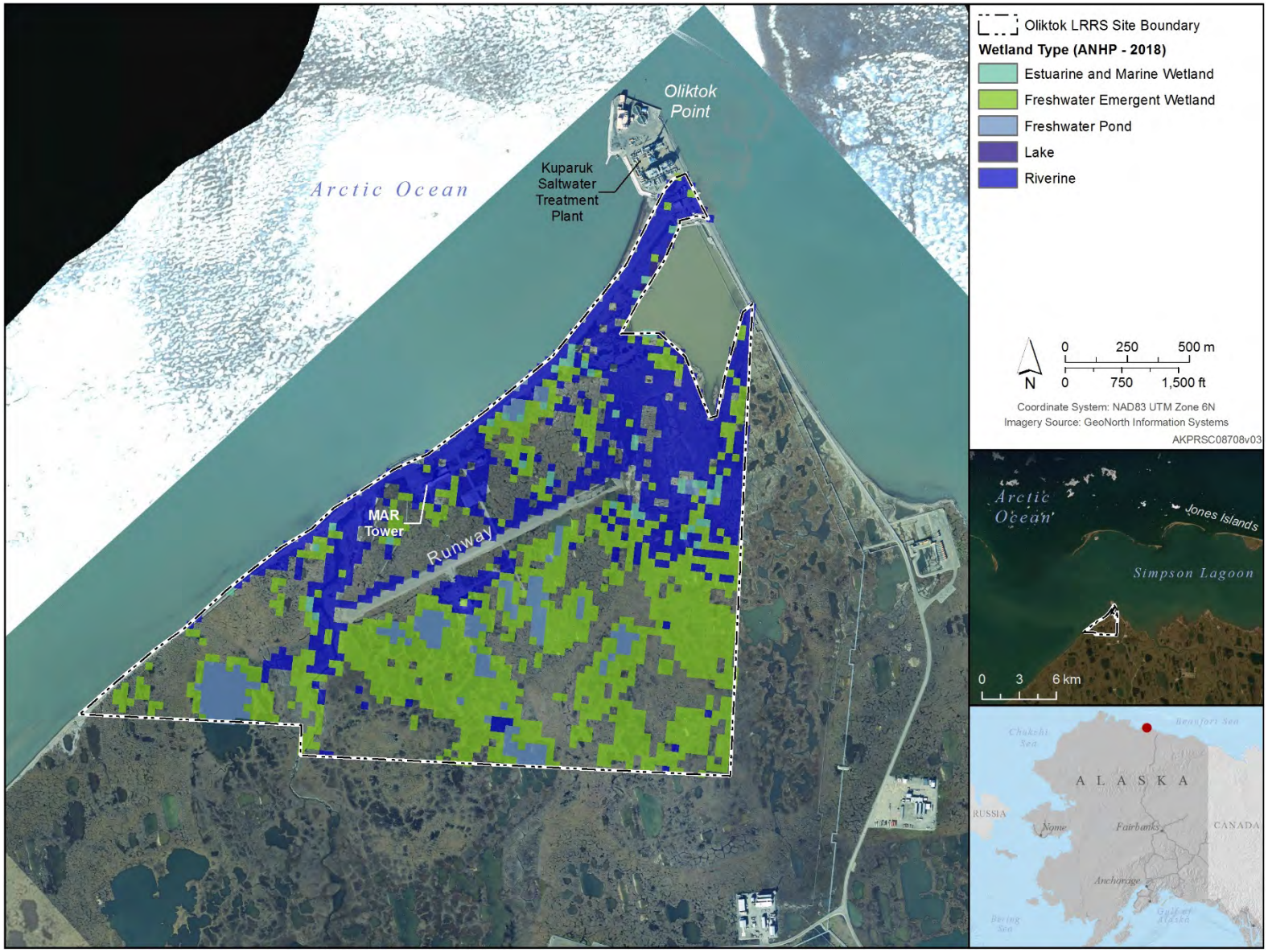

Figure H-89. Oliktok LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.12.9.4.3 Birds

A total of 68 bird species have been recorded at the Oliktok LRRS (Table H-23). The wet tundra environment of the Oliktok region provides good nesting and foraging habitat for a wide variety of shorebirds, waterfowl, and passerines. Brant use the estuarine marsh east of the site and sites west of the LRRS for resting and foraging. Common eider, Arctic tern, glaucous gull, and black guillemot use offshore barrier islands for nesting. Sea ducks that frequent nearshore areas include king eider, common eider, long-tailed duck, scoters, and red-breasted merganser. Other common waterfowl of the area include white-fronted goose, Canada goose, brant, tundra swan, American wigeon, mallard, green-winged teal, northern shoveler, northern pintail, greater scaup, and red-throated and Pacific loons. Several species of shorebirds frequent ponds and small lakes in and around the site including American golden-plover, semipalmated plover, ruddy turnstone, semipalmated sandpiper, pectoral sandpiper, dunlin, long-billed dowitcher, red-necked phalarope, and red phalarope. A large influx of passerine birds occurs in summer as a result of hordes of insects that breed and hatch in wetlands. Snow bunting, savannah sparrow, and lapland longspur are common. Predatory species, such as parastic and long-tailed jaegers, snowy owl, gyrfalcon, and common raven are common in the area, particularly when lemming and ground squirrel populations are high (Stickney 1997; 611 ASG 1995c; Ritchie et al. 2003).

Important Bird Areas (IBAs)

The Oliktok LRRS is adjacent to the Beaufort Sea Nearshore IBA (Figure H-29). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The Beaufort Sea Nearshore IBA occupies 6,800 mi^2 of pelagic open water habitat in the Beaufort Coastal Plain ecoregion within the Beaufort Sea-continental coast and shelf. The Beaufort Sea Nearshore is an IBA for large breeding populations of glaucous gull and long-tailed duck (Audubon Alaska 2014).

H.12.9.5 ESA- and MMPA-listed Species

Six ESA-listed species potentially occur on or in the vicinity of the Oliktok LRRS: threatened spectacled and Steller's eiders, threatened polar bear, threatened ringed and bearded seals, and endangered bowhead (Table H-22 and Table H-23 and INRMP Table 6). The polar bear, ringed and bearded seals, and bowhead are also listed under the MMPA. Four additional species are listed under the MMPA and occur on site or in the vicinity: Pacific walrus, killer whale, beluga, and spotted seal.

ESA-listed Species

Spectacled and Steller's Eiders. Oliktok LRRS has been identified as one of the five PRSC sites along the northern Arctic coast (Point Lay, Point Barrow, Point Lonely, and Bullen Point are the others) with the greatest potential for nesting spectacled eiders and little potential for nesting Steller's eiders. However, neither species has been recorded as nesting within the LRRS or in the immediate vicinity based on surveys conducted during 1994-2007 (Day et al. 1995; Day and Rose 2000; Ritchie et al. 2003; Oasis Environmental, Inc. 2008). The remains of an old (1993) nest of what was probably a spectacled eider was found on the site in 1994 (Day et al. 1995). A pair of spectacled eiders were observed at the Oliktok LRRS during a spring 2001 survey (Kendall et al. 2001). The presence of the pair of spectacled eiders in the spring may indicate that this species at least attempted to breed at or near the site. There have been regular observations of pre-breeding pairs on the Oliktok LRRS, but the nearest broods have been south of site and aerial surveys regularly record spectacled eiders in the Oliktok area (Day et al. 1995; Ritchie et al. 2003; Schick et al. 2004). A spectacled eider may have nested on the marsh near the Oliktok LRRS in 1992 (611 ASG 1995c).

In 2003, a spectacled eider habitat assessment was conducted at the Oliktok LRRS (Figure H-90). Although high-value spectacled eider nesting habitat was identified in the southern and eastern portions of the LRRS, no spectacled eiders (or Steller's eiders) were recorded at the Oliktok LRRS during pre-breeding aerial surveys or ground-based nesting surveys (Schick et al. 2004).

Polar Bear. Polar bears often travel the shoreline of Oliktok, especially in the fall when they travel east to west following the bowhead whale migration. Natives of the village Nuiqsut hunt whales in the fall and polar bears feed on the butchered whale carcasses along the coast, including Oliktok (PRSC 2020). Denning habitat is immediately south of the LRRS, and historical (1910-2010) denning sites are 2 miles to the north (ADNR 2014b; Smith et al. 2017). Denning (female) polar bears may be present from November to March although they are dormant (PRSC 2020). During the winter, male polar bears forage on sea-ice or terrestrial areas within the vicinity of the LRRS (Wynne 1993; Smith et al. 2017). As females emerge from their dens with their young in the spring, they will forage on the pack ice and nearshore areas of Oliktok (Smith et al. 2017).

Although the Oliktok LRRS has been excluded from polar bear critical habitat designation (USFWS 2010), the surrounding terrestrial area is within denning critical habitat and the nearby barrier islands are considered barrier island critical habitat that also includes a 1-mile no disturbance zone (Figure H-30 and Figure H-31). In addition, the adjacent marine waters are considered sea ice critical habitat (Figure H-32).

Ringed and Bearded Seals. Both ringed and bearded seals can be found along the coast of Oliktok year-round (Smith et al. 2017). Ringed seals may den in the Oliktok area during winter/spring (Smith et al. 2017) and the coastal waters are considered a major adult area in February-June (ADNR 2014b). In 2014, the marine waters adjacent to the Oliktok site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bowhead. The offshore waters of Oliktok are considered major adult areas for bowhead during June-September (ADNR 2014b). The offshore waters are also areas of concentrated bowhead use during spring and fall migration as well as during summer when calves accompany their mothers and feed along the nearshore waters of the Beaufort Sea (Smith et al. 2017).

Other MMPA-listed Species

Pacific Walrus. Although the summer range of walrus includes the southern Beaufort Sea and coastline, they are considered uncommon to rare in the Oliktok area (Smith et al. 2017; PRSC 2020). There are two historical walrus haulouts 27 and 45 miles east of the Oliktok LRRS (Figure H-91). Both of these supported fewer than 10 individuals and the last recorded use was during 2000-2010 (Fishbach et al. 2016).

Whales. The killer whale and beluga are uncommon in the offshore waters of the LRRS. Gray whales may occasionally occur in offshore waters in April-December (ADNR 2014b).

Seals. Spotted seals are common along the coast of Oliktok during June-December (ADNR 2014b).

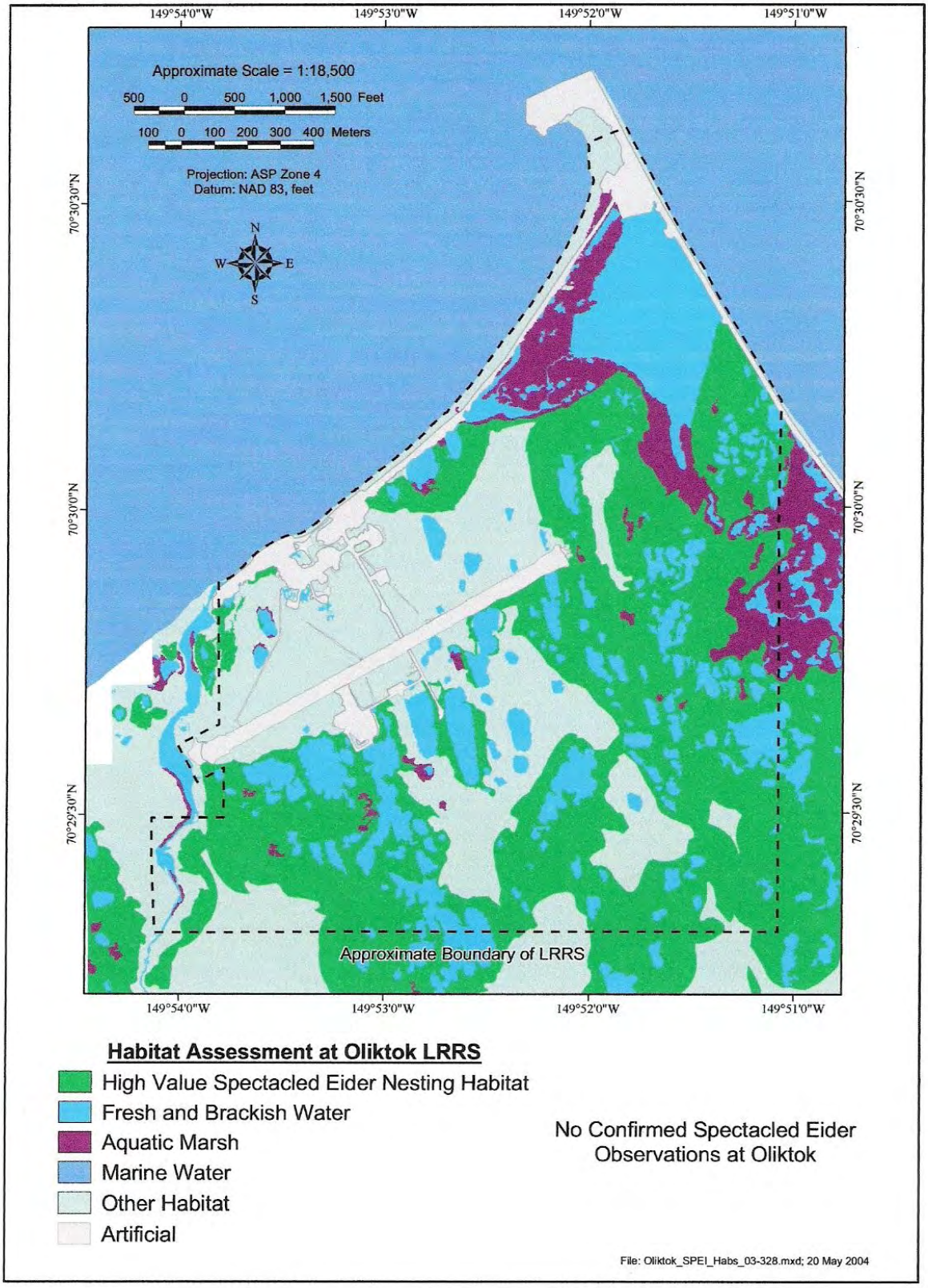

Figure H-90. 2003 Spectacled Eider Habitat Assessment at the Oliktok LRRS
(*Source*: Schick et al. 2004)

Figure H-91. Historical Walrus Haulouts in the Vicinity of Oliktok LRRS and Bullen Point SRRS
(*Source*: Fischbach et al. 2016)

H.12.10 Other Natural Resource Information

H.12.10.1 Subsistence

Traditional subsistence activities in the Nuiqsut area have revolved principally around caribou and fish. Marine mammals (e.g., polar bear, bowhead, seals), moose, waterfowl, bird eggs, and furbearers have also been important although secondary (Braund and Associates 2004; Smith et al. 2017). Nuiqsut is one of 10 Alaska Eskimo Whaling Commission communities; whaling is based from Cross Island, a considerable travel distance from Nuiqsut (Oliktok is approximately midway between). The Nuiqsut subsistence use area includes the area between Harrison and Camden bays. Of primary importance is the Colville River area. Three species (caribou, whitefish, and bowhead) account for about 88% of Nuiqsut's annual subsistence harvest in terms of edible pounds. Subsistence activities are an important component of the Nuiqsut economy and the local Inupiat culture (Braund and Associates 2004).

H.12.10.2 Outdoor Recreation

Natural resources uses at Oliktok LRRS consist primarily of non-organized activities such as fishing. Recreational fishing occurs in streams and rivers near the site and in the Arctic Ocean for whitefish, cisco, salmon, and Arctic char. Caribou infrequently move through the installation in large herds. The adjacent oil development is open to hunting; however, access is controlled (personal communication, P. Cooley 2007).

H.12.11 Mission and Other Impacts on Natural Resources

H.12.11.1 Land Use

Facilities

The primary building is Module Train A, which includes living quarters, communications equipment rooms, and the MAR tower. The LRRS also has a vehicle maintenance shop, cold storage building, and five, 4,000-gal diesel fuel tanks. The airfield is maintained by Italian oil producer ENI for use as an emergency medevac runway to back up its helipad. The decommissioned air freight terminal at the airfieldp is used by Fairweather/Sandia Labs for Arctic research (611 CES 2019).

Roads

Primary access to the site is through oil company roads from Prudhoe Bay/Deadhorse, approximately 60 miles to the east. Emergency landings at the Oliktok LRRS airfield are permitted (personal communication, N. Hilton with G. Augustine 1999). The main access road is a gravel road approximately 4,200 ft long from the Kuparuk Saltwater Treatment Plant at Oliktok Point, along the shoreline of the Beaufort Sea to the LRRS. This section of road is maintained by the BOS contractor. The main access road is exposed to storm action, and has been washed out numerous times.

Since site access is primarily achievable through land controlled by private oil companies, site personnel and others working temporarily at the site, as a courtesy and imperative if a weapon is being carried, should make prior contact with oil companies' security offices. The BP Exploration (Alaska)-leased Prudhoe Oil Field and the Conoco Philips Alaska Incorporated-leased Kuparuk Oil Field are controlled access areas. Public access ends about 50 miles east of Oliktok at the Deadhorse/Prudhoe Bay state airport and at the end of the Dalton Highway, a state road.

Use of private oil industry roads is not allowed for recreation. Access is limited to persons with business in the oil companies' leased areas, residents of Nuiqsut and adjacent areas, and persons with official Air Force business at Oliktok LRRS via the oil field road system.

Access by Air

Access by air to Oliktok LRRS is provided through the airport at Deadhorse, approximately 46 miles southeast of Oliktok. Both Raven Air and Alaska Air fly commercially into Deadhorse, with Northern Air Cargo and Hageland Aviation Services also providing cargo and other charter services.

Leases and Easements

The Italian oil and gas company Ente Nazionale Idrocarburi (Eni) has a current easement and a lease for Eni is in the renewal process. The Air Force has applied to the State of Alaska, DNR for an easement for a new access road (611 CES/CEIA 2020).

H.13 POINT BARROW LRRS

H.13.1 Location and Area

The 243-acre Point Barrow LRRS is located on the coast of the Chukchi Sea, 3 miles northeast of the city of Utqiagvik (formerly known as Barrow), the northernmost U.S. city (Figure H-92 and Figure H-93). The LRRS is 725 miles north-northwest of Anchorage and 500 miles northwest of Fairbanks.

Figure H-92. Ground-level View of Point Barrow LRRS

H.13.2 Installation History

Point Barrow was selected as the headquarters for construction of the DEW Line system. During World War II the Navy established a camp at this northernmost point of our nation. All essentials of a working headquarters and base of supply for the DEW Line project were available, including a landing strip, warehouses, and barracks. It was in the heated hangar at Point Barrow that the first module, the basic building block of the DEW Line station, was assembled and mounted on sledlike bases for transport to more than 18 sites, located at approximately 50-mile intervals. The two main DEW stations in Alaska were at Point Barrow and Barter Island. In the mid-1980s the Point Barrow DEW Line site was upgraded into a North Warning LRRS with a MAR (Denfeld 1993).

Clean Sweep demolition and debris removal of older structures at Point Barrow LRRS occurred in 2011. The site is currently configured with a Module Train Facility divided into Module Trains A and B, connected by an elevated pedestrian walkway. Module Train A has two bedrooms, equipment work areas, offices, mechanical rooms with water and sewer storage, dining, kitchen, and recreation areas, and access to the MAR tower. Module Train B includes the power plant, personnel sleeping quarters, electronic equipment, and an office (611 CES 2019).

Figure H-93. Overview of Point Barrow LRRS

H.13.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. Three contractor personnel who live onsite are responsible for the operation, maintenance, and support of the LRRS (611 CES 2019).

H.13.4 Surrounding Communities

The city of Utqiagvik is the largest native community in Alaska with a population of 5,256 (2018 estimate) persons. Most residents are Inupiat Eskimos. Traditional marine mammal hunts and other subsistence practices are an active part of the culture. Utqiagvik is the economic center of the North Slope Borough, the city's primary employer. The Arctic Slope Regional Corporation and offices of several subsidiaries are based in Utqiagvik. A number of federal agencies maintain facilities at Utqiagvik, including the National Weather Service, FAA, Bureau of Indian Affairs, and Public Health Service (State of Alaska 2018, 2019). Browerville is a suburb of Utqiagvik and is located between the LRRS and Utqiagvik.

H.13.5 Regional Land Use

Traditionally, Barrow is known as Utqiagvik or Ukpeagvik (place where owls are hunted). The Inupiat (northern Eskimo) of the area have traditionally depended on marine mammal hunting, supplemented by fishing and trapping. In 1923 the Naval Petroleum Reserve (now National Petroleum Reserve – Alaska) was established, followed by the establishment of the Naval Arctic Research Laboratory, 3 miles north of Utqiagvik. With exception of about 680 acres (still under Navy responsibility), the former Naval Arctic Research Laboratory is under private ownership and is called Ukpeagvik Inupiat Corporation Naval Arctic Research Laboratory. Most of the land surrounding the LRRS is native land while areas further east and south are managed by the BLM as part of the National Petroleum Reserve (North Slope Borough 2019b).

H.13.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Point Barrow LRRS.

H.13.7 Physical Environment

H.13.7.1 Climate

Point Barrow falls within the arctic climate zone, characterized by seasonal extremes in temperature. With the Arctic Ocean to the west, north, and east and flat tundra stretching 200 miles to the south of Point Barrow, there are no natural barriers to the persistent cold easterly winds that blow around the edge of the high pressure area over the North Pole. Winters are long and harsh, and summers are short but warm. The Chukchi Sea is typically ice-free from mid-June through October. The sun does not set in the area between May 10 and August 2 each summer and does not rise between November 18 and January 24 each winter.

Daily summer temperatures only average in the upper 30s and low 40s °F; the average low from November through April is well below 0 °F (Table H-63). The daily minimum temperature is below freezing at least 300 days of the year. Prevailing winds are easterly and average 13 mph. Precipitation is light year-round, averaging about 5 inches annually. Most annual precipitation occurs as rain in July-September. Snowfall occurs every month of the year and averages 33 inches annually. Most snow occurs during September through November, and the least falls in summer.

Table H-63. Monthly Climatic Averages for Utqiagvik, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	-7.4	-10.6	-7.9	7.0	24.7	38.9	45.8	43.3	34.9	20.7	5.8	-4.4
Avg. Low (ºF)	-19.9	-22.7	-20.6	-6.8	15.3	30.1	34.1	34.0	28.2	11.6	-5.4	-16.2
Avg. Precipitation (inches)	0.2	0.2	0.1	0.2	0.2	0.3	0.9	1.0	0.7	0.5	0.3	0.2
Avg. Snowfall (inches)	2.4	2.7	2.0	2.8	2.3	0.6	0.3	0.7	4.0	7.7	4.3	2.8
Avg. Wind Speed (mph)	11.9	12.1	15.4	13.8	13.9	11.9	11.5	12.7	0	14.6	15.5	12.0
Prevailing Wind Direction	ENE	E	E	E	E	E	E	E	E	E	E	ENE

Note: *nd = no data.
Source: 611 CES 2019.

H.13.7.2 Topography

Point Barrow LRRS is located in the extreme northwestern portion of the Arctic Coastal Plain on the coast of Chukchi Sea, southwest of Point Barrow. The low relief of the Point Barrow area and the presence of permafrost have promoted the formation of ice wedge polygons, large elliptical lakes, and thaw lakes.

H.13.7.3 Geology and Soils

The geology of the Arctic Coastal Plain is relatively well characterized, primarily due to the extensive exploration for petroleum that has occurred in the region. Bedrock in the region forms a broad, low-relief surface known as the North Beringian Marine Abrasion Platform. The uppermost bedrock unit in the Barrow area, which consists primarily of shale, is not exposed on the surface, but is commonly found in boreholes at depths ranging from 10 to 30 m. The bedrock is overlain by unconsolidated marine, eolian, and lacustrine-lagoonal deposits. These deposits are a mixture of sand, silt, gravel, and clay, and shallow ground water in the Barrow area generally occurs entirely within the uppermost materials. In coastal areas, deposits include sand dunes and beach gravels. The Barrow airport facility was constructed on one of these dunes (McCarthy 1994).

Soils in the Barrow vicinity are generally characterized by thick accumulations of organic matter at the surface, persistent cold temperatures, shallow permafrost, and very high moisture contents. The considerable organic content of these soils is due largely to the persistent cold temperatures, which restrict biodegradation and thus promote the accumulation of organic material from vegetation. Because organic material has a lower thermal conductivity than mineral soils, it serves to insulate the underlying permafrost. As a result, where the ground surface has not been disturbed, the depth of the active layer is generally limited to the top 20 inches; in disturbed areas, the depth of the active area can extend to 5 ft (McCarthy 1994).

Physical churning of the soils above the permafrost results from cyclic freezing and thawing. Because of this churning, distinct soil layers are often absent and organic material from plants at the surface is commonly distributed downward. Cyclic freezing of the soils also causes contraction cracks to form. Such cracks may fill with water, which subsequently freezes and cracks. As this cycle repeats, the fissures grow. Extensive networks of interconnected cracks, referred to as patterned ground or ice-wedge polygons, are common in the Barrow area (McCarthy 1994).

The soils throughout the area generally have a very fine-grained texture and are characterized by high porosity and low permeability. However, gravelly soils also occur in the area, particularly near the beach. The permeabilities of soils in the area thus span several orders of magnitude. All soils, however, have a substantially reduced permeability to water once their temperature drops below freezing. As a result, hydraulic conductivities are extremely low for most of the year, and vertical movement of water is restricted year round by the presence of near-surface permafrost (McCarthy 1994).

H.13.8 Hydrology

H.13.8.1 General

Point Barrow LRRS lies between two water bodies, Imikpuk Lake to the west and North Salt Lagoon to the east, which are separated by less than 700 ft. Surface drainage originating from the installation flows either to the lake or the lagoon. The proximity of permafrost to the surface and the great depths to which it extends largely control hydrology in the Point Barrow area. Permafrost is much less permeable than unfrozen ground and thus acts as a hydrologic confining layer, limiting the vertical movement of water. The presence of this shallow confining layer greatly impedes infiltration and, as a result, water remains at the surface or within the shallow subsurface. The permafrost thus isolates the near-surface flow system, including surface water and ground water within the active layer, from the deeper, regional flow system (McCarthy 1994).

The Barrow groundwater regime is controlled by an extensive permafrost layer underlying the entire region. Groundwater use is limited due to the ephemeral nature of the active zone and because much of the groundwater is brackish. Suprapermafrost groundwater, groundwater occurring above the permafrost zone, occurs only in summer thaw months and extends to a maximum depth of 20 inches. With saturated conditions that exist during portions of the summer thaw period, it is difficult to delineate between surface water and this groundwater (McCarthy 1994).

H.13.8.2 Floodplains

There is no data on flooding caused by rainfall at this site. A severe rainfall event could inundate all but the highest ground due to poor drainage. The greatest flood threat comes from coastal storms. The flood of record was the coastal storm of October 3, 1963, which caused a surge to 12 ft MSL. Several other storms in the 20th Century were recorded with storm surges to 10 ft MSL. The 100-year flood level is 12 ft MSL. Essentially all natural terrain of Point Barrow LRRS is within the 100-year flood plain (Legare 1998).

H.13.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Point Barrow LRRS. Attachment 4 contains lists of vascular plants (Table H-20), fish (Table H-21), mammals (Table H-22), and birds (Table H-23) known to occur or potentially occurring in the Point Barrow area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Point Barrow site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.13.9.1 Ecoregion Classification

The Point Barrow site is located in the Beaufort Coastal Plain ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.13.9.2 Vegetation/Habitat

A general vegetation map of the Point Barrow LRRS was prepared in 1995 (611 ASG 1995c). Schick et al. (2004) made significant improvements in vegetation mapping using 2000 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Point Barrow LRRS using the most recent imagery found on Google Earth. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 5 habitat classes were

identified (Table H-64 and Figure H-94). A list of vascular plants known to occur or potentially occurring in the Point Barrow area is provided in Table H-20.

Table H-64. Habitat Classes at Point Barrow LRRS (2017)

Habitat Class	Acres	Proportion
Wetlands	150.2	61.8%
Open Water	48.4	19.9%
Developed & Barren Land	38.9	16.0%
Sedge or Herbaceous	4.9	2.0%
Tussock Tundra	0.7	0.3%
Total	**243.1**	

Source: CEMML 2019a.

Freshwater wetlands dominate the site (Figure H-94) and are discussed in detail below. Approx 20% of the site has open water habitat associated with Imikpuk Lake to the west and North Salt Lagoon to the north. The remainder of the site is primarily developed/barren areas associated with the LRRS facilities and roads.

H.13.9.3 Wetlands

The current mapping of wetlands at Point Barrow LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 243-acre Point Barrow site, 194 acres (or 80%) are considered wetlands per the NWI mapping (Table H-65 and Figure H-95). Wetlands of Point Barrow LRRS include both tidal and non-tidal wetlands. Tidal wetlands at the site include estuarine subtidal with unconsolidated bottom areas bordered by estuarine, intertidal, persistent emergent vegetation that is irregularly flooded. Non-tidal wetlands at Point Barrow are predominately palustrine emergent areas that are saturated, seasonally flooded, or semi-permanently flooded. These areas are typically moist and wet tundra, and are either saturated or seasonally flooded, depending on microtopography and landscape position. These areas are typically dominated by sedges (*Carex* spp.) and cotton grass (*Eriophorum* spp.) (Schick et al. 2004).

Although there is an abundance of smaller shallow waterbodies at the site, freshwater ponds with islands and/or polygonized margins, which provide habitat for nesting waterbirds, are rare. Coastal salt marsh occurs along the shoreline of the brackish lake in the northern portion of the site (Schick et al. 2004).

Table H-65. Point Barrow LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

	2019 NWI*[(1)]		2018 ANHP†[(2)]	
Wetland Type	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	194.3	79.9%	157.5	64.7%
Estuarine and Marine	21.1	8.7%	15.7	6.4%
Estuarine and Marine Deepwater	9.4	3.9%	0	0
Riverine	0.2	<0.1%	20.2	8.3%
Freshwater Pond/Lake	0	0	34.4	14.1%
Wetlands Total	**225.0**	**92.6%**	**227.8**	**93.5%**
Upland	18.1	7.4%	15.8	6.5%
Site Total	**243.1**		**243.6**	

Notes: *See Figure H-95. †See Figure H-96.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

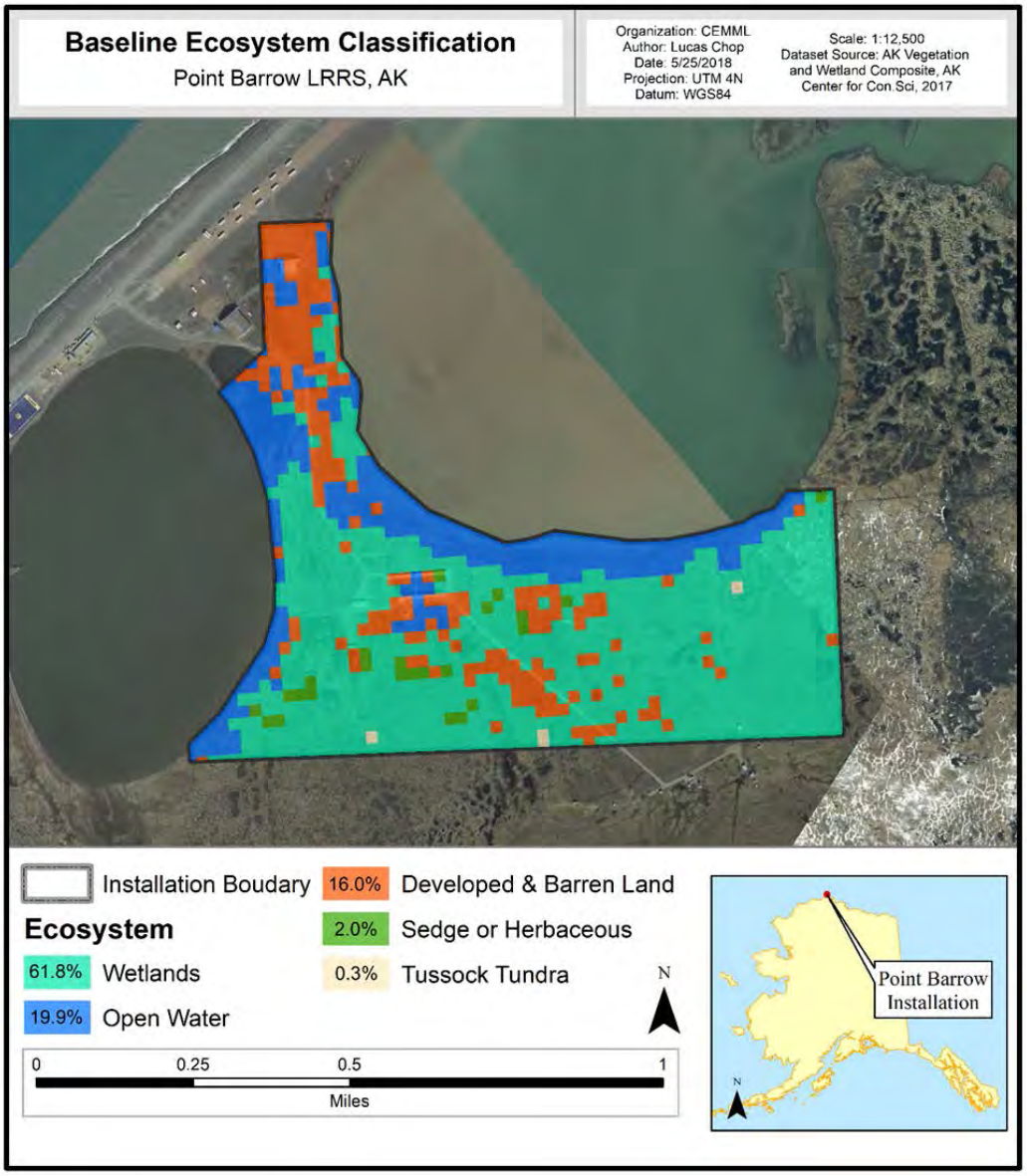

Figure H-94. Point Barrow LRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

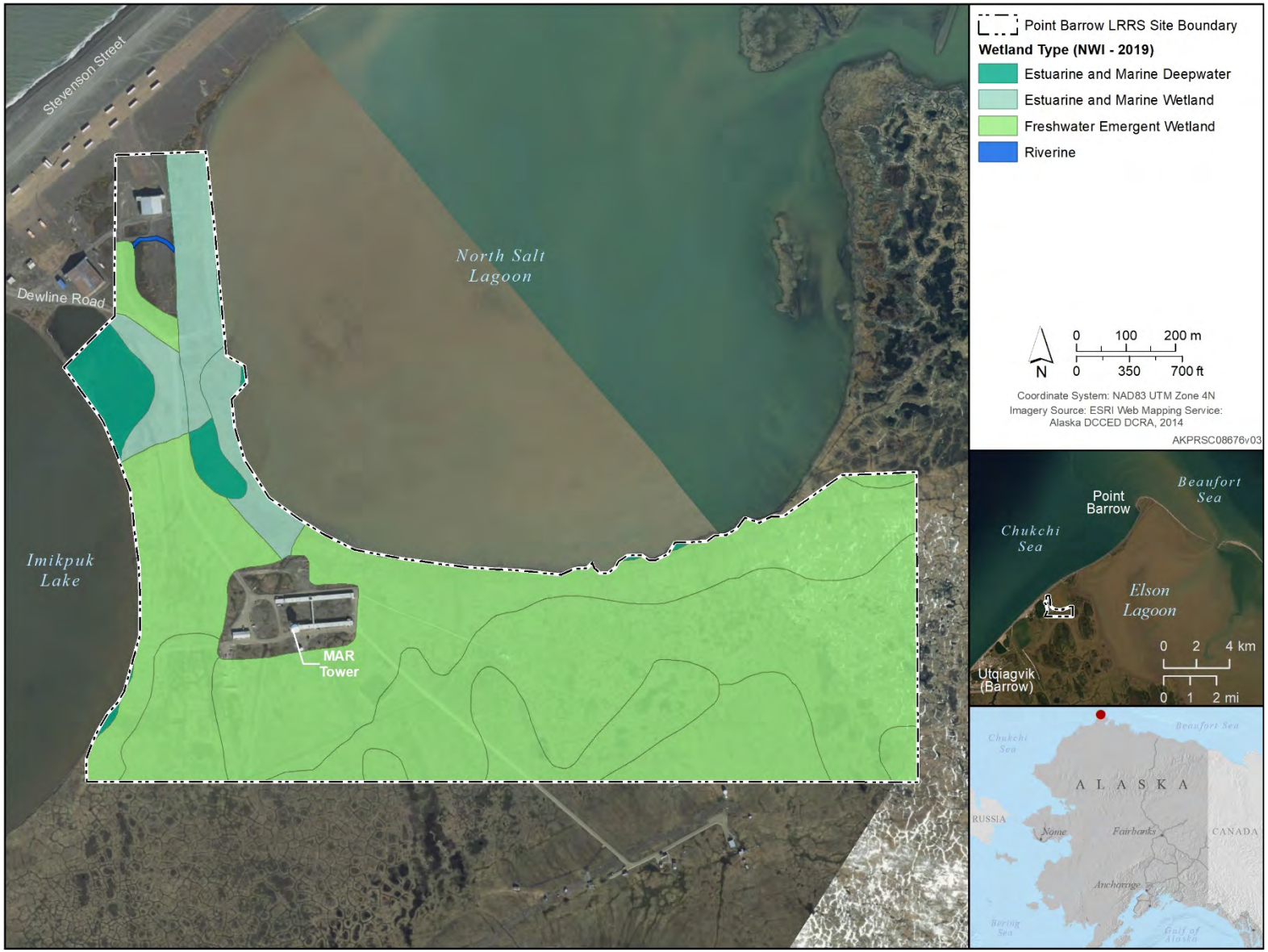

Figure H-95. Point Barrow LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

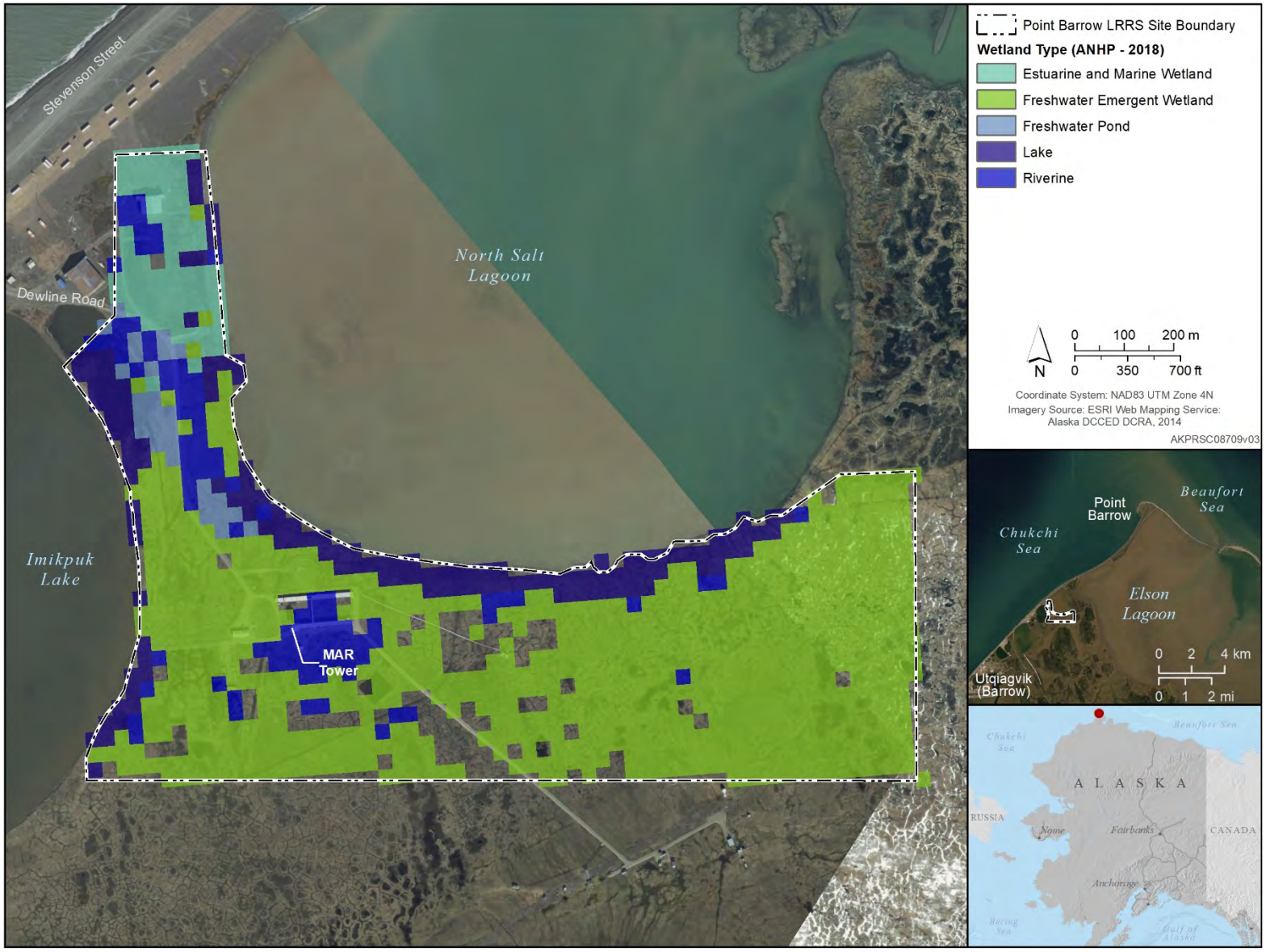

Figure H-96. Point Barrow LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.13.9.4 Fish and Wildlife

H.13.9.4.1 Fish

A total of 16 fish species occur or potentially occur within the vicinity of the Point Barrow site (Table H-21). Subsistence fishing includes pink and chum salmon, several species of cisco, broad whitefish, rainbow smelt, Arctic flounder, and polar and saffron cod. Whitefish account for the highest percentage of the total subsistence harvest in terms of edible pounds. Dolly Varden and Arctic grayling are also occasionally taken in a recreational hook-and-line fishery (Braund and Associates 2004).

H.13.9.4.2 Mammals

Terrestrial Mammals

Eleven terrestrial mammal species have been observed or potentially occur on or in the vicinity of the Point Barrow site (Table H-22). Small mammals include brown and collared lemmings and Arctic fox, as well as ermine and least weasel. Caribou, moose, and brown bear are uncommon near Barrow but are occasionally harvested by hunters. Arctic ground squirrels have been extirpated from the Barrow area for parkas, and no wolves or wolverines occur within 5-10 miles of Barrow for the same reason (611 ASG 1995c).

Marine Mammals

Pacific walrus, four species of seal, three species of whale, and polar bear occur in the region (Table H-22). Marine mammals are discussed in detail below in Section H.13.9.5 (ESA- and MMPA-listed Species).

H.13.9.4.3 Birds

The wet tundra environment within and adjacent to the LRRS provides nesting and foraging habitat for a wide variety of bird species and 154 species have been recorded on the site or in the vicinity (Table H-23). Common breeding birds in the area include red-throated loon, Pacific loon, tundra swan, greater white-fronted goose, snow goose, brant, Canada goose, northern pintail, greater scaup, king eider, long-tailed duck, American golden-plover, semipalmated sandpiper, pectoral sandpiper, Baird's sandpiper, dunlin, red-necked phalarope, pomarine jaeger, parasitic jaeger, glaucous gull (which have nested near Imikpuk Lake), Sabine's gull, black guillemot, snowy owl, common raven, snow bunting, common redpoll, and lapland longspur. Seabirds that are commonly seen in the Point Barrow area include Arctic tern, Ross' gull, ivory gull, black-legged kittiwake, common murre, black guillemot, tufted puffin, and red phalarope. The Point Barrow area is frequented by large numbers of waterfowl during the post-breeding molt and fall migration. The long-tailed jaeger and short-eared owl are also occasionally abundant, corresponding to lemming population cycles. An abandoned tropospheric communication tower on the site has provided nesting habitat for common ravens (Norton et al. 1993; 611 ASG 1995c; Andres and Brann 1997; Ritchie et al. 2003).

Important Bird Areas (IBAs)

The Point Barrow LRRS is adjacent to the Chukchi Sea Nearshore IBA and Barrow Canyon & Smith Bay IBA (Figure H-29). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The Chukchi Sea Nearshore IBA occupies 3,100 mi^2 of pelagic open water habitat in the Beaufort-Chukchi Coastal-Shelf ecoregion within the Chukchi Sea-continental coast and shelf. The Chukchi Sea Nearshore is an IBA for large breeding populations of glaucous gull, long-tailed duck, and Sabine's gull, as well as important breeding areas for black-legged kittwake, pomarine jaeger, and Arctic tern (Audubon Alaska 2014; BirdLife International 2019).

The Barrow Canyon and Smith Bay IBA occupies 4,600 mi^2 of pelagic open water habitat in the Beaufort-Chukchi Coastal-Shelf ecoregion within the Beaufort Sea-continental coast and shelf. The Barrow Canyon & Smith Bay is an IBA for large breeding populations of long-tailed duck, black-legged kittwake, king eider, Arctic tern, red phalarope, and glaucous gull (Audubon Alaska 2014; BirdLife International 2019).

H.13.9.5 ESA- and MMPA-listed Species

Six ESA-listed species potentially occur on or in the vicinity of the Point Barrow LRRS: threatened spectacled and Steller's eiders, threatened polar bear, threatened ringed and bearded seals, and endangered bowhead (Table H-22 and Table H-23 and INRMP Table 6).

Spectacled and Steller's Eiders

Point Barrow LRRS has been identified as one of four PRSC sites along the northern Arctic coast (Point Lay, Point Barrow, Point Lonely, and Oliktok) with the greatest potential for nesting spectacled eiders and little potential for nesting Steller's eiders. However, neither species has been recorded as nesting within the LRRS or in the immediate vicinity based on surveys conducted during 1994-2017 (Day et al. 1995; Day and Rose 2000; Kendall et al. 2001; Ritchie et al. 2003; Schick et al. 2004; Frost et al. 2007; Oasis Environmental, Inc. 2008; Burrell et al. 2015).

In 2003, a spectacled eider habitat assessment was conducted at the Point Barrow LRRS (Figure H-97). Although high-value spectacled eider nesting habitat was identified in the western portion of the LRRS, no spectacled eiders (or Steller's eiders) were recorded at the LRRS during pre-breeding aerial surveys or ground-based nesting surveys (Schick et al. 2004).

Polar Bear

Polar bears are common in the vicinity of Point Barrow and likely spend time in the area hunting for seals on the sea ice or searching out denning habitat. Winter and fall are the most common times for bears to be present; however, they have been observed near the Point Barrow LRRS year-round. The city of Utqiagvik hunts whales in both spring (June and July) and fall (September and October). Polar bears are primarily attracted to this area because of whale carcasses but sometimes go into Utqiagvik looking for food (PRSC 2020). During one whaling season 30 polar bears were observed around Barrow (Bridges 2001). Historical (1910-2010) denning sites are at Point Barrow, 5 miles to the north of the LRRS (ADNR 2014b; Smith et al. 2017).

Although the Point Barrow LRRS has been excluded from polar bear critical habitat designation (USFWS 2010), the surrounding terrestrial area is within denning critical habitat and the spit from the LRRS to Point Barrow is considered barrier island critical habitat that also includes a 1-mile no disturbance zone (Figure H-30 and Figure H-31). In addition, the adjacent marine waters are considered sea ice critical habitat (Figure H-32).

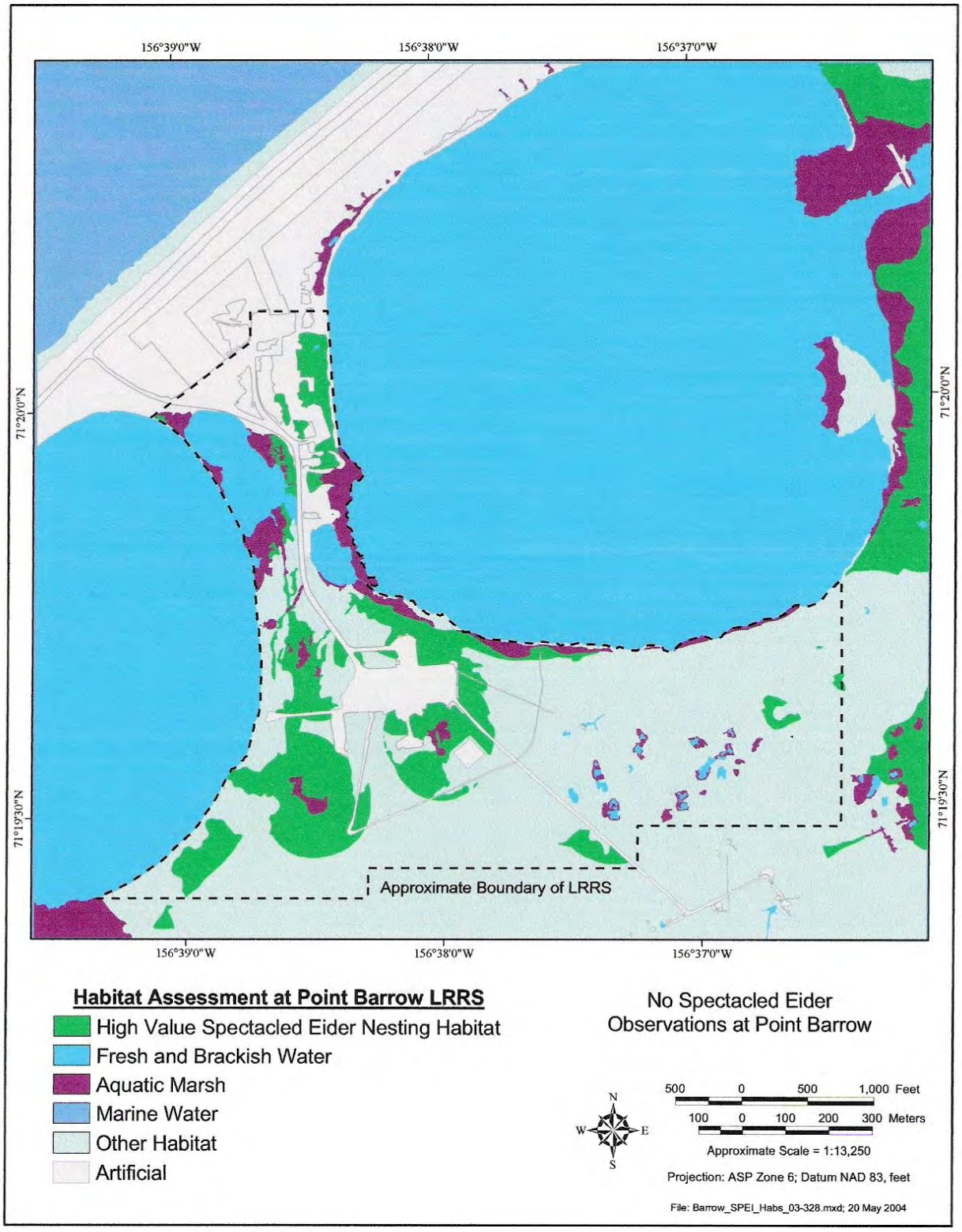

Figure H-97. 2003 Spectacled Eider Habitat Assessment at Point Barrow LRRS
(*Source*: Schick et al. 2004)

Ringed and Bearded Seals

Both ringed and bearded seals can be found along the coast of Point Barrow year-round (Smith et al. 2017). Ringed seals may den in the Point Barrow area during winter/spring (Smith et al. 2017) and the coastal waters are considered a major adult area in February-June (ADNR 2014b) and a winter/spring concentration area with higher quality denning and breeding habitat (Audubon et al. 2016). In 2014, the marine waters adjacent to the Point Barrow site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bowhead

The offshore waters of Point Barrow are considered major adult areas for bowhead in May (ADNR 2014b). The offshore waters are also areas of concentrated bowhead use during spring and fall migration as well as during summer when calves accompany their mothers and feed along the nearshore waters of the Beaufort Sea (Audubon et al. 2016; Smith et al. 2017).

Other MMPA-listed Species

Other marine mammal species occurring in the Point Barrow area include gray whale, beluga, killer whale, common minke whale, spotted seal, ribbon seal, harbor porpoise, and Pacific walrus.

Whales. The offshore waters of Point Barrow have been identified as important area for adult gray whales from April through December (ADNR 2014b) and a reproduction and feeding area (Audubon et al. 2016). The waters around Point Barrow are considered a beluga summer core area and a spring migration corridor between the Beaufort and Chukchi seas (Audubon et al. 2016; Smith et al. 2017).

Seals. The Point Barrow waters are also considered spotted seal adult areas during June-December (ADNR 2014b) and are also used regularly year-round (Boveng et al. 2009; Smith et al. 2017). Ribbon seals may occasionally occur within the offshore waters west of Point Barrow (Boveng et al. 2013; Smith et al. 2017).

Pacific Walrus. Although the summer range of walrus includes the southern Beaufort Sea and coastline, they are considered uncommon in the Point Barrow area in summer/fall (Smith et al. 2017; PRSC 2020). There is an historical walrus haulout at on Point Barrow (Figure H-98). It supported fewer than 10 individuals and the last recorded use was in 2000-2010 (Fishbach et al. 2016).

H.13.10 Other Natural Resource Information

H.13.10.1 Subsistence

Barrow is 1 of 10 Alaska Eskimo Whaling Commission communities. Hunting bowhead is a key activity in the organization of social relations in the community. Of all subsistence activities, bowhead whaling represents one of the greatest concentrations of effort, time, money, group symbolism, and significance. The Barrow subsistence use area includes a large geographic area extending from Wainwright to Nuiqsut. Barrow residents rely heavily on large land and marine mammals and fish. Bowhead, caribou, walrus, and whitefish account for about 85% of Barrow's annual subsistence harvest in terms of edible pounds. Beluga are also harvested by the local native community (Braund and Associates 2004). Waterfowl are hunted by at Point Barrow throughout the summer at "Duck Camp," located north of the LRRS on the Chukchi Sea side of the spit (611 ASG 1995c).

Figure H-98. Historical Walrus Haulout in the Vicinity of the Point Barrow LRRS
(*Source*: Fischbach et al. 2016)

H.13.10.2 Outdoor Recreation

Point Barrow LRRS is one of the few LRRSs located near a major community that offers alternative (indoor) recreational opportunities. Outdoor recreation opportunities available at or near Point Barrow LRRS include access to game and waterfowl hunting, ATV routes, open space for non-consumptive use of natural resources such as running or hiking, bird watching, photography, and limited fishing opportunities in lakes and marine shorelines adjacent to the facility.

H.13.11 Mission and Other Impacts on Natural Resources

H.13.11.1 Land Use

Point Barrow LRRS is accessed via public roads from the community of Utkiagvik. From Stevenson Street, Dewline Road is the main access road into the LRRS. Dewline Road is maintained by the LRRS BOS Contractor. Non-military personnel use the site roads to provide services to Point Barrow LRRS, and to access other facilities beyond the LRRS. There is no security fencing and the site is accessible to the public at any time.

H.14 SPARREVOHN LRRS

H.14.1 Location and Area

The 1,065-acre Sparrevohn LRRS is located about 190 miles west of Anchorage on the top and south slopes of a northeast-southeast trending ridge, informally referred to as Sparrevohn Mountain (Figure H-99 and Figure H-100). The LRRS is comprised of two camps connected by a gravel road: Top Camp, which contains the MAR tower, and Lower Camp, which contains all the support facilities and airfield. The site is accessible only by air.

Figure H-99. Aerial View of Sparrevohn LRRS - Lower Camp

H.14.2 Installation History

Sparrevohn was one of the original 12 AC&W sites constructed as a part of the air defense system in Alaska. In 1951 the Alaska Air Command decided to add two additional ground-controlled intercept sites to cover radar gaps in interior Alaska. A mobile radar became operational in 1951, providing temporary and sporadic radar coverage. `Construction of the installation was performed by the military and was completed in 1952. Communications were provided by a high frequency radio system until 1957 when a WACS was installed. The WACS was deactivated in 1978, and a commercial satellite earth terminal became operational. In 1984 a MAR was installed and remains active (Argonne National Laboratory and CEMML 2013).

H.14.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. The site is operated and maintained by four on-site contractor personnel (611 CES 2019).

Figure H-100. Overview of Sparrevohn LRRS

H.14.4 Surrounding Communities

Lime Village, the nearest community, is 18 miles north-northeast of the installation. Lime Village is a Denaina Athabascan Indian settlement with a population of 15 (2018 estimate) that practices a subsistence lifestyle. Salmon, moose, bear, caribou, waterfowl, and berries are utilized. Some seasonal work is available through BLM fire fighting or training. There is a gravel runway just north of the village that is owned and maintained by the state (State of Alaska 2018, 2019). The LRRS is not connected to Lime Village by any road.

H.14.5 Regional Land Use

The surrounding lands to the west, north and east are all managed by BLM, and lands to the south are state managed. The installation previously maintained a satellite camp (Fish Camp) for the recreation of personnel. This camp has been abandoned by the USAF and transferred to the BLM, then the State of Alaska. Contractors continue to maintain and use the facility on a personal basis through an agreement with the current owner (personal communication, P. Cooley 2007).

H.14.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Sparrevohn LRRS.

H.14.7 Physical Environment

H.14.7.1 Climate

Sparrevohn LRRS falls within the western transitional climate zone, characterized by tundra interspersed with boreal forests, and weather patterns of long, cold winters and shorter, warm summers. Temperatures range between an average low around 1 in winter to an average high in the upper 40s °F in summer (Table H-66). Annual precipitation averages 24 inches, with snowfall of 99 inches per year. Wind speeds average 6 mph from the south, but extreme east-southeasterly winds have been recorded at over 100 mph (Woodward-Clyde 1991f).

Table H-66. Monthly Climate Averages for Sparrevohn LRRS, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	17.4	16.3	24.0	32.5	48.8	58.0	60.3	57.3	48.1	31.4	24.1	15.7
Avg. Low (ºF)	3.4	2.7	11.9	20.9	35.1	43.7	47.3	45.9	37.8	22.0	12.2	1.5
Avg. Precipitation (inches)	1.2	0.8	1.2	1.4	1.0	2.4	4.0	4.4	2.9	1.8	1.4	1.2
Avg. Snowfall (inches)	11.8	9.6	14.2	14.5	3.5	0.6	0	0.1	2.2	14.7	14.4	13.3
Avg. Wind Speed (mph)	5.7	5.8	6.2	6.4	6.5	5.2	5.4	5.7	5.7	6.5	5.9	6.2

Note: Data are for conditions at Lower Camp; conditions at Top Camp are different due to location and elevation.
Source: 611 CES 2019.

H.14.7.2 Topography

Sparrevohn LRRS lies between Stony River and Hook Creek, southwest of Cairn Mountain. Lower Camp is at an elevation of about 1,700-ft MSL and Top Camp is at 3,300 ft MSL, approximately 1.5 miles to the northwest. The ridge is located in the western foothills of the Central Alaska Range, which form the transition between the Alaska Range to the east and relatively flat Holitna and Kuskokwim lowlands to the west between Stony River and Hook Creek. The surrounding area has numerous isolated hills and rounded ridges separated by wide river and stream channels. It is a transition zone between the central Alaska Range to the east and broad, flat Hoholitna and Kuskokwim lowlands to the west (Woodward-Clyde 1991b).

H.14.7.3 Geology and Soils

The southwestern region of Alaska is part of an active mountain-building belt that trends northeast-southeast through central and southwestern Alaska. Principal fault systems of the region follow an arcuate trend roughly paralleling the zone of crustal plate collisions. The most significant fault in the region is the Togiak Fault, a southwest extension of the Denali Fault system (Woodward-Clyde 1991b).

The backbone of the Alaska-Aleutian Range is a quartz-rich batholith. Flanks and foothills of the Alaska Range are composed of moderately folded and faulted Mesozoic and Cenozoic sedimentary and volcanic rock. Pleistocene glaciers scoured the landscape, creating broad stream and river valleys and leaving extensive till and moraine deposits (Woodward-Clyde 1991b).

Bedrock in the region of Sparrevohn LRRS is situated on rounded hills composed of steeply-dipping, interbedded layers of Cretaceous graywacke and shale bedrock. Broad stream and river valleys in the area consist of modified glacial outwash deposits (Woodward-Clyde 1991b).

The surficial geology of Sparrevohn LRRS Upper Camp is dominated by a thin veneer of broken weathered shale, 1-3 ft thick. Outcrops of shale and graywacke bedrock are common along the ridgetop. The geology of Lower Camp and airfield areas consists of mixed talus and alluvial deposits approximately 20 ft thick. These materials include sand, gravel, cobbles, and boulders which have been washed downslope from the ridgelines. Thin alluvial deposits of silt, sand, and gravel have accumulated in the stream channel of the southward-flowing Hook Creek tributaries. It is presumed that weathered bedrock, similar to that exposed at Upper Camp, underlies the alluvium at shallow depths in the Lower Camp area (Woodward-Clyde 1991b).

Soils throughout the LRRS are shallow to bedrock, with occasional deeper pockets of loamy, gravelly till material. Soils are very stony to extremely stony and are generally steeply sloping. Permafrost occurs as isolated masses in this region of Alaska. The location, thickness, and depth of permafrost at Sparrevohn LRRS are not known (Woodward-Clyde 1991b).

H.14.8 Hydrology

H.14.8.1 General

The Kuskokwim River and its tributaries, which dominate the region, compose the second largest drainage system in the State of Alaska. Lowlands are characterized by braided meandering river channels and tributaries. Highlands, near the Alaska Range, are characterized by broad, glacially fed drainage, isolated rounded hills, and ridges and rugged peaks. Discharge rates of local rivers fluctuate with seasons, reaching a peak in late spring. Mean annual runoff rates for the area are low. Chemical quality of surface waters is good (Woodward-Clyde 1991b).

Sparrevohn LRRS is 15 miles south of Stony River, a glacially fed tributary of the Kuskokwim River. The confluence of the two rivers is 80 miles northwest of the installation at the community of Sleetmute. Surface water draining from the installation flows south into an unnamed tributary and then to Hook Creek, 2 miles south of the installation. Three large lakes, the largest of which is Tundra Lake, are 8-10 miles north of the installation (Woodward-Clyde 1991b).

Groundwater in small to moderate amounts is found almost everywhere in the region. More reliable and larger quantities are found in river and streambed alluvium. Groundwater, which probably follows local topography, occurs at the installation as shallow and unconfined occurrences in the streambed alluvium of the single unnamed stream flowing through the LRRS. Sparrevohn LRRS obtains drinking water from a gallery well installed into streambed alluvium 18 ft below the surface (Woodward-Clyde 1991b).

H.14.8.2 Floodplains

Rainfall from all but the most severe storms would be contained within drainage ditches and natural watercourses. During severe storms some smaller channels may overflow. Except for one location, these overbank flows would be minor and more characteristic of heavy localized runoff than of an identifiable floodplain. The one area at risk would have overland flow caused by a culvert restricting the natural channel. Flow depths in the floodplain would be a foot or less but would threaten buildings at the site (Legare 1998).

H.14.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Sparrevohn LRRS. Attachment 7 contains lists of vascular plants (Table H-47), fish (Table H-48), mammals (Table H-49), and birds (Table H-50) known to occur or potentially occurring in the Sparrevohn area. ESA-listed species that may occur at or in the vicinity of the Sparrevohn site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.14.9.1 Ecoregion Classification

The Sparrevohn site is located in the Lime Hills ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.14.9.2 Vegetation/Habitat

A general vegetation map of Sparrevohn LRRS was prepared in 1995 (611 ASG 1995f). Schick et al. (2004) made significant improvements in vegetation mapping using 2000 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Sparrevohn LRRS using the most recent imagery found on Google Earth and, if available, 2009-2010 SPOT-5 satellite imagery. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 3 habitat classes were identified (Table H-67 and Figure H-101). Table H-47 provides a list of the vascular plant species observed or potentially occurring on the Sparrevohn site.

Table H-67. Habitat Classes at Sparrevohn LRRS (2017)

Habitat Class	Acres	Proportion
Shrub or Scrub	781.7	73.4%
Forest	191.7	18.0%
Developed & Barren Land	90.5	8.5%
Total	**1,064.9**	

Source: CEMML 2019a.

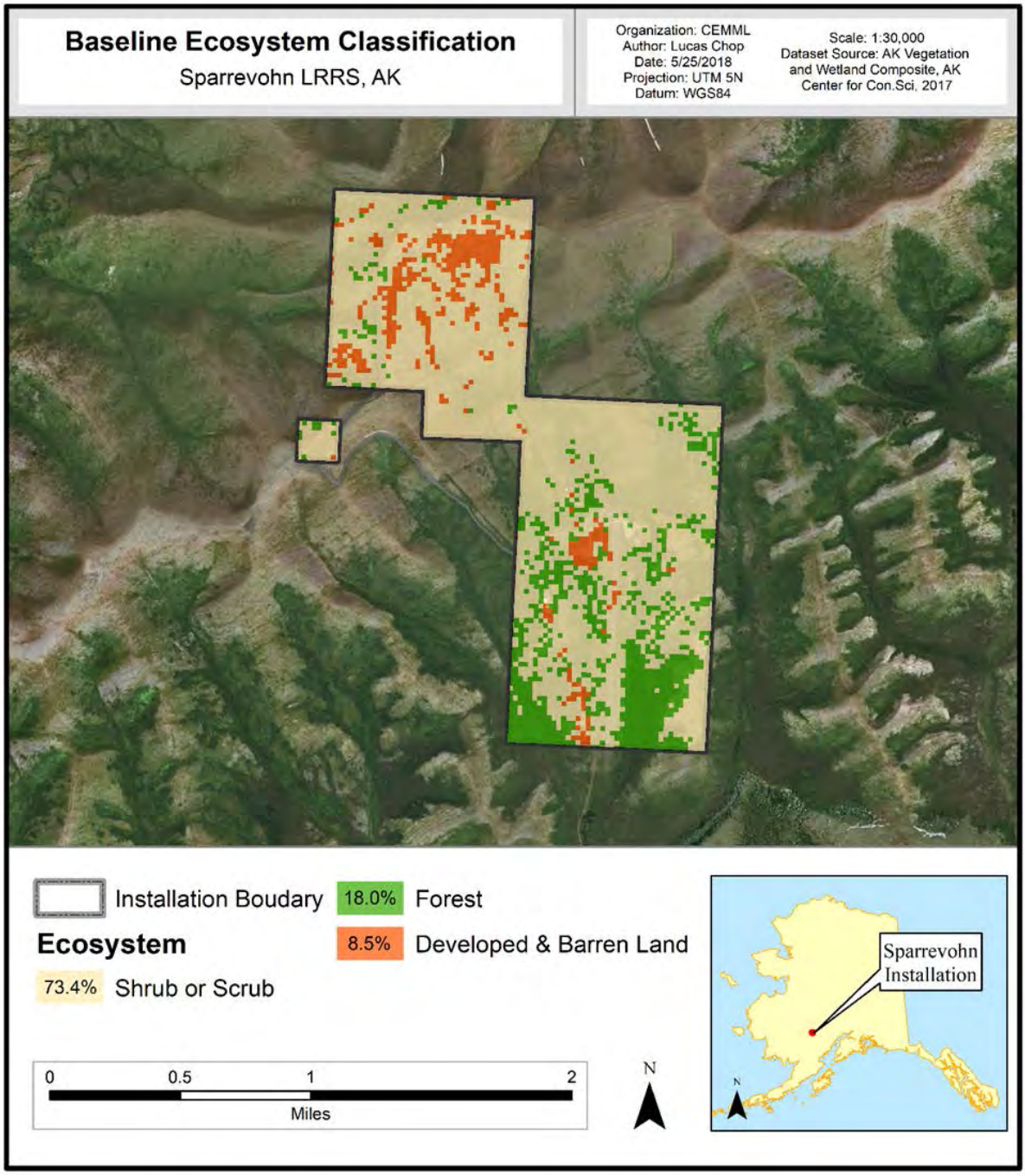

Figure H-101. Habitat Classes for Sparrevohn LRRS (2017)
(*Source*: CEMML 2019a)

Sparrevohn LRRS encompasses 1,065 acres of steep upland, subalpine, and alpine mountainous terrain. Overall, the area is well-drained, and there are no wet, and few moist tundra habitats. The site's habitat classes include forest (alder/willow stands, upland spruce/hardwood, relatively pure stands of white and black spruce), shrub or scrub (alpine tundra, disturbed vegetation), and developed and barren land (i.e., residential/industrial areas) (Schick et al. 2004).

Upper Camp was built in an unspoiled natural area of alpine tundra and barren ground. The habitat is comparatively arid due to the drying effect of the wind and shallow, well-drained loams on ridges, steep

slopes, and mountain tops. Plants in the barren windswept areas include various lichens, lupine, aster, and cinquefoil. Other plants in slightly protected areas are alpine azalea, Arctic willow, mountain avens, and moss campion. Many steep slopes are microterraced, and a decayed mat of moss with scattered tufts of grasses, sweet coltsfoot, and yarrow can be found on the flattened steps. Bearberry and cranberry grow in some slightly protected areas, such as in the lee of a rock. A pattern of discontinuous heath is found in slight depressions where crowberry predominates (Gutleber undated [c]).

Lower Camp is located at treeline; above the camp is alpine tundra; below is open spruce forest. The forest just below treeline is upland spruce/hardwood forest, characterized by a mixture of very open-grown black and white spruce, an occasional tamarack, and some paper birch and balsam poplar. This type has a dense, low brush understory of resin birch, Labrador tea, blueberry, and willows, with a dense groundcover of feather mosses and lichens (Gutleber undated [c]).

H.14.9.3 Wetlands

The current mapping of wetlands at the Sparrevohn LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 1,065-acre Sparrevohn LRRS, 152 acres (or 14%) are considered wetlands per the NWI mapping (Table H-68 and Figure H-102). The Sparrevohn site is dominated by well-drained, steep-sloping upland areas and wetter saturated or seasonal flooded freshwater forested/shrub wetland areas. The most common wetland type at Sparrevohn is palustrine, broad-leaved deciduous and evergreen scrub-shrub, which can be mixed with emergent vegetation and/or lichens. Other common wetlands include palustrine, broadleaved deciduous scrub-shrub and saturated or seasonally flooded and palustrine shrubs mixed with persistent emergent vegetation. These areas of moist dwarf scrub and tall shrubs can be saturated, moderately well-drained, or well-drained, depending primarily on soil type, microtopography, and landscape position. Dominant dwarf scrub species include *Empetrum nigrum, Vaccinium uliginosum, V. vitis-idaea, Ledum decumbens*, *Dryas octopetala, Arctostaphylos alpina*, and *Salix rotundifolia*. Tall shrub areas are primarily dominated by *A. crispa* with common associates of *Salix pulchra*, *Spiraea stevenii*, *Betula nana, B. glandulosa, Vaccinium uligonosum, Dryopteris dilitata*, *Empetrum nigrum*, and *Calamagrostis canadensis* (Schick et al. 2004).

Table H-68. Sparrevohn LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Forested/Shrub	142.9	13.4%	0.3	<0.1%
Riverine	8.6	0.8%	0	0
Wetlands Total	**151.5**	**14.2%**	**0.3**	**<0.1%**
Upland	913.4	85.8%	1,061.8	99.9%
Site Total	**1,064.9**		**1,062.1**	

Notes: *See Figure H-102. †See Figure H-103.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

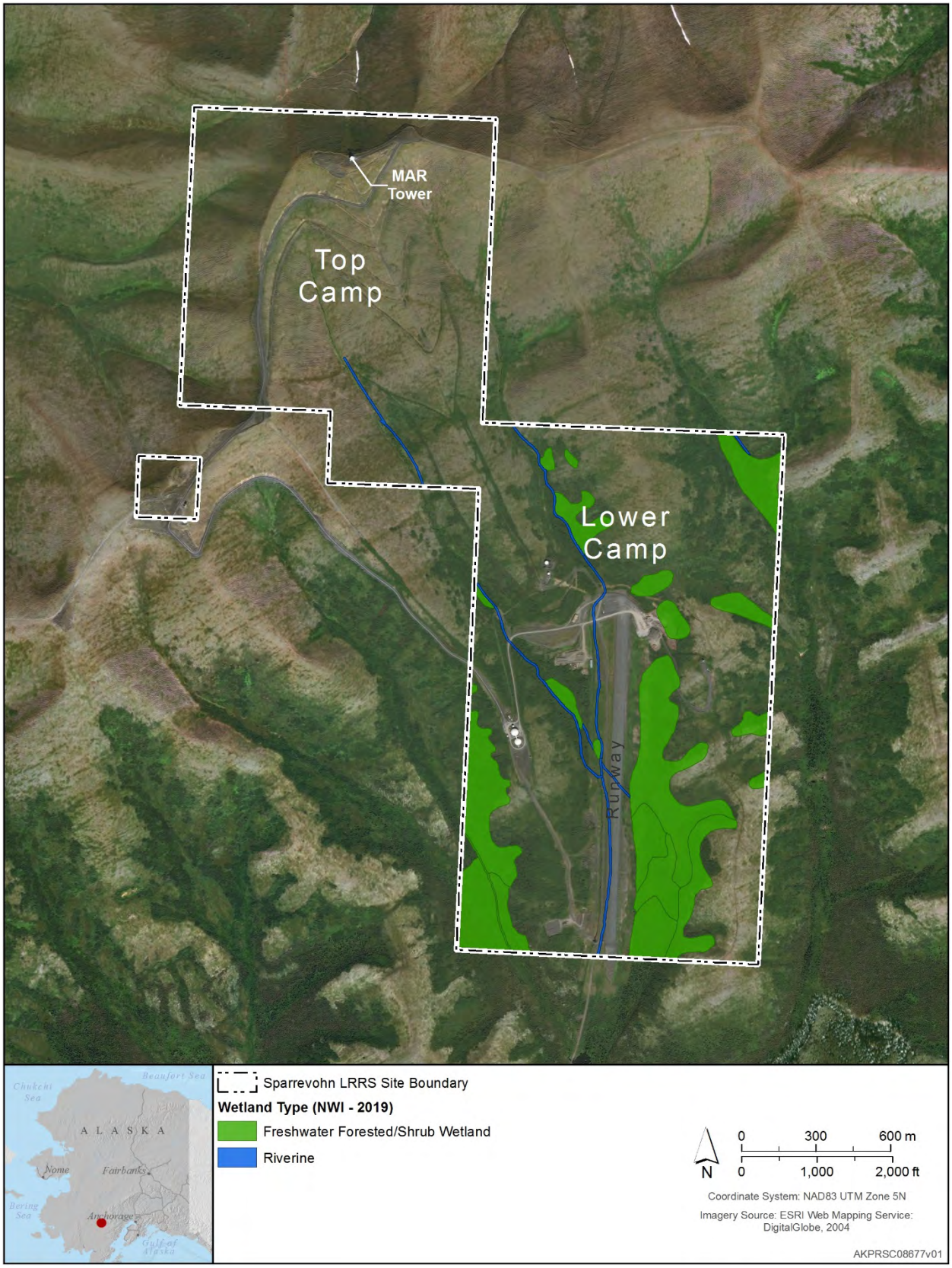

Figure H-102. Sparrevohn LRRS Wetlands (NWI 2019)
(*Source*: USFWS 2019d)

Figure H-103. Sparrevohn LRRS Wetlands (ANHP 2019)
(*Source*: Flagstad et al. 2018)

H.14.9.4 Fish and Wildlife

H.14.9.4.1 Fish

Surface water channels on the hillsides upgradient from Lower Camp are probably intermittent and therefore are not likely to contain fish. Lower Camp drainages may be ephemeral with exceptions of bogs located immediately downstream from the facility boundary. Although fish surveys have been not been conducted within any of these systems, 13 species of fish may occur within streams or creeks in the region (Table H-48).

The upper Kuskokwim River basin supports a variety of anadromous and freshwater fish. Coho, sockeye, chum, and chinook salmon occur in Hook Creek (Johnson and Blossom 2019e). Suckers and black fish occur in many oxbow sloughs, ponds, and lakes. Common fish species harvested by installation personnel at Fish Camp include chinook and coho salmon and Arctic grayling (Gutleber undated [c]).

H.14.9.4.2 Mammals

Almost 30 species of mammals occur or potentially occur on or in the vicinity of the Sparrevohn LRRS (Table H-49). Brown bear range throughout the foothills and mountain valleys. Black bear inhabit open forests and adjacent areas of most types of mixed vegetation, depending upon food sources. Wolf and wolverine are uncommon around Sparrevohn LRRS. The area's primary furbearers are American mink, muskrat, beaver, rover otter, martin, lynx, coyote, and fox. Muskrat, American mink, least weasel, lynx, and river otter are relatively common in most drainages. Smaller mammals include snowshoe and Arctic hare and various species of voles and lemmings.

The Mulchatna caribou herd occurs in the area and the LRRS and surrounding lands are considered a calving ground. The herd's summer range, as well as a known caribou migration route, are just south of the Sparrevohn site. Depending upon food abundance, moose are found in the shrub zone in higher elevations and at lower elevations in most drainages of the area (BLM 2019b).

H.14.9.4.3 Birds

A total of 22 bird species have been observed on the Sparrevohn site, with many more having the potential to occur (Table H-50). The upland (interior) habitat of Sparrevohn LRRS is well-suited for willow, rock, and white-tailed ptarmigan. Grouse (spruce, ruffed, and sharp-tailed) inhabit birch and spruce areas bordering river valleys and lake shores. The Sparrevohn area supports diverse populations of passerine species including Lapland longspur, savannah sparrow, common raven, tree and cliff swallows, Canada jay, boreal chickadee, American dipper, American robin, varied and gray-cheeked thrushes, northern waterthrush, Wilson's warbler, common redpoll, white-crowned and golden-crowned sparrows, and snow bunting. Most small birds leave the area by mid-September, but the snow bunting commonly winters here (Gutleber undated [c]; 611 CES 2007a).

This interior area, with its abundance of nesting habitat and food sources, is attractive to raptors. The most common raptors found in the region are bald and golden eagles. The hilly to mountainous topography of the region and the availability of fish and waterfowl for bald eagles and small mammals and grouse for golden eagles provide abundant food resources. Other raptors likely to occur include gyrfalcon, rough-legged hawk, goshawk, merlin, and great horned owl (Gutleber undated [c]).

H.14.9.5 ESA-listed Species

No ESA-listed species have been reported within the boundaries of the Sparrevohn LRRS.

H.14.10 Other Natural Resource Information

H.14.10.1 Subsistence

Lime Village residents depend on year-round hunts for large land mammals, particularly moose. In mid- to late spring, residents travel to lakes to fish and hunt waterfowl and muskrat. From the end of June through August, residents concentrate their efforts on harvesting salmon. Between August and October, residents harvest berries and plant materials for food, medicine, handicrafts, and construction projects, as well as returning to the lakes to harvest whitefish and waterfowl and travel extensively while hunting large game animals. In winter, the hunt for large game animals is punctuated by trapping and ice fishing (Braund and Associates 2004).

H.14.10.2 Outdoor Recreation

The area surrounding Sparrevohn LRRS provides big game and grouse hunting, furbearer trapping, fishing, hiking, and ATV riding opportunities. Although hunting is not allowed on the LRRS, hunting in the area is popular in mid- to late August each year. Numerous caribou of the Mulchatna Herd, as well as moose and bear, are hunted by BOS contract personnel stationed at Sparrevohn, temporary duty personnel during free time, DoD personnel who travel to the site for recreation, and subsistence hunters from Lime Village. Furbearer trapping has been conducted primarily as a recreational pursuit by site personnel. Few animals are trapped, and little impact to furbearer populations occurs. Species commonly trapped include beavers, martins, wolverines, and an occasional wolf. ATV riding is a primary recreation of site personnel.

Guided sport hunting and fishing by private lodges and/or fly-in charter services are commercial endeavors occurring in the area. Hunting, trapping, and fishing are common outdoor recreation activities occurring in the Sparrevohn LRRS area.

H.14.11 Mission and Other Impacts on Natural Resources

H.14.11.1 Land Use

A MAR is the only facility at Upper Camp. Temporary living facilities, used when weather restricts access, are included in the MAR facility for BOS contractor personnel attending the radar. Lower Camp has an industrial and a residential dome, a landing field, fuel storage, a power plant for both camps, and other facilities to support LRRS operation. A gravel quarry for maintenance purposes is at the north end of the runway.

Portions of land at Sparrevohn LRRS are leased to NOAA for research purposes and to the FAA for public air travel communications.

H.15 TATALINA LRRS

H.15.1 Location and Area

The 4,963-acre Tatalina LRRS is located 230 miles northwest of Anchorage, 280 miles west-southwest of Fairbanks, 6 miles south of Takotna, and 13 miles west of McGrath. The installation consists of a Top Camp and a Lower Camp (Figure H-104 and Figure H-105).

Figure H-104. Aerial View of Tatalina LRRS Looking South with Top Camp and the MAR Tower in the Foreground, Lower Camp in the Middle-Right, and the Airfield in the Upper Left.

H.15.2 Installation History

Tatalina LRRS was one of the original AC&W sites built in the 1950s in Alaska for an air defense system. The installation became operational as a ground-controlled intercept site in spring 1954. Communications were initially provided by high frequency radio. A WACS replaced the radio communications in 1957. In 1979 the WACS was deactivated and replaced with a commercial satellite earth terminal. A MAR unit was installed in 1985 and remains active (Argonne National Laboratory and CEMML 2013).

H.15.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. The site is operated and maintained by four on-site contractor personnel (611 CES 2019).

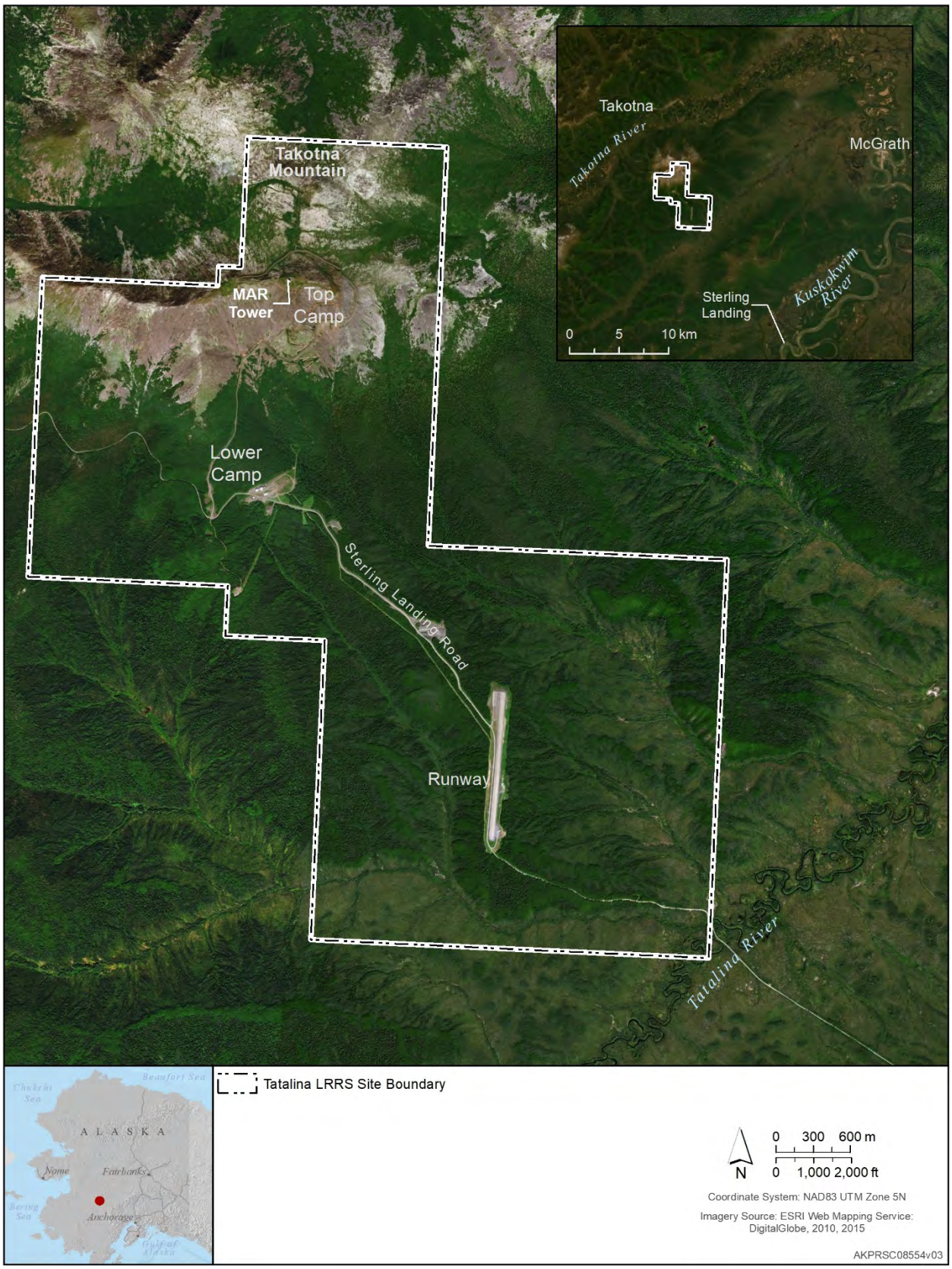

Figure H-105. Overview of Tatalina LRRS

H.15.4 Surrounding Communities

The nearest communities are Takotna, 6 miles north-northwest of the site on the Takotna River, and McGrath, 13 miles east of the site on the Kuskokwim River. The LRRS and Takotna are connected by a road that is usable in winter and can be used by passenger vehicles after it has dried out in the summer and fall. Access to McGrath from the LRRS is via the Sterling Landing Road to Sterling Landing (13-road miles east of the LRRS airfield) (Figure H-105). Fuel and construction materials for Tatalina LRRS are barged up the Kuskokwim River to Sterling Landing, and are then trucked to the facility.

The population of Takotna is 72 (2018 estimate) and is a mixed population of non-Natives, Ingalik Athabascans, and Eskimos. Employment is through the school district, post office, clinic, local businesses, and seasonal construction (State of Alaska 2018, 2019).

The population of McGrath is 275 (2018 estimate) and the population is slightly more than half Athabascan and Eskimo. McGrath functions as a transportation, communications, and supply center in Interior Alaska. McGrath offers a variety of employment opportunities, but subsistence remains an important part of the local culture. Numerous residents have dog teams that are entered in the Iditarod, Kuskokwim 300, and Mail Trail 200 sled dog races (State of Alaska 2018, 2019).

H.15.5 Regional Land Use

The Tatalina area is inhabited by members of an Athapaskan society known as the Kolchon who speak a language related to Tanana Athapaskan. They were historically bordered by the Tanana to the south, the Koyukon to the north, the Ingalik to the west, and the Tanana to the east (Gutleber undated [d]).

Lands surrounding the LRRS to the west, south, and east are Alaska Native Allotment Lands. BLM lands are immediately to the north of the LRRS (BLM 2019a).

H.15.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Tatalina LRRS.

H.15.7 Physical Environment

H.15.7.1 Climate

This area has a characteristic continental climate with low rainfall, severe winters, and short, warm summers. There are great diurnal and annual temperature variations. The average annual high temperature in the summer is in the mid-60s ºF (Table H-69). During winters, which are long and cold, temperatures fall well below freezing, and minimum average monthly temperatures in December through February are below 0 ºF. Annual precipitation averages 15 inches, occurring primarily during the summer months. Thunderstorm activity is common during summer. Annual snowfall is 86 inches, with the majority falling from October through March.

Table H-69. Monthly Climatic Averages for Tatalina, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	4.4	9.6	23.3	36.6	54.4	63.0	65.2	61.3	51.2	30.1	16.1	5.9
Avg. Low (ºF)	-5.5	-2.7	8.0	21.3	37.8	47.2	50.8	47.5	37.9	20.8	6.5	-3.4
Avg. Precipitation (inches)	0.7	0.5	0.6	0.6	0.8	1.7	2.5	2.6	1.3	1.5	1.1	1.2
Avg. Snowfall (inches)	11.0	8.4	11.4	9.0	0.8	0	0	0	.07	14.3	17.0	14.1
Avg. Wind Speed (mph)	2.8	3.6	4.9	5.6	5.9	5.4	4.9	4.9	5.0	4.6	3.3	2.6
Prevailing Wind Direction	W	WNW	N	N	W	W	S	W	N	N	N	N

Note: Data are for conditions at Lower Camp; conditions at Top Camp are different due to location and elevation.
Source: 611 CES 2019.

H.15.7.2 Topography

Tatalina LRRS is located in the upper reaches of the Kuskokwim Bay subregion of southwestern region of Alaska. This vast region drains into the Bering Sea and extends south from Norton Sound to Bristol Bay. Top Camp of the LRRS is located on Takotna Mountain, the highest point in the region at 3,200 ft MSL. Takotna Mountain lies between the Takotna River valley to the west and the Tatalina and Kuskokwim river valleys to the east; the surrounding area is characterized by rolling hills and valleys.

H.15.7.3 Geology and Soils

A variety of events including tectonism, volcanism, sedimentation, and erosion have shaped the landscape, rocks, soils, and minerals of the area. Continental and oceanic crusts of unsure origin apparently came together to form the Kuskokwim Bay region. In the Jurassic Period, about 150 million years ago, a drifting continental platform ascended over the Pacific Ocean floor, marked by the Aleutian Trench. Movements of these plates caused mountains and volcanoes to form. Subducting plates carried and scraped ocean-deposited sediments into the crust, and obducting plates dragged up ultramafic rock (*i.e.*, rock rich in iron and magnesium). After Jurassic subduction, uplift occurred in the area of the present day Kuskokwim Mountains and the Alaskan-Aleutian Range (Gutleber undated [d]).

The Precambrian and early Paleozoic history of the southwest subregion is virtually unknown. During late Paleozoic and early Mesozoic era, seas occupied this widespread area where sediments were deposited in deep basins adjacent to volcanic islands. Older rocks in the Bristol Bay and Kuskokwim subregions are characteristically rich in volcanic material. In the middle Jurassic time an intrusion of a large mass of igneous material, called a batholith, formed the backbone of the southern Alaska Range; deformation accompanied and followed this intrusive activity, producing a mountainous upland approximately where the Kuskokwim Mountains and Alaska-Aleutian Range now stand. These uplifted regions were eroded and produced sediments that were deposited on adjoining shallow marine shelves and in adjacent basins (Gutleber undated [d]).

During the Tertiary period much of the Bristol Bay and Kuskokwim areas were being slowly eroded, and thick sequences of sediments were being deposited on the adjacent Bering Sea lowland. The development of much of the present landscape took place in Quaternary times, when extensive ice fields and a large glacier scoured and modified the landscape. Unconsolidated materials comprise surficial deposits that accumulated on the land surface during the glacial period. As glaciers advanced and retreated, a complex and interrelated series of deposits were produced by the interplay of three main agents: glacial ice, flowing water in streams or on deltas, and still water in ponds, lakes, and marine estuaries. The most common glacial deposits are moraines, which are composed of glacial till (gravel, sand, silt, and clay) laid down at the sides and in front of the glaciers (Gutleber undated [d]).

Tatalina is located within the Minchumina Basin, which contains the upper basin of the Kuskokwim River. This broad basin is the direct result of an extensive ice field and glaciers. The region is characterized as a vast lowland of meandering rivers, scattered oxbow and pothole lakes, and marshy tundra. Bedrock in the Tatalina area is composed of interbedded layers of graywacke and shale and local areas of basalt flows. Soils were probably formed in gravelly or sandy materials, thereby providing good surface drainage (Gutleber undated [d]).

Tatalina LRRS is underlain by moderately thick to thin permafrost and predominantly fine-grained deposits. Maximum depth to base of permafrost is about 600 ft. Temperature of permafrost ranges from 23° to 30°F, but temperatures may be higher locally. Surface disturbance resulting from construction may have altered the upper limit of permafrost by reducing insulation of the surface layer (Gutleber undated

[d]). IRP remedial investigations and feasibility studies have more current drilling logs with detailed information on permafrost depth.

H.15.8 Hydrology

H.15.8.1 General

The Kuskokwim Bay subregion has two disparate areas tied together by the Kuskokwim River. The Kuskokwim Valley is a wide, flat basin approaching 75 miles in width in some places, with occasional knobs and benches and numerous small ponds and lakes. Near the river, which trends toward the western edge of the basin, is a wide, alluvial flood plain interlaced with sloughs, lakes, and oxbows typical of meandering glacial-fed rivers of Alaska. This meandering is especially marked at the North Fork of the Kuskokwim River to the north of McGrath where the river drops very gently (Gutleber undated [d]).

Tatalina LRRS is in the upper reaches of the Kuskokwim River, one of the principal waterways in Alaska and second only to the Yukon River in size and length. The installation lies on an upland area between two drainage systems, the Takotna River to the north and the Tatalina River to the south. Throughout their meandering courses, both of these rivers are dotted with isolated wetlands, some of which have small lakes and ponds (Gutleber undated [d]).

Tatalina LRRS obtains its water supplies from a gallery constructed into highly permeable mixed-talus and alluvial deposits of the Lower Camp area. These deposits form the area's shallow aquifer and occur at ground surface. The gallery consists of a one-foot diameter vertical pipe installed to a depth of 23 ft below grade, connected to a lateral 285-foot-long pipe. The lateral pipe has been constructed along the alignment of an unnamed stream extending through the Upper Camp area (Gutleber undated [d]).

H.15.8.2 Floodplains

The installation is well above any 100-year flood plain. The closest major river is the Tatalina River, which flows in a broad river valley and would flood during a 100-year flood. However, the lowest elevation of any facility at the LRRS is the airfield at approximately 800 ft MSL, well above the approximate 400 ft elevation of the river. The unnamed creek to the west of the airfield is at 600 ft MSL, well below the closest LRRS infrastructure (airfield).

H.15.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Tatalina LRRS. Attachment 7 contains lists of vascular plants (Table H-47), fish (Table H-48), mammals (Table H-49), and birds (Table H-50) known to occur or potentially occurring in the Tatalina area. ESA-listed species that may occur at or in the vicinity of the Tatalina site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.15.9.1 Ecoregion Classification

The Tatalina site is located in the Kuskokwim Mountains ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.15.9.2 Vegetation/Habitat

A general vegetation map of Tatalina LRRS was prepared in 1995 (611 ASG 1995f). Schick et al. (2004) made significant improvements in vegetation mapping at Tatalina LRRS using 2000 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2012, CSU/CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes for Tatalina LRRS using

the most recent imagery found on Google Earth and, if available, 2009-2010 SPOT-5 satellite imagery. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). Based on the mapping of the LRRS (4,963 acres) and adjacent parcels (2,409 acres), a total of 4 habitat classes were identified (Table H-70 and Figure H-106). Table H-47 provides a list of the vascular plant species observed or potentially occurring on the Tatalina site.

Table H-70. Habitat Classes at Tatalina LRRS and Surrounding Lands (2017)

Habitat Class	Acres	Proportion
Forest	5,565.5	75.5%
Shrub or Scrub	1,636.5	22.2%
Developed & Barren Land	169.5	2.3%
Open Water	0.1	<0.1%
Total	**7,371.6**	

Source: CEMML 2019a.

Tatalina LRRS is located in an area of lowland river valley flats and gently sloping uplands to steep subalpine slopes and rocky mountainous terrain. The area is well-drained, and there are few wet or moist tundra habitats. The Lower Camp area is dominated by dense upland spruce/hardwood forest comprised of evergreen and deciduous trees, such as white and black spruce, quaking aspen, balsam poplar (cottonwood), and paper birch. White spruce, ranging 30-70 ft in height and up to 16 inches in diameter, form pure stands along streams and grow with scattered birch or aspen on moderate south-facing slopes and well-drained soils at the LRRS. Black spruce, ranging 15-40 ft in height and 3-6 in in diameter, form pure stands on north-facing slopes and poorly drained flat areas. Aspen range 20-50 ft in height and 3-12 in in diameter and generally grow, following forest fires, in pure and mixed stands on well-drained soils. Paper birch, ranging 30-60 ft in height and 6-12 in in diameter, grow in clumps, usually mixed with aspen. Balsam poplar range 40-60 ft high and 1-2 ft in diameter, have deeper roots, and occur in small scattered groves along streams. Forest undergrowth consists of spongy moss and low brush on cool, moist slopes; grass on dry slopes; and willow, alder, and dwarf birch in high, open forests near timberline (Gutleber undated [d]).

Upper Camp, where steep slopes rise to 2,500 ft MSL or more, has an alpine tundra characterized by isolated areas of a discontinuous carpet of prostrate shrub consisting of mountain avens, crowberry, alpine bearberry, and mountain cranberry. Plant species occurring in alpine tundra include Arctic poppy and dwarf fireweed. Mosses are common where snow accumulates, and lichens may be common on wind-exposed ridges (Gutleber undated [d]).

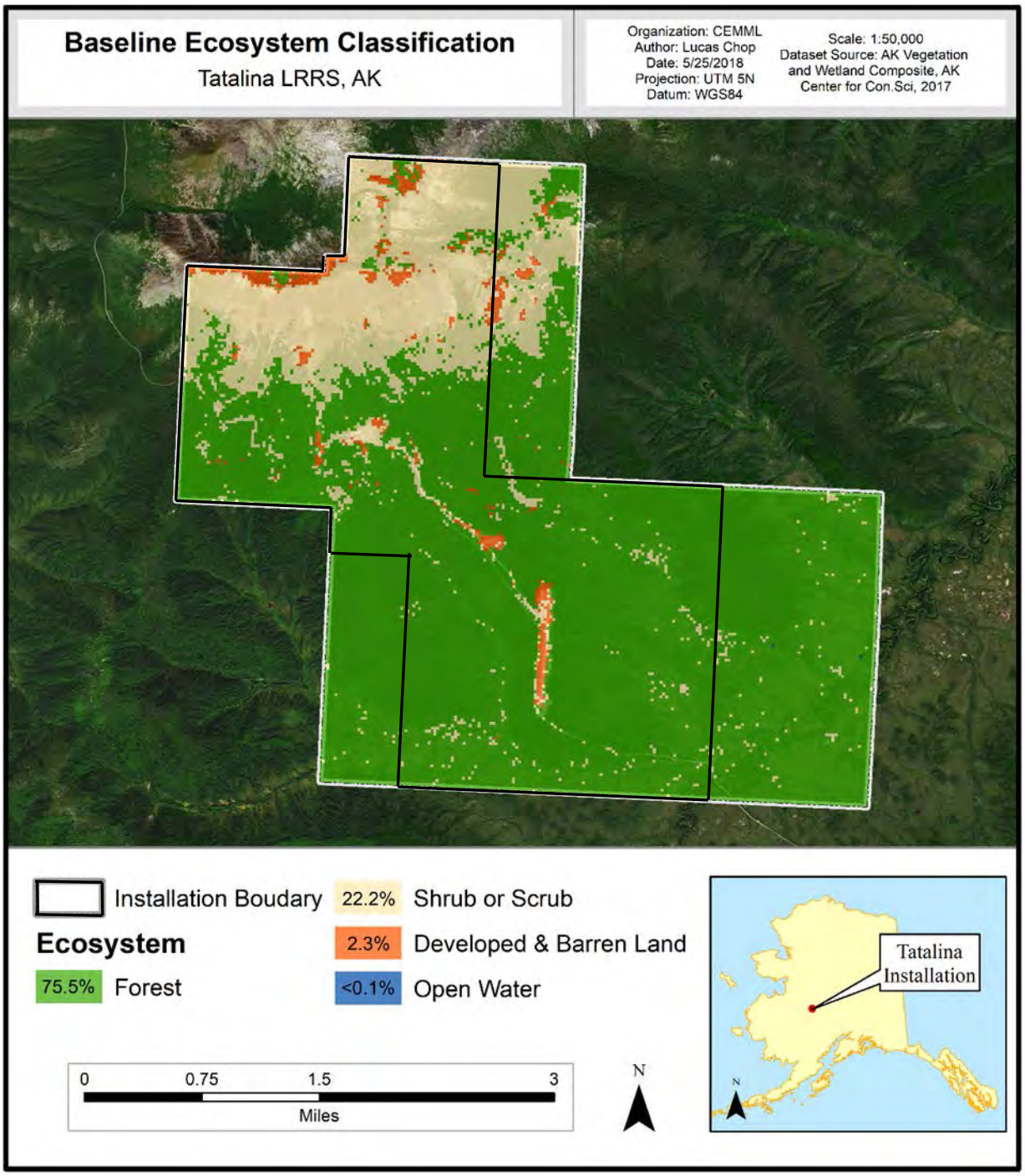

Figure H-106. Habitat Classes for Tatalina LRRS (2017)
(*Source*: CEMML 2019a)

H.15.9.3 Wetlands

The current mapping of wetlands at the Tatalina LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 4,963-acre Tatalina LRRS, 1,451 acres (or 29%) are considered wetlands per the NWI mapping (Table H-71 and Figure H-107). Tatalina LRRS is in an area of moderately hilly terrain removed from the Kuskokwim River and its associated wetlands. The installation lies between two drainage systems, the Takotna River to the north and the Tatalina River to the south. Throughout their meandering courses, both of these rivers are dotted with isolated wetlands, some of which have small lakes and ponds (Gutleber undated [d]).

Table H-71. Tatalina LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

	2019 NWI*[(1)]		2018 ANHP†[(2)]	
Wetland Type	**Area (acres)**	**Proportion**	**Area (acres)**	**Proportion**
Freshwater Forested/Shrub	1,435.7	28.9%	4.4	0.1%
Riverine	15.3	0.3%	0	0
Wetlands Total	**1,451.0**	**29.2%**	**4.4**	**0.1%**
Upland	3,511.8	70.8%	4,958.4	99.9%
Site Total	**4,962.8**		**4,962.8**	

Notes: *See Figure H-107. †See Figure H-108.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

Wetlands at Tatalina LRRS are dominated by well-drained, steep-sloping upland areas, shallower sloped areas of wetter saturated or seasonal flooded soils, and fewer areas of permanently flooded water channels. Common palustrine forested wetland types that occur at the LRRS include needle-leaved evergreen and broad-leaved deciduous and needle-leaved evergreen. Common palustrine shrub wetland on the site include broad-leaved deciduous and evergreen scrub-shrub, broad-leaved deciduous scrub-shrub, and shrubs mixed with persistent emergent vegetation; as well as some riverine areas. These areas of moist dwarf scrub habitats, tall shrubs, and upland needleleaf and mixed forests can be saturated, moderately well-drained, or well-drained depending primarily on soil type, microtopography, and landscape position. Dominant forest species in these areas include *Picea glauca, P. mariana,* and *Betula papyrifera* with an understory of species like *Salix pulchra, S. scouleriana, S. alaxensis, Alnus crispa, Calamagrostis canadensis, Galium triflorum, Linnaea borealis, Mertensia paniculata, Trientalis europaea, Artemisia tilesii,* and *Rosa acicularis.* Tall shrub areas are primarily dominated by *A. crispa* with common associates of *Salix pulchra, Spiraea stevenii (beauverdiana), Betula nana, B. glandulosa, Vaccinium uligonosum, Dryopteris dilitata, Empetrum nigrum,* and *Calamagrostis canadensi*. Dominant dwarf scrub species include *Empetrum nigrum, Vaccinium uliginosum, V. vitis-idaea, Ledum decumbens, Dryas octopetala, Arctostaphylos alpina,* and *Salix rotundifolia* (Schick et al. 2004).

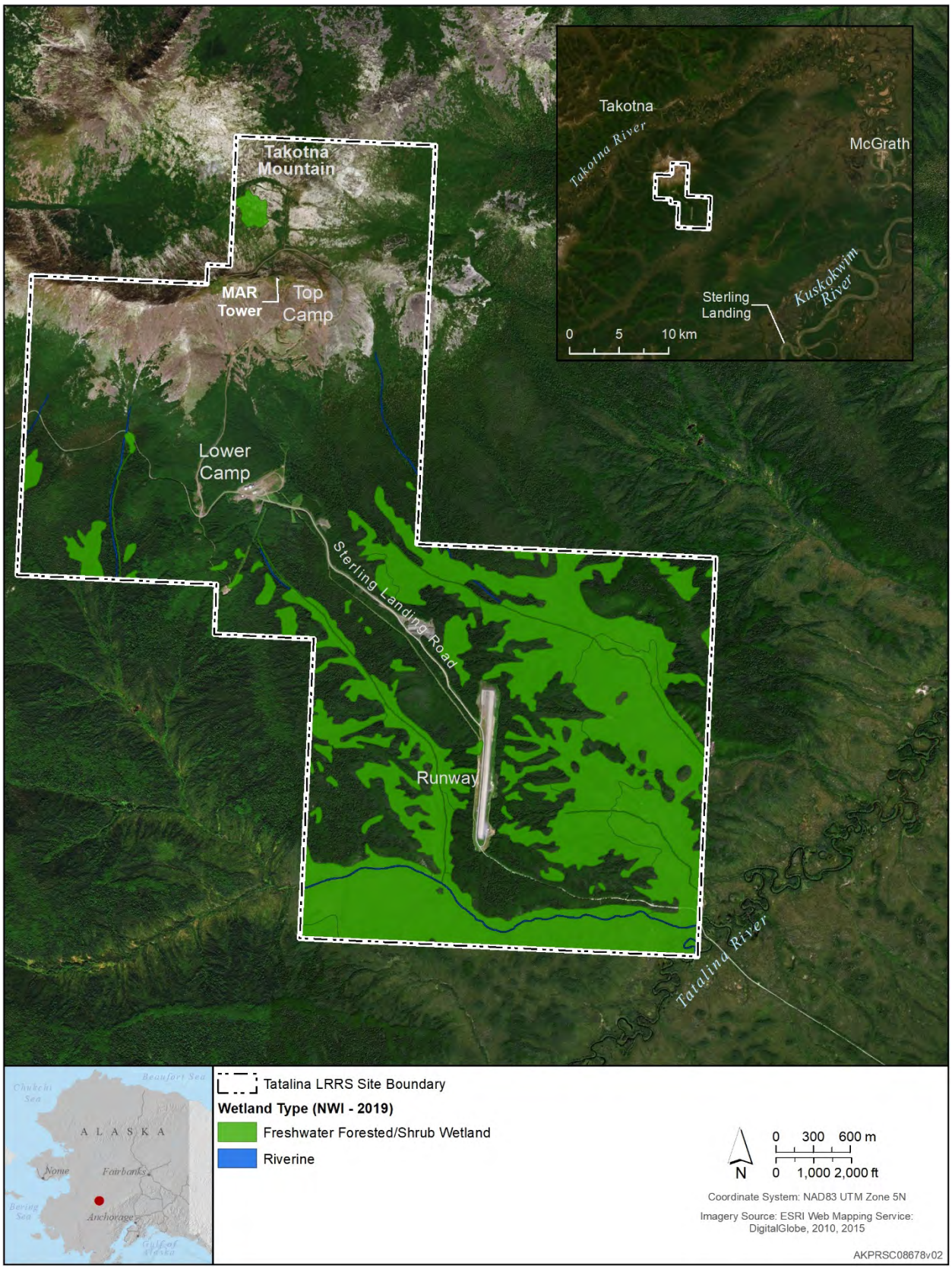

Figure H-107. Tatalina LRRS Wetlands (NWI 2019)
(*Source*: USFWS 2019d)

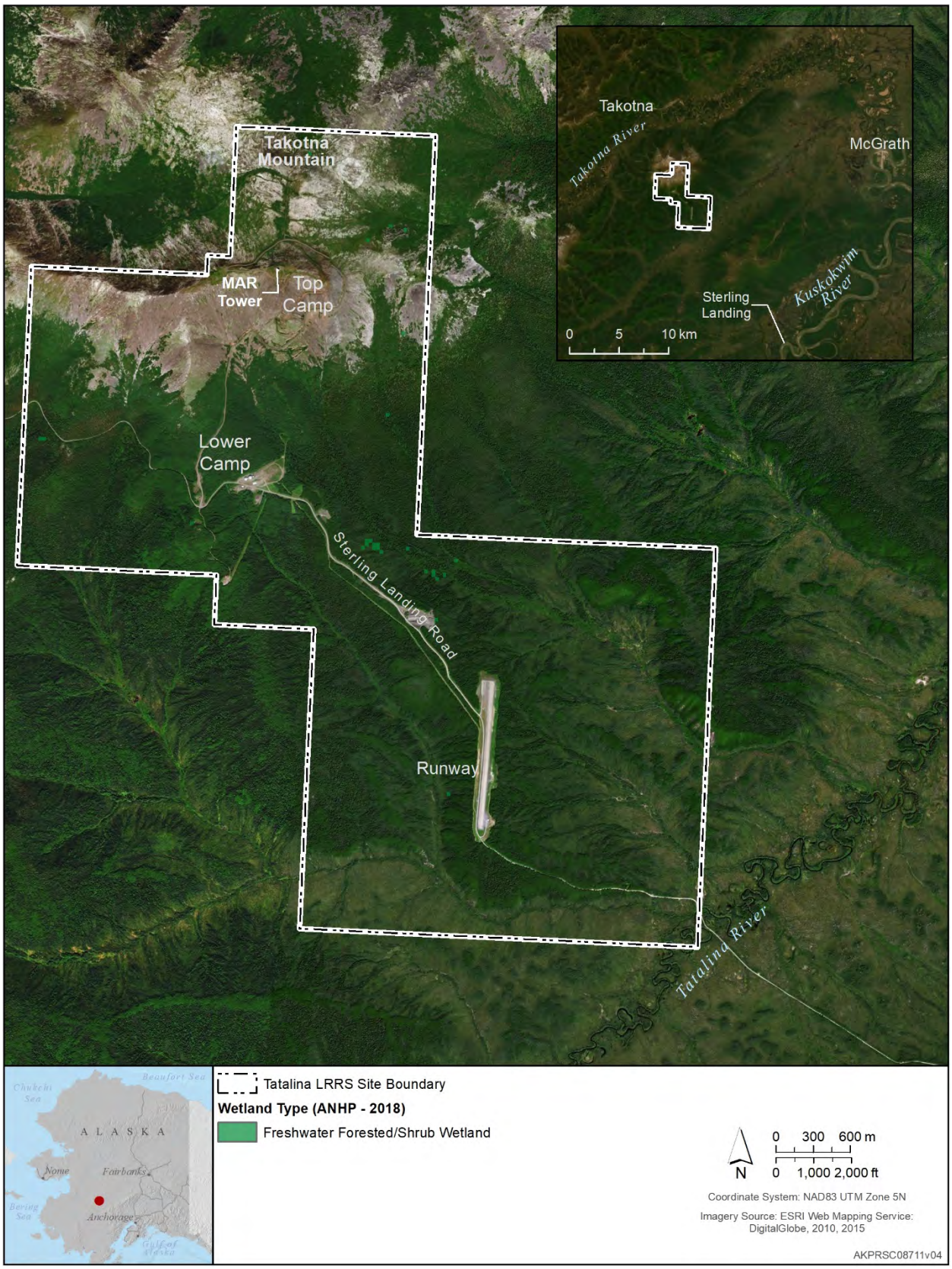

Figure H-108. Tatalina LRRS Wetlands (ANHP 2019)
(*Source*: Flagstad et al. 2018)

H.15.9.4 Fish and Wildlife

H.15.9.4.1 Fish

Lower Camp drainages that flow into the Tatalina River may be ephemeral and therefore are not likely to contain fish. Although fish surveys have been not been conducted within any of these systems, 13 species of fish may occur within surface waters in the region (Table H-48). The upper basins of the Kuskokwim and Takotna rivers support a variety of anadromous and freshwater fish including coho, sockeye, chum, and chinook salmon; inconnu/sheefish; and whitefish (Johnson and Blossom 2019c).

H.15.9.4.2 Mammals

Almost 30 species of mammals occur or potentially occur on or in the vicinity of the Tatalina LRRS (Table H-49). Brown bear range throughout the foothills and mountain valleys. Black bear inhabit open forests and adjacent areas of most types of mixed vegetation, depending upon food sources. Wolf and wolverine are uncommon around the LRRS. The area's primary furbearers are American mink, muskrat, beaver, rover otter, martin, lynx, coyote, and fox. Muskrat, American mink, least weasel, lynx, and river otter are relatively common in most drainages. Smaller mammals include snowshoe and Arctic hare and various species of voles and lemmings (Gutleber undated [d]).

The range of the Beaver Mountains caribou herd includes the LRRS and its summer range is just west of the LRRS (BLM 2019b). Rich moose habitat, much of it due to wildfire and riverbar succession, is widely distributed at the LRRS. Depending upon food abundance, moose are found in the shrub zone in higher elevations and at lower elevations in most drainages of the area. Winter range is restricted primarily to river bottoms where timber is often used for winter cover (Gutleber undated [d]).

H.15.9.4.3 Birds

The upland habitat of the installation is well-suited for willow, rock, and white-tailed ptarmigan. Spruce and ruffed grouse inhabit the upland spruce/hardwood forest, particularly areas bordering river valleys. Common birds occurring in the area include lapland longspur; common raven; tree and cliff swallows; Canada jay; boreal chickadee; alder flycatcher; American dipper; American robin; sandhill crane; ruby-crowned kinglet; Swainson's, hermit, varied, and gray-cheeked thrushes; dark-eyed junco; orange-crowned, Arctic, and Wilson's warblers; northern waterthrush; white-winged crossbill; common redpoll; white-crowned and savannah sparrows; and snow bunting (Gutleber undated [d]; USFWS 1991b; 611 CES 2007a). Most small birds leave the area by mid-September, but the snow bunting commonly winters in the area.

This interior area, with its abundance of nesting habitat and food sources, is attractive to raptors. The most common raptors in the area are bald and golden eagles. Other raptors likely to occur in the vicinity of Tatalina LRRS include gyrfalcon, rough-legged hawk, goshawk, merlin, and great horned owl (Gutleber undated [d]).

H.15.9.5 ESA-listed Species

No ESA-listed species have been reported within the boundaries of the Tatalina LRRS.

H.15.10 Other Natural Resources Information

H.15.10.1 Subsistence

Approximately 80% of the residents of Takotna are involved in subsistence activities. Moose are the most important resource, along with small furbearers, migratory waterfowl, and game birds. McGrath offers a variety of employment opportunities, but subsistence remains an important part of the local culture.

Residents harvest salmon, moose, caribou, bear, and hare. Some residents also trap furbearers and tend vegetable gardens. The role and importance of subsistence resources for McGrath is similar to that of Takotna. Takotna and McGrath subsistence use areas include the LRRS (Braund and Associates 2004).

H.15.10.2 Outdoor Recreation

The installation provides BOS contractor personnel with excellent hunting and fishing resources in the area. Most hunting, trapping, and fishing, however, is conducted by the rural residents for subsistence. The area surrounding Tatalina LRRS provides big game hunting, primarily for moose and black bear; some fishing; trapping for lynx, martin, fox, wolverine, and weasel; and ATV and snow machine riding opportunities. The village of Takotna is on the Iditarod trail, and LRRS personnel provide assistance for the annual dog sled race.

While DoD personnel may obtain authorization to fly private aircraft to Tatalina LRRS on their own time and at their own cost, it is not common since big game is not abundant. Hunting is done during free time by BOS contract personnel assigned to the LRRS and temporary duty personnel (military, civilian, or contractor) working at the site.

H.15.11 Mission and Other Impacts on Natural Resources

H.15.11.1 Land Use

Facilities include an airfield near the base of Takotna Mountain; Lower Camp, located 2 miles upslope of the airstrip, and which contains the main support and living facilities for the LRRS; and Top Camp at the summit of Takotna Mountain, which supports the MAR. Top Camp and Lower Camp are connected by a winding 2.8-mile gravel road. There is no security fencing, and the site is accessible to the public at any time. The only security for the facilities is provided by locking the exterior doors (611 CES 2019).

The USAF has a Right-of-Entry to conduct environmental sampling at Sterling Landing. In addition, the USAF leases space to the ADNR, FAA, NOAA, and AT&T.

<u>Roads</u>

Tatalina LRRS has 5.9 miles of gravel roads, including the portion of the Takotna/Sterling Landing Road that runs southeast/northwest through the property, and the access road to Top Camp. The crushed gravel material used for roads and the airfield was produced on-site at a gravel pit north of the airfield. Access to Top Camp can be difficult, especially during low visibility, high icing, heavy winds, and other extreme weather conditions. Top Camp can be iced in or snowed in, and may not be accessible for days or weeks at a time (611 CES 2019).

<u>Airfield</u>

The LRRS has a lighted and marked military airfield southeast of Lower Camp. The runway is 3,800 ft long, and is slightly inclined with an elevation gain of 41 ft from south to north (611 CES 2019).

H.16 TIN CITY LRRS

H.16.1 Location and Area

The 667-acre Tin City LRRS is located near the end of the Seward Peninsula approximately 640 miles northwest of Anchorage and 600 miles west of Fairbanks. The installation consists of an Upper Camp, Lower Camp, and an airfield. Lower Camp and the airfield are west and east, respectively, of the abandoned Tin City mine site that was located at the mouth of Cape Creek. Upper Camp is west of Lower Camp, on top of Cape Mountain (Figure H-109 and Figure H-110). It is accessible by air year-round, and by sea only during the summer.

H.16.2 Installation History

Tin City LRRS was one of 12 original AC&W sites built as part of the air defense system constructed in Alaska during the early 1950s. Tin City LRRS, originally known as Cape Prince of Wales but renamed in 1957 for the adjacent mining community, was activated in 1953. Communications were initially provided by high frequency radio. A WACS was activated at the site in 1958 to replace the high frequency radio system. In 1975 the WACS was replaced by microwave relays, and in 1980 the communication system was replaced with a satellite system. A MAR system was installed in 1985, which remains active today, and other modifications were made to remotely operate and maintain the radar from Elmendorf Region Operations Control Center. These improvements resulted in a reduction in the amount of necessary staff, which went from 95 military personnel in 1953 to 14 non-military contract personnel in 1977 to 4 operations and maintenance contract personnel in 1998 (Argonne National Laboratory and CEMML 2013).

H.16.3 Military Mission

The LRRS network provides Alaska air space surveillance, intercept control, and navigational assistance to military and civilian aircraft. The site is operated and maintained by four on-site contractor personnel (611 CES 2019).

H.16.4 Surrounding Communities

The closest community to the Tin City LRRS is the village of Wales, located 5 miles to the northwest. Wales has a population of 165 (2018 estimate) with a strong traditional Kinugmiut Eskimo whaling culture. The economy of Wales is based on subsistence hunting and fishing, trapping, Native arts and crafts, and some mining. Whales, walrus, polar bear, moose, salmon, and other fish are utilized. A private reindeer herd is managed out of Wales, and local residents are employed to assist in the harvest (Kawerak, Inc. 2012; State of Alaska 2018, 2019).

An undeveloped road connects Wales to the Tin City LRRS. Tin City has a deep water port and is used to unload heavy equipment and building materials for Wales that are then transported via the road. The road also serves as an emergency alternate access when the Tin City runway cannot be used, but the Wales runway is accessible. Access to the LRRS from Wales is also possible by boat, snowmachine, or ATV (Kawerak, Inc. 2012).

Figure H-109. Aerial Views of Tin City LRRS in the 1990s – Upper Camp (top) and Lower Camp (bottom)

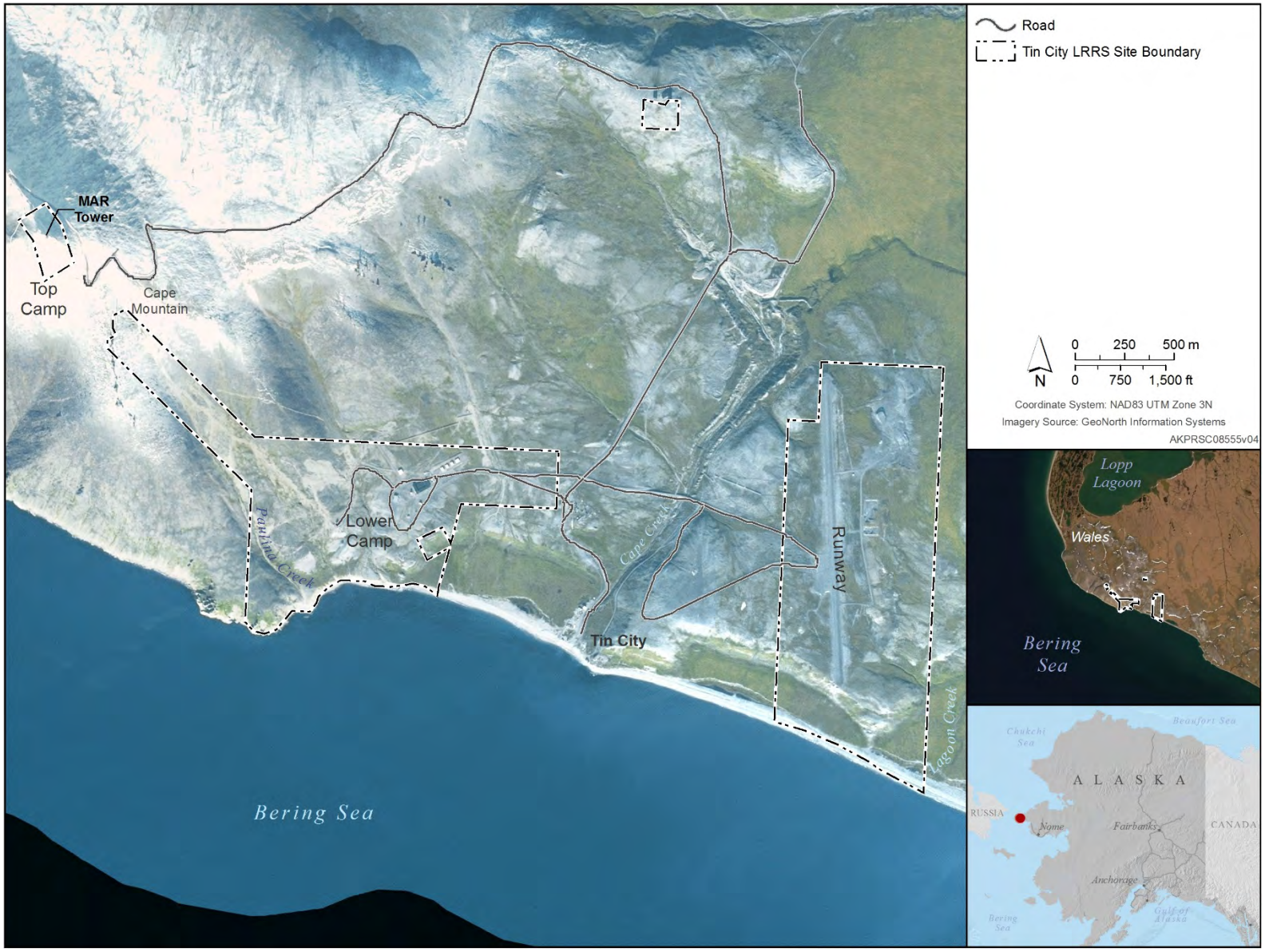

Figure H-110. Overview of Tin City LRRS

H.16.5 Regional Land Use

Most land surrounding the installation was conveyed in March 1982 to the Bering Straits Native Corporation in conjunction with the Wales Native Corporation. Much of the Tin City area has been degraded by past mining activities. Tin deposits along stream channels were surface-mined until 1990, leaving scarred and unvegetated stream banks and waste rock piles.

H.16.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Tin City LRRS.

H.16.7 Physical Environment

H.16.7.1 Climate

The Tin City LRRS falls within the transitional climate zone, characterized by weather patterns of long, cold winters and shorter, warm summers. Typical weather conditions at Tin City are cold, damp, foggy, and windy, which often limit access to the site. Average summer high temperatures are in the mid- to upper 40s ºF, and average winter low temperatures are typically below 0 ºF (Table H-72). Average annual precipitation is approximately 12 inches, with most occurring between July and November. Annual snowfall is over 54 inches with snow possible every month of the year. Winds are practically non-stop and average 17 mph. Occasional gusts of more than 80 mph are not uncommon (Woodward-Clyde 1993b).

Table H-72. Monthly Climatic Averages for Tin City, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	7.9	-0.4	4.2	13.3	30.6	42.8	49.9	48.9	43.1	30.6	19.8	7.8
Avg. Low (ºF)	-2.6	-10.2	-6.1	3.6	23.0	34.2	41.9	42.2	36.5	24.4	11.6	-1.8
Avg. Precipitation (inches)	0.6	0.3	0.4	0.4	0.3	0.6	1.8	2.4	1.5	1.9	1.5	0.5
Avg. Snowfall (inches)	5.7	2.5	3.4	4.0	2.4	0.7	0.2	0.3	1.7	13.6	14.6	5.1

Note: Data are for conditions at Lower Camp; conditions at Top Camp are different due to location and elevation.
Source: 611 CES 2019.

H.16.7.2 Topography

The topography in the vicinity of LRRS is relatively flat to the east, becoming steeper to the west. The elevation at Top Camp is approx. 2,300 ft MSL. The terrain drops steeply to an elevation of 250 ft MSL at Lower Camp and the airfield.

H.16.7.3 Geology and Soils

The geology of the Tin City area is dominated by undifferentiated alluvium and slope deposits (talus) common to steeply sloping and mountainous regions. The surficial geology of lower elevations, such as at Lower Camp, consists of thin accumulations of mixed silt, sand, gravel, cobbles, and boulders overlying bedrock. The Top Camp geology may consist of a thin veneer of residual (weathered rock) soils. Granitic bedrock outcrops are common on steep slopes and eroded mountaintop areas. The Tin City water well log indicates that unconsolidated deposits are only 9.5 ft thick at the well site at Lower Camp. Weathered, fractured granitic bedrock underlies the sediment. Soils are classified as Histic Pereglic Cryaquepts and Pergelic Cryaquepts. They range from silty to gravelly and are poorly drained (Woodward-Clyde 1993b).

The runway, located east of Cape Creek, is situated over limestone bedrock with surficial deposits typically deeper than those found to the west at the Lower Camp area (Woodward-Clyde 1993b).

The geology of the area is economically significant because the contact zone of tin-rich, granitic bedrock and limestone bedrock is situated between the installation runway and Lower Camp. This contact zone

between the two rock bodies is a source of lode and placer-type tin deposits and has been mined in the past (Woodward-Clyde 1993b).

Permafrost is most likely intermittent along the coast. Farther inland, it is mostly continuous to a maximum depth of 600 ft and occurs primarily in fine-grained silt and clay soils. The presence of permafrost at the installation is undetermined (Woodward-Clyde 1993b).

H.16.8 Hydrology

H.16.8.1 General

Surface water runoff from the installation flows into one of five creeks. Paulina Creek drains Top Camp and portions of Lower Camp, Cape Creek drains the eastern portion of Lower Camp, and Lagoon Creek drains areas east of the runway. These creeks flow south into the Bering Sea (Woodward-Clyde 1993b).

The hydrogeology of Lower Camp consists of a thin layer of mixed talus and alluvium overlying bedrock at shallow depths. Groundwater occurs in secondary openings of local bedrock (e.g., faults, fractures, fissures) at highly variable depths below ground surface. Groundwater is recharged at the installation by infiltration of precipitation and streamflow seepage through highly permeable surficial materials present at or near ground surface. Seasonal groundwater may occur in unconsolidated materials above bedrock. Permafrost is thought to be generally limited to layers of fine-grained sediments that may be present (Woodward-Clyde 1993b).

The hydrogeology of Top Camp consists of thin gravelly, bouldery residuum overlying bedrock; bedrock crops-out frequently. Groundwater, if present, may occur in secondary openings of local bedrock or may be seasonally trapped in the residual material as perched water. The installation's water supply comes from a well that was drilled into fractured zones of granitic bedrock. Water is pumped into storage tanks for later use (Woodward-Clyde 1993b).

H.16.8.2 Floodplains

Installation lands are well above any floodplain, except for the toe of the coastal bluff. Wave runup on the coast will reach about 14 ft (Legare 1998).

H.16.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Tin City LRRS and the surrounding area. Attachment 5 contains lists of vascular plants (Table H-27), fish (Table H-28), mammals (Table H-29), and birds (Table H-30) known to occur or potentially occurring in the Tin City area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Tin City site are discussed in in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.16.9.1 Ecoregion Classification

The Tin City LRRS is located within the Seward Peninsula Ecoregion. Refer to INRMP Section 2.3.1 (Ecoregion Classification) for details.

H.16.9.2 Vegetation/Habitat

A general vegetation map of Tin City LRRS was prepared in 1995 (611 ASG 1995d). Schick et al. (2004) made significant improvements in vegetation mapping at the LRRS using 1996 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2012, Colorado State University, CEMML, in cooperation with the 611 CES/CEPT GeoBase Program, mapped habitat classes

for Tin City LRRS using the most recent imagery found on Google Earth. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 4 habitat classes were identified (Table H-73 and Figure H-111). A list of vascular plants known to occur or potentially occurring in the Kotzebue area is provided in Table H-27.

Table H-73. Habitat Classes at Tin City LRRS (2017)

Habitat Class	Acres	Proportion
Sedge & Herbaceous	400.2	60.0%
Developed & Barren Land	253.4	38.0%
Shrub or Scrub	8.0	1.2%
Open Salt Water	5.3	0.8%
Total	**666.9**	

Source: CEMML 2019a.

Tin City LRRS encompasses 667 acres of gently sloping, rocky tundra and steep mountainous terrain. The most common habitats at the site are dwarf scrub and partly barren rock in the mountains, lowland tundra near the coast, and upland tundra on gentle mountain slopes; relatively little riverine and almost no lacustrine habitat are present. Most riverine barrens in the area are composed of reworked gravels from earlier mining operations. Tundra varies from almost continuous and uniformly developed cotton-grass tussocks, with sparse growth of other sedges and dwarf shrubs, to stands where tussocks are scarce or lacking, and dwarf shrubs are dominant. Common plant species occurring on the site include currant, crowberry, cloudberry, lousewort, glacier avens, and several species of prostrate willow. Ground cover at higher elevations consists entirely of alpine tundra, with increased areas of barren ground and generally low-growing vegetation adapted to severe winds and harsh growing conditions. Common plants at Top Camp include Arctic poppy, moss campion, and four-angled cassiope (Schick et al. 2004).

H.16.9.3 Wetlands

The current mapping of wetlands at the Tin City LRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 667-acre Tin City site, 63 acres (or 9%) are considered wetlands per the NWI mapping (Table H-74 and Figure H-112). The most common wetland type at the Tin City LRRS is freshwater emergent characterized by evergreen broad-leaved scrub-shrub, with or without lichens. Dominant species include *Dryas octopetala*, *Salix rotundifolia*, and lichens (Schick et al. 2004).

H.16.9.4 Fish and Wildlife

H.16.9.4.1 Fish

Fourteen fish species potentially occur within the marine waters of the Tin City area, including five salmon species, Pacific tomcod, Arctic cod, Arctic flounder, and rainbow smelt (Table H-28). The creeks within the vicinity of the LRRS (Paulina, Cape, Lagoon, and one unnamed creek) are not listed in the ADFG anadromous stream catalog (Johnson and Blossom 2019b).

Table H-74. Tin City LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	38.3	5.7%	375.8	56.3%
Estuarine and Marine	10.3	1.5%	6.3	0.9%
Freshwater Forested/Shrub	9.6	1.4%	0.4	<0.1%
Riverine	4.2	0.6%	0	0
Estuarine and Marine Deepwater	0.6	<0.1%	0	0
Freshwater Pond	0	0	2.7	0.4%
Wetlands Total	**63.0**	**9.4%**	**385.2**	**57.7%**
Upland	603.9	90.6%	281.7	42.3%
Site Total	**666.9**		**666.9**	

Notes: *See Figure H-112. †See Figure H-113.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

H.16.9.4.2 Mammals

Terrestrial Mammals

A total of 23 terrestrial mammals have been observed or have the potential to occur on the Tin City LRRS (Table H-29). Common small mammals include northern red-backed, meadow, root, and singing voles; masked shrew; brown and collared lemmings; snowshoe and tundra hares; Arctic ground squirrel; and Arctic and red fox. Larger species, such as brown bear and wolf, may also occur in the area. Caribou are rare but are occasionally seen in the area. Muskox are residents in the area and forage on alpine tundra surrounding Top Camp (611 ASG 1995d).

Marine Mammals

A total of 16 marine mammal species are known to or potentially occur within the vicinity of the Tin City LRRS: five seal species and Pacific walrus, eight whale species, harbor porpoise, and polar bear (Table H-29). Marine mammals are discussed in detail in Section H.16.9.5 (ESA- and MMPA-listed Species).

H.16.9.4.3 Birds

A total of 64 bird species have been observed on the Tin City LRRS or in the immediate vicinity (Table H-30). Low-lying areas near sea level and adjacent to the LRRS provide breeding and foraging habitat for waterfowl and shorebirds, such as the northern pintail and semipalmated plover. Typical species observed on the LRRS include common raven, horned lark, yellow and white wagtails, Lapland longspur, snow bunting, rough-legged hawk, and sandhill crane. The area around Tin City exhibits a geographic proximity to Asia that accounts for the presence of species not found farther east. Regular breeders along the western Seward Peninsula include the Arctic loon, rufous-necked stint, and red-throated pipit. The most common seabirds found in the area include red-throated loon, glaucous gull, pelagic cormorant, black-legged kittiwake, common and thick-billed murres, horned puffin, and pigeon guillemot (Kessel 1989; 611 ASG 1995d; 611 CES 2007a). As of 1978, two small seabird colonies occurred on sea cliffs approx. 1-1.5 miles west of Lower Camp. These colonies consisted of 20 pelagic cormorants, an unknown number of black-legged kittiwakes and horned puffins, and possibly Kittlitz's murrelet (Sowls et al. 1978).

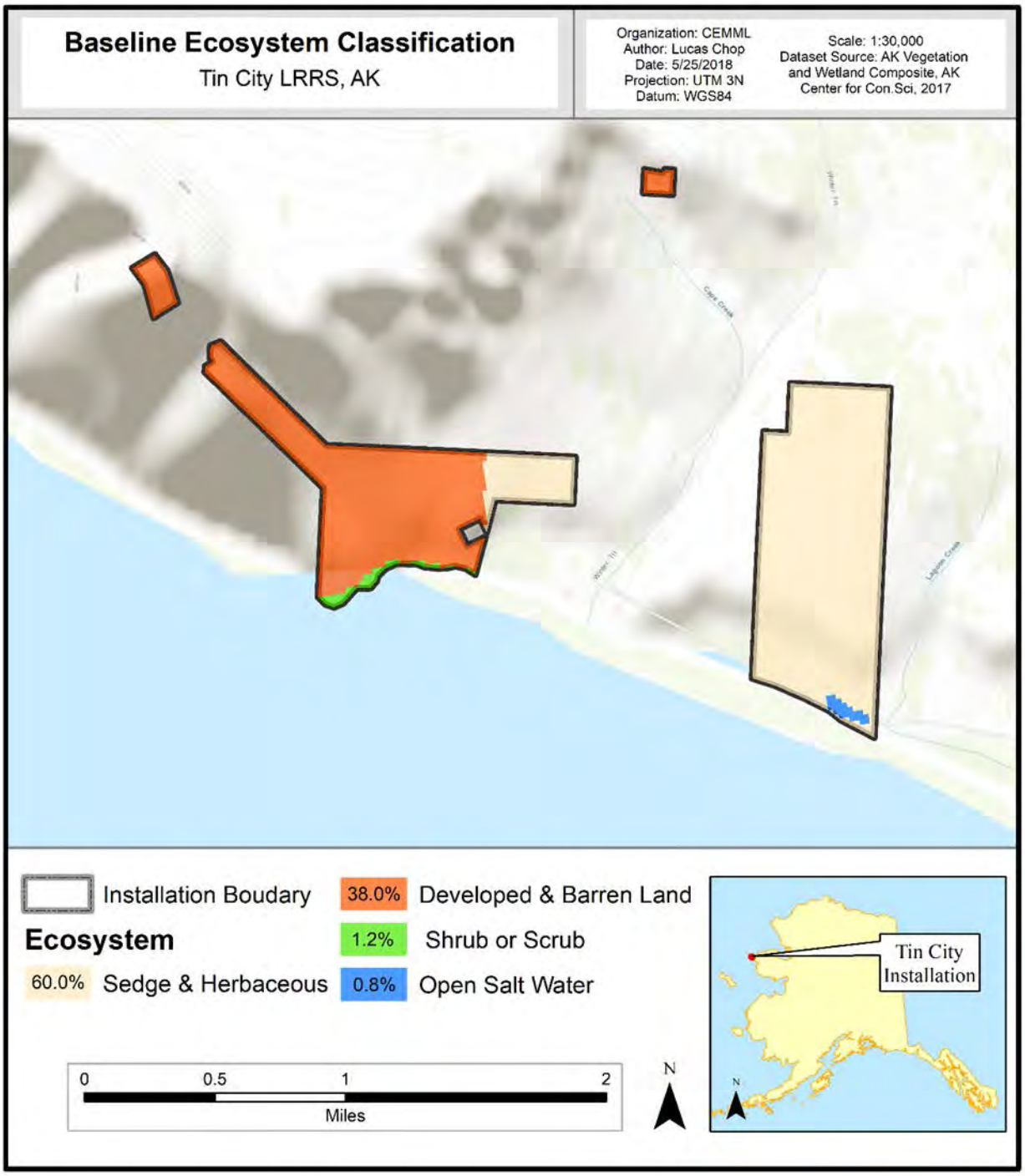

Figure H-111. Tin City LRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

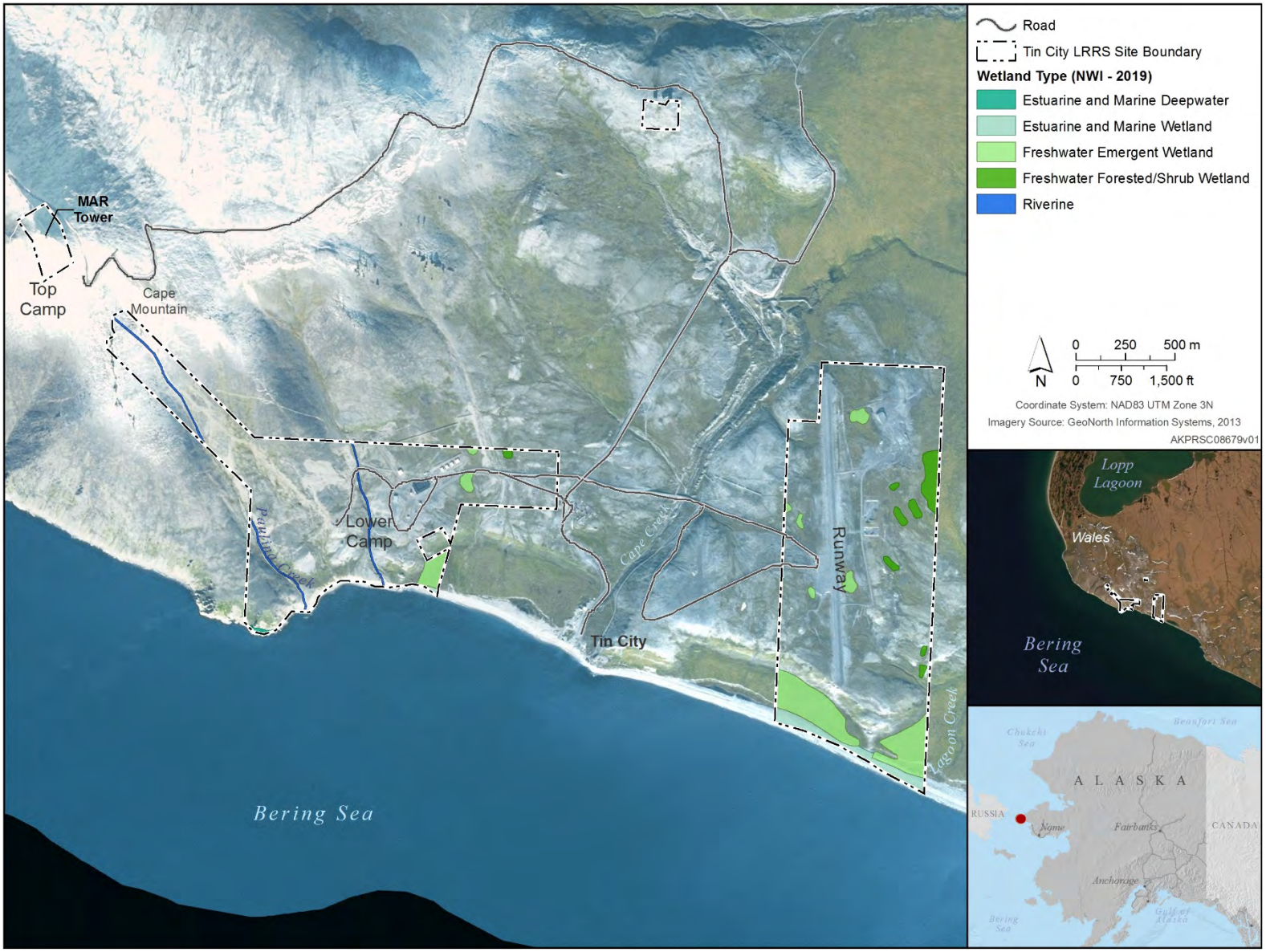

Figure H-112. Tin City LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

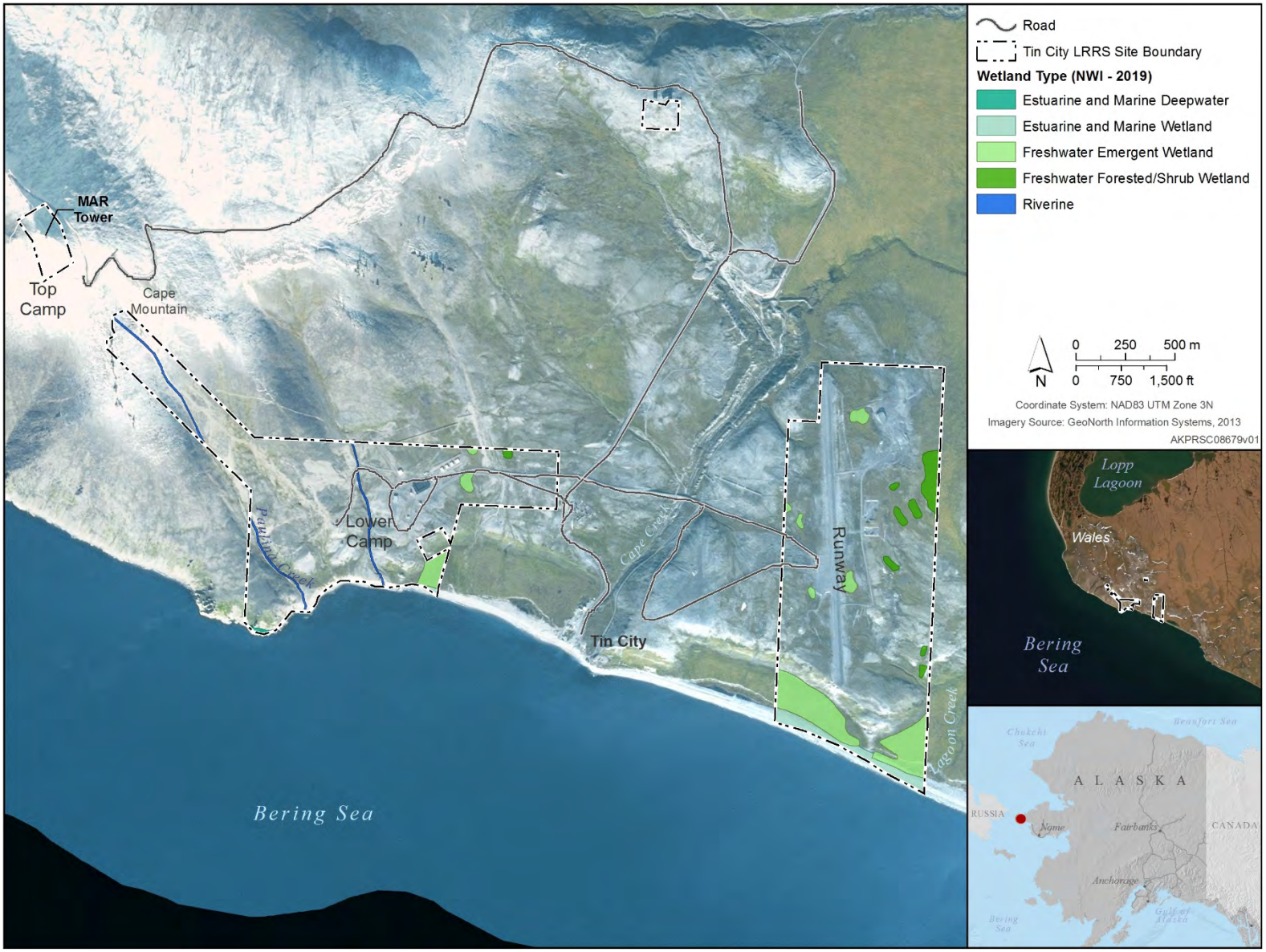

Figure H-113. Tin City LRRS Wetlands (2019 ANHP)
(*Source*: Flagstad et al. 2018)

H.16.9.5 ESA- and MMPA-listed Species

Although no ESA-listed species are known to occur on the LRRS, 10 ESA-listed species potentially occur in the vicinity: threatened spectacled and Steller's eiders; threatened polar bear; endangered humpback, North Pacific right, fin, and bowhead whales; endangered Steller sea lion; and threatened ringed and bearded seals (Table H-29 and Table H-30 and INRMP Table 5).

ESA-listed Species

Spectacled and Steller's Eiders. Spectacled and Steller's eiders are known to breed only on the Arctic Coastal Plain and the Yukon-Kuskokwim Delta. However, both species are expected to occur in the offshore marine waters of the Tin City LRRS during spring and fall migration (USFWS 1996, 2002).

Polar Bear. Polar bears are extremely rare at Tin City LRRS during November to March, even though they are common on the opposite side of the mountain near the village of Wales (PRSC 2020). The adjacent marine waters are considered sea ice critical habitat for polar bears (Figure H-32) (USFWS 2010).

Steller Sea Lion. The area of the Tin City LRRS is considered the northernmost extent of the Steller sea lion range. There are no known haulouts in the vicinity of the LRRS and the northernmost rookery is at Seal Rocks, at the entrance to Prince William Sound, well south of the Tin City site (NMFS 2008). The occurrence of Steller sea lions in the vicinity is expected to be very rare.

Ringed and Bearded Seals. Both ringed and bearded seals can be found along the coast of the Tin City LRRS year-round (Smith et al. 2017). In 2014, the marine waters adjacent to the Tin City site extending from the shoreline out to the U.S. EEZ were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bowhead, Humpback, Fin, and Northern Right Whales. Bowhead whales are expected to occur in the offshore marine waters of the Tin City LRRS during spring, fall, and winter. Humpback, fin, and northern right whales are expected to occur in offshore waters during summer (Smith et al. 2017; NOAA Fisheries 2019).

Other MMPA-listed Species

Pacific Walrus.Although there are no known walrus haulouts in the vicinity of the Tin City LRRS (Fischbach et al. 2016), the area is within the walrus' range and are expected to be uncommon in the offshore waters.

Ribbon and Spotted Seals. Both ribbon and spotted seals can be found along the coast of the Tin City LRRS year-round (Smith et al. 2017).

Gray Whale, Killer Whale, and Beluga. Gray whales are expected to occur in the offshore waters of the LRRS during summer and also during spring and fall migration to and from their southern calving areas. Killer whales are expected to occur in offshore waters in the summer, migrate north in the spring as the pack ice retreats, and then thru fall when they begin to migrate south when the pack ice advances. Beluga may be found offshore during spring, summer, and fall (NOAA Fisheries 2019).

H.16.10 Other Natural Resource Information

H.16.10.1 Subsistence

Residents of Wales utilize an area encompassing the westernmost portion of the Seward Peninsula southwest of Shishmaref and west of Mary's Igloo for harvest of subsistence resources. Traditional subsistence activates in the Wales area have revolved principally around marine mammals, especially

bowhead, walrus, and bearded seals. In addition to marine mammals, Wales residents rely, to a lesser extent, on reindeer, moose, various fish species, clams, birds and their eggs, and a variety of greens and berries. Wales is one of 10 Alaska Eskimo Whaling Commission communities. Of all subsistence activities, bowhead whaling represents one of the greatest concentrations of effort, time, money, group symbolism and significance. Five species, bearded seal, bowhead, walrus, ringed seal, and chum salmon accounted for about 77% of Wales annual subsistence harvest in terms of edible pounds (Braund and Associates 2004).

H.16.10.2 Outdoor Recreation

Outdoor recreation at Tin City LRRS for installation personnel or Wales residents consists primarily of beachcombing, mountain biking, whale watching, and ATV riding along trails and beaches. Tin City LRRS provides exceptional wildlife viewing. Muskox, gray whales, and breeding seabirds frequently are observed from the site. Little potential exists for installation personnel to use hunting and fishing resources in the Tin City area. BOS contract personnel stationed at Tin City, temporary duty personnel during free time, and subsistence hunters from the neighboring area hunt and fish the surrounding area, but little or no demand exists by DoD personnel to travel to the site for recreational purposes. ATV riding on the LRRS is restricted to designated trails and roads.

H.16.11 Mission and Other Impacts on Natural Resources

H.16.11.1 Land Use

Lower Camp includes the main living quarters, storage buildings, and most of the site's facilities. Top Camp includes the MAR tower, residential building and diesel fuel tanks for the generator. The road to Top Camp is approximately 5 miles long and it is maintained for wheeled vehicles during the summer and traversed using a PistenBully in the winter. Top Camp access can be difficult, especially during low visibility, high icing, heavy winds, and other extreme weather conditions. Top Camp can be iced in or snowed in, and may not be accessible for days or weeks at a time.

The airfield is 4,702 ft long by 100 ft wide and is equipped with REIL and PAPI light systems and frangible distance remaining indicators (611 CES 2019).

Tin City LRRS is served by ocean-going barges to deliver fuel, construction material and equipment, and other large or heavy equipment/maintenance components. When a barge is due, operations personnel construct a temporary barge landing and use heavy construction equipment to anchor the barge. The temporary barge landing is typically washed away by wave action after each use (611 CES 2019).

The water gallery and well are near Pauline Creek above Lower Camp. The gallery, a buried perforated pipe that acts as a collecting pan, intercepts water moving along a fault zone and channels the water into the well. The water is pumped from the well and stored in tanks for use by the LRRS; it is chlorinated before dispensing.

A license for the University of Alaska – Fairbanks Earthquake Information Center for remotely-monitored seismic and tsunami equipment at Tin City LRRS is being renewed, and a permit for the FAA for general aviation communication facilities is in process (611 CES/CEIA 2020).

H.17 BULLEN POINT SRRS (INACTIVE)

H.17.1 Location and Area

The 670-acre former Bullen Point (also known as Flaxman Island) SRRS is located on the northern coast of Alaska on the Beaufort Sea about 35 miles east of Deadhorse/Prudhoe Bay and 375 miles north of Fairbanks (Figure H-114). The site was inactivated in 2007 and there are no remaining facilities or structures on the site.

H.17.2 Installation History

Bullen Point was 1 of 20 auxiliary DEW Line stations. Construction began at Bullen Point in 1953 and the site became operational in 1957. The site was closed between 1971 and 1992. In 1994, the station was converted to an SRRS and was in operation until 2007 when the facility was again deactivated. In 2007, the site was included as part of the USAF's Clean Sweep demolition program which removed all pre-1994 structures associated with the former DEW Line station with the intent to facilitate future transfer of the property to the BLM. In August 2014, all aboveground portions of the remaining structures at the Bullen Point SRRS were demolished and removed for offsite disposal/recycling (AFCEC and PACAF 2018).

Environmental assessment activities conducted in August 2014 indicated concentrations of diesel range organics contamination at a former shed site were greater than ADEC standards. A Site Characterization Investigation conducted by the Air Force in 2017 assessed and delineated the extent of contamination detected during the 2014 field activities, and evaluated a number of potential remedial alternatives for the site. Future remedial actions are currently being considered including additional monitoring and analysis of the site and the development of site-specific cleanup standards for maintaining the long-term remedial objective(s) for the former Bullen Point SRRS (AFCEC and PACAF 2018). Further characterization of this site will occur in 2019 with a remedial action planned for 2023 (AFCEC/CZOP 2019).

H.17.3 Military Mission

The former Bullen Point SRRS is now closed (see Section H.17.2, Installation History). The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is scheduled for 2023.

H.17.4 Surrounding Communities

The former Bullen Point SRRS is located within a remote and unpopulated region of northern Alaska. The nearest populated area is Deadhorse/Prudhoe Bay, located approximately 40 miles to the west. Conoco's Badami Oilfield facilities are located 5 miles west of Bullen Point and ExxonMobil's Point Thomson exploration facilities are located approximately 10 miles east. Transportation to the SRRS is limited to aircraft, seasonal barges, and extremely limited land travel. No roads connect to the facility.

H.17.5 Regional Land Use

The site is surrounded by state lands. As stated above, oil and gas facilities are in the vicinity.

H.17.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Bullen Point SRRS. The western boundary of the Arctic NWR is approx. 20 miles to the east of Bullen Point.

Figure H-114. Overview of Former Bullen Point SRRS

H.17.7 Physical Environment

H.17.7.1 Climate

Prudhoe Bay, 35 miles west of the SRRS, is the nearest source of meteorological data in the area. The climate of the North Slope is arctic. Prudhoe Bay temperatures range from average lows in winter of -24-°F to average highs in the upper 40s and low 50s °F in the summer (Table H-75). Precipitation is light, averaging only 4 inches per year. Average annual snowfall is 33 inches. Strong winter winds are common, and over half the days in January, February, and March have windchills of below -40 °F (ICF Technology, Inc. 1996b). Complete cloud cover occurs 54% of the year and fog may be expected 115 days annually.

Table H-75. Monthly Climatic Averages for Prudhoe Bay, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	-11.9	-10.1	-5.2	10.1	28.8	45.2	55.4	51.0	38.3	21.0	0.9	-6.6
Avg. Low (ºF)	-24.0	-24.3	-20.3	-4.8	19.0	32.7	39.7	37.5	28.9	9.7	-11.0	-19.2
Avg. Precipitation (inches)	0.2	0.2	0.1	0.1	0.1	0.4	0.7	1.1	0.6	0.4	0.2	0.2
Avg. Snowfall (inches)	2.8	2.4	2.7	1.7	1.4	1.0	0	0.5	3.5	9.3	4.3	3.5

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.17.7.2 Topography

The Bullen Point site is situated in the Arctic Coastal Plain physiographic region. The Coastal Plain is a relatively smooth surface showing little relief, sloping downward to the north from the foothills of the Brooks Range. Due to the flat terrain and the continuous occurrence of permafrost, marshes and lakes are abundant. The coastline is characterized by low coastal banks with narrow gravel beaches. Coastal erosion occurs as thermal undercutting of the frozen bank and slumping into the sea (CH2M Hill 1981).

Bullen Point is located on the coast of the Beaufort Sea on a relatively flat area below a gradual slope. Elevations at the site range from 10 to 18 ft MSL. The site contains a wide variety of terrain, including shallow lagoons, numerous and varied stages of thaw lakes, intermediate zones of polygonal ground, and upland areas of relatively flat tundra mat. A chain of barrier islands is located offshore.

H.17.7.3 Geology and Soils

Similar to other areas of the Arctic Coastal Plain, Bullen Point was not glaciated. Thus, many periglacial features, such as polygonal ground, sorted circles, pingos, and ice wedges, can be observed in the area. Surficial deposits in the area consist of sand and gravel near the shoreline and along stream channels; silt, sand, and gravel deposits in the inland low areas; and eolian silt and fine sand deposits in upland areas. Oil is present in the region. Numerous oil wells have been drilled offshore on some of the barrier islands, but none have been drilled in the immediate vicinity of the SRRS.

Permafrost is continuous at Bullen Point and is probably hundreds of feet deep. Summer thaw depths in the active layer range from 1 to 6 ft in the tundra soils.

H.17.8 Hydrology

Surface water resources of Bullen Point site are similar to other Arctic coastal areas and include lagoons, thaw lakes, and shallow streams. The drainage pattern is generally to the north and occurs as sheet flow and ephemeral streams and may drain into larger streams or directly to the ocean. A partially captured thaw lake forms a brackish water lagoon along the northern portion of the site. Lakes in the general area are less than 10 ft deep. Abundant thaw lakes and polygonal ground near the site are drained by several small, slow-moving streams.

H.17.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on Bullen Point SRRS. Attachment 8 contains lists of vascular plants (Table H-78), fish (Table H-79), mammals (Table H-80), and birds (Table H-81) known to occur or potentially occurring in the Bullen Point area; a list of fish species is found in Table H-21. ESA- and MMPA-listed species that may occur at or in the vicinity of the Oliktok site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.17.9.1 Ecoregion Classification

The Bullen Point site is located in the Beaufort Coastal Plain ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.17.9.2 Vegetation/Habitat

Schick et al. (2004) mapped habitat at the Bullen Point site using 2000 digital aerial photography and conducting flora and fauna surveys. Wells et al. (2010) updated this mapping and data analysis using 2006 pan-sharpened Quick Bird aerial photos. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). Six habitat classes were identified (Table H-76 and Figure H-115). A list of vascular plants known to occur or potentially occurring in the Bullen Point area is provided in Table H-78.

Table H-76. Habitat Classes at Bullen Point SRRS (2017)

Habitat Class	Acres	Proportion
Lowland Tundra	315.0	47.0%
Sedge Marsh	101.2	15.1%
Coastal Brackish Water	100.5	15.0%
Developed & Barren Land	95.8	14.3%
Coastal Salt Marsh	40.9	6.1%
Shrub or Scrub	16.1	2.4%
Total	**669.5**	

Source: CEMML 2019a.

Habitat of the North Slope is generally classified as wet tundra. The site is characterized by coastal tundra typical of the central Beaufort Sea area. Moist polygon tundra consisting primarily of high-centered polygons with little topographic relief (<0.5 m, sometimes referred to as "flat-topped polygons") cover much of the area. Vegetative cover in these areas is typically about 100% and is dominated by vascular plants, such as *Carex aquatilis*, *Carex bigelowii*, *Salix planifolia, Dryas integrifolia,* and various moss and lichen species. Alternating with the polygon tundra are shallow thaw lakes, pond complexes, and drained lake basins. Drained lake basins are wetter than the more elevated polygon tundra and exhibit tundra plant communities dominated by *Carex aquatilis* and *Eriophorum angustifolium* (Schick et al. 2004).

Inland from the coast some small patches of moist tussock tundra dominated by *Eriophorum vaginatum* are present. Along the immediate coastline are areas of moist polygon tundra that are periodically inundated with saltwater during storm surges. These areas have patches of bare peat and mud and a mixture of typical moist tundra plants and more halophytic species, such as *Stellaria humifusa*, *Carex ursina*, and *Salix ovalifolia*. The Bullen Point site encompasses a portion of a large saltwater lagoon and sand spit system. Surrounding the lagoon are patches of arctic saltmarsh dominated by *Carex subspathacea* and *Puccinellia phryganodes* (Schick et al. 2004).

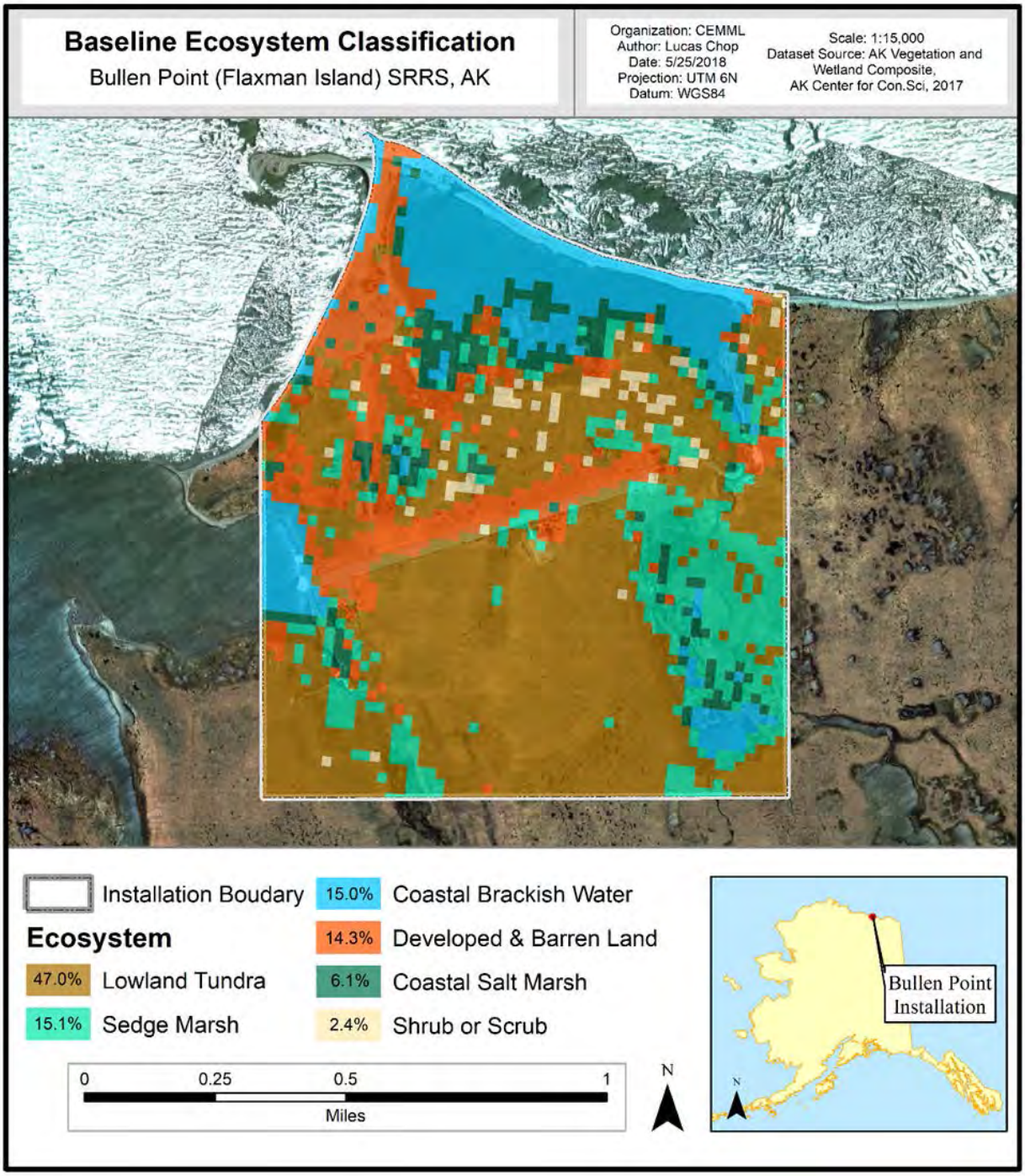

Figure H-115. Bullen Point SRSS Habitat Classes (2017)
(*Source*: CEMML 2019a)

H.17.9.3 Wetlands

The current mapping of wetlands at the Bullen Point SRRS is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a*

comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.]

Of the approximate 670-acre Bullen Point site, 631 acres (or 94%) are considered wetlands per the NWI mapping (Table H-77 and Figure H-116). The most common wetland type at the Bullen Point SRRS is freshwater emergent. These areas are typically moist and wet tundra, and are either saturated, seasonally flooded or semi-permanently flooded, depending on microtopography and landscape position. These areas are often dominated by sedges (*Carex* spp.) and cotton grass (*Eriophorum* spp.) Other wetlands include deep or shallow ponds and seasonally flooded emergent areas mixed with mosses and/or lichens. Estuarine habitats are common in the northeastern part of the site and include estuarine, subtidal, unconsolidated bottom areas, bordered by estuarine, intertidal emergent vegetation that is irregularly flooded from storm events (Schick et al. 2004).

Table H-77. Bullen Point SRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*(1)		2018 ANHP†(2)	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	498.2	74.3%	136.3	20.3%
Estuarine and Marine Deepwater	87.5	13.1%	11.6	1.7%
Estuarine and Marine	34.7	5.2%	57.7	8.6%
Freshwater Pond/Lake	7.9	1.2%	82.9	12.4%
Riverine	3.1	0.5%	36.8	5.5%
Wetlands Total	**631.4**	**94.2%**	**325.3**	**48.5%**
Upland	38.8	5.8%	345.2	51.5%
Site Total	**670.2**		**670.5**	

Notes: *See Figure H-116. †See Figure H-117.
Sources: (1)USFWS 2019d. (2)Flagstad et al. 2018.

H.17.9.4 Fish and Wildlife

H.17.9.4.1 Fish

A total of 15 fish species are known to or potentially occur within the vicinity of the Bullen Point site (Table H-79). The most common species of fish found in nearshore habitats of the western Beaufort Sea include Arctic char, Arctic cisco, boreal smelt, Pacific herring, polar cod, and fourhorn sculpin. Ninespine stickleback are found in fresh and brackish water habitats along the Arctic coast. Arctic char is the most commonly targeted species for subsistence and recreational fishing (Arctic Slope Technical Services 1982; Hart Crowser 1987; ICF Technology, Inc. 1996b). The closest anadromous stream is an unnamed creek 1.5 miles to the east and it is listed as supporting Dolly Varden (Johnson and Blossoum 2019b).

H.17.9.4.2 Mammals

Terrestrial Mammals

Although only nine terrestrial mammal species have observed on or in the vicinity of the Bullen Point site, an additional 6 species potentially occur on the site (Table H-80). The most common mammals within the area are brown and collared lemmings, least weasel, ermine, red fox, Arctic fox, and Arctic ground squirrel. Caribou and muskox are the most conspicuous terrestrial mammals occurring in and around Bullen Point. The SRRS and surrounding area have been identified as a summer calving area for the Central Arctic caribou herd. Although brown bears are considered rare within the vicinity of Bullen Point, the area approx. 9 miles to the west along the Shaviovik River has been identified as a high concentration area (ICF Technology, Inc. 1996b, c; ADNR 2014b; North Slope Borough 2019b).

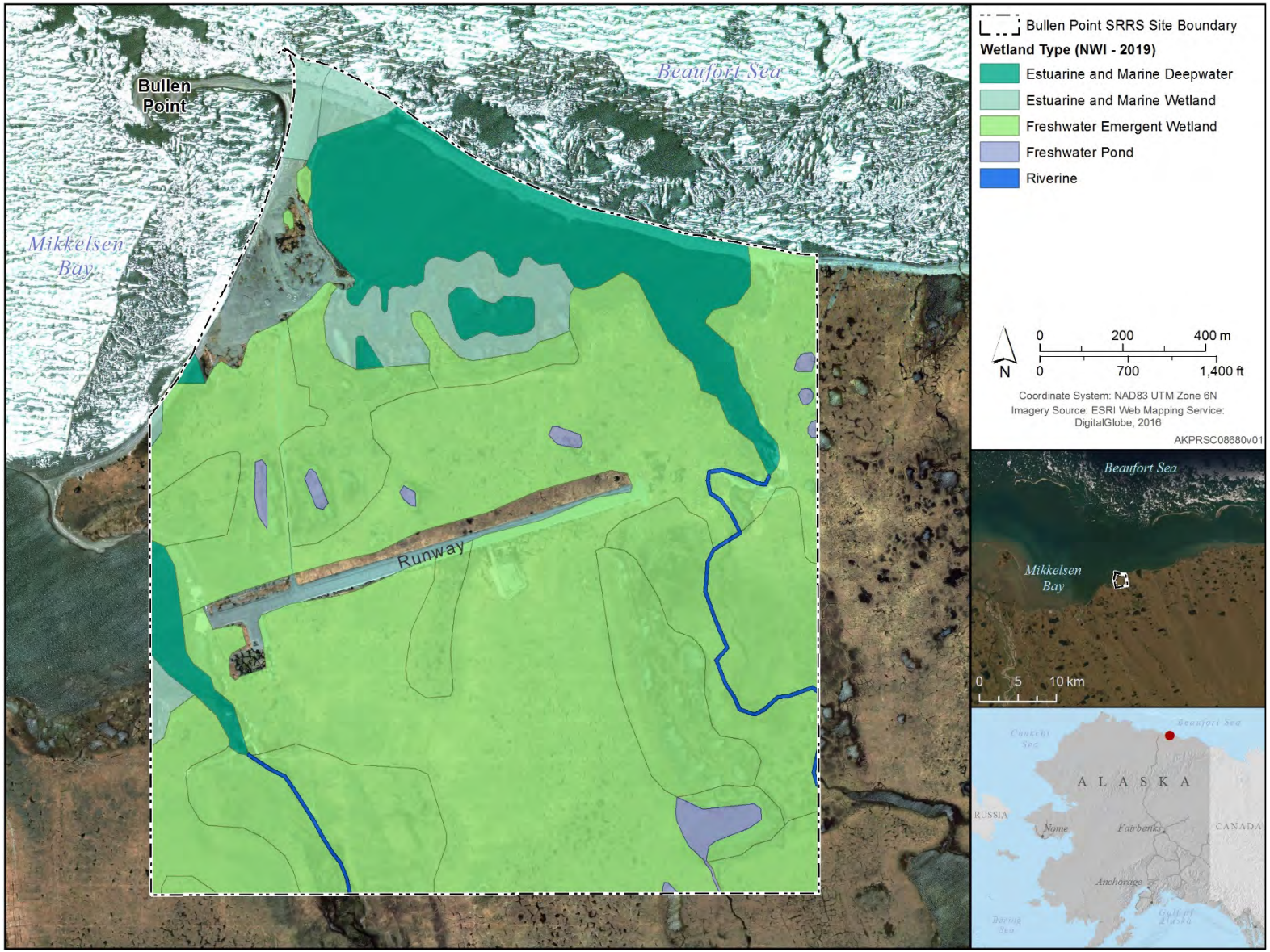

Figure H-116. Bullen Point SRRS Wetlands (2019 NWI)
Source: USFWS 2019d)

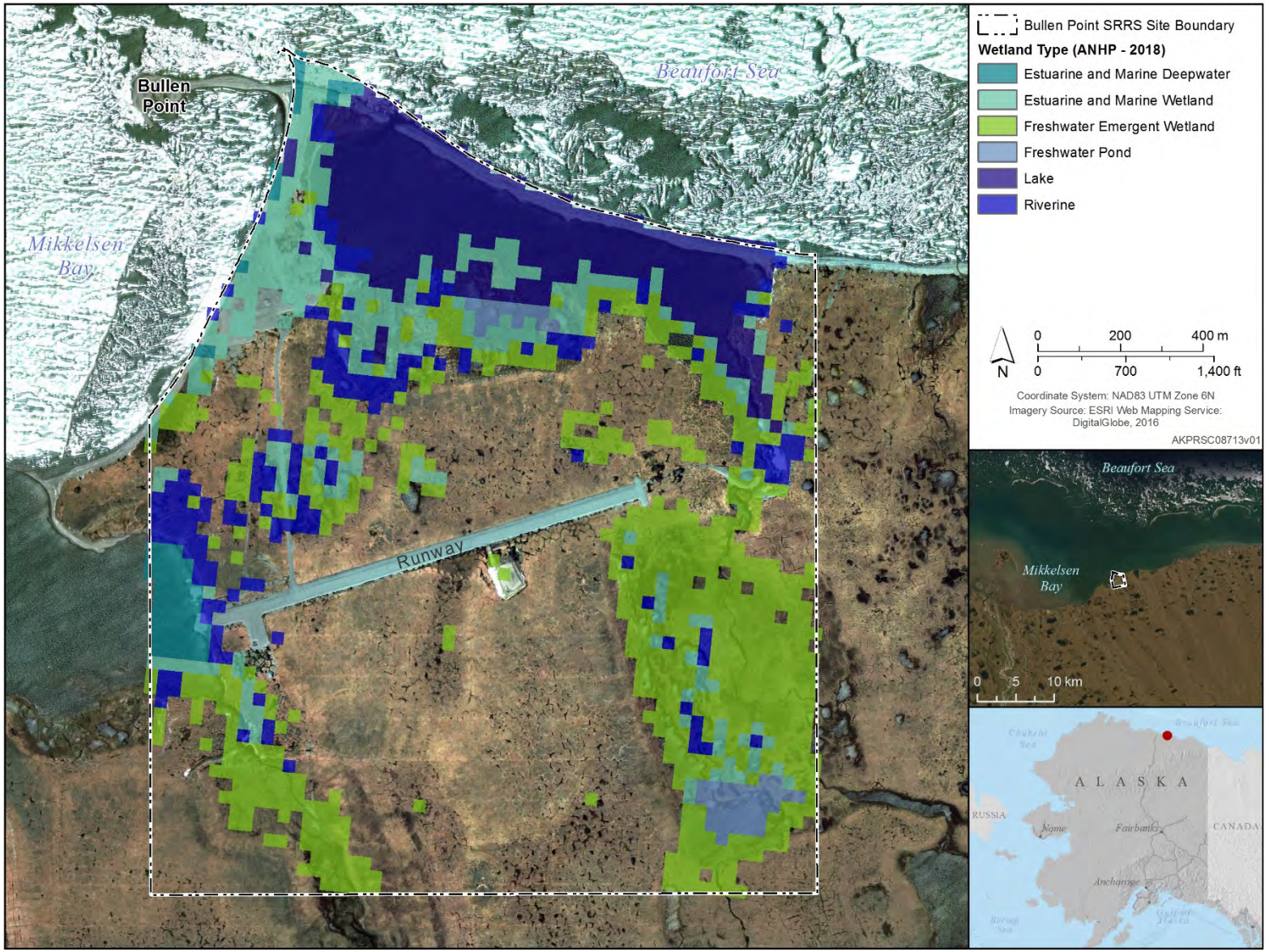

Figure H-117. Bullen Point SRRS Wetlands (2019 ANHP)
Source: Flagstad et al. 2018)

Marine Mammals

Pacific walrus, three species of seal, three species of whale, and polar bear occur in the Bullen Point area (Table H-80). Marine mammals are discussed in detail in Section H.17.9.5 (ESA- and MMPA-listed Species).

H.17.9.4.3 Birds

Habitats of the Arctic Coastal Plain provide nesting and foraging opportunities for a wide variety of bird species. Many of these are shorebirds and waterfowl using migratory corridors that pass through the Bullen Point area. Use of the coastal plain is highly seasonal and associated with avian breeding and migration cycles. Molting, pre-migratory staging, and post breeding movements occur in association with shoreline habitats.

A total of 41 bird species have been observed on the site, with an additional 31 having the potential to occur either on site or in the vicinity (Table H-81). Migratory birds using the area include brant; snow, greater white-fronted, and Canada goose; common and king eider; white-winged, surf, and common scoter; tundra swan, long-tailed duck, red-breasted merganser, loons, scaup, northern pintail, and various other waterfowl. The protected lagoon/saltmarsh area of the Bullen Point site is favored by waterfowl, and is especially good brood rearing habitat in the post-nesting season. Several sandpiper and plover species and the red-necked phalarope frequent ponds and small lakes in and around the site. Predatory birds that use the Bullen Point area include snowy owl, short-eared owl, rough-legged hawk, pomarine jaeger, long-tailed jaeger, and parasitic jaeger (Schick et al. 2004). During a 1999 site visit, the following species displayed breeding behavior and/or nests were observed: tundra swan, Canada goose, common eider, long-tailed duck, rough-legged hawk, American golden-plover, semipalmated sandpiper, Baird's sandpiper, pectoral sandpiper, dunlin, red-necked phalarope, red phalarope, Lapland longspur, and snow bunting.

Important Bird Areas (IBAs)

The Bullen Point SRRS is adjacent to the Beaufort Sea Nearshore IBA (Figure H-29). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The Beaufort Sea Nearshore IBA occupies 6,800 mi^2 of pelagic open water habitat in the Beaufort Coastal Plain ecoregion within the Beaufort Sea-continental coast and shelf. The Beaufort Sea Nearshore is an IBA for large breeding populations of glaucous gull and long-tailed duck (Audubon Alaska 2014).

H.17.9.5 ESA- and MMPA-listed Species

Six ESA-listed species potentially occur on or in the vicinity of the Bullen Point SRRS: threatened spectacled and Steller's eiders, threatened polar bear, threatened ringed and bearded seals, and endangered bowhead (Table H-80 and Table H-81 and INRMP Table 6). The polar bear, ringed and bearded seals, and bowhead are also listed under the MMPA. Four additional species are listed under the MMPA and occur on site or in the vicinity: Pacific walrus, killer whale, gray whale, beluga, and spotted seal.

ESA-listed Species

Spectacled and Steller's Eiders. Bullen Point is one of five remote USAF sites with the greatest potential for nesting spectacled eiders and one of four sites with the greatest potential for nesting or brood-rearing based on habitat suitability (Day et al. 1995). During 1994 surveys of the site, a pair of spectacled eiders were observed sitting on the edge of a lake in the southeast corner of the site, a male spectacled eider was observed flying along the shoreline at point, and a dead female spectacled eider was documented in the southeastern portion of the site and appeared to have been killed by a raptor (Figure H-118) (Day et al. 1995).

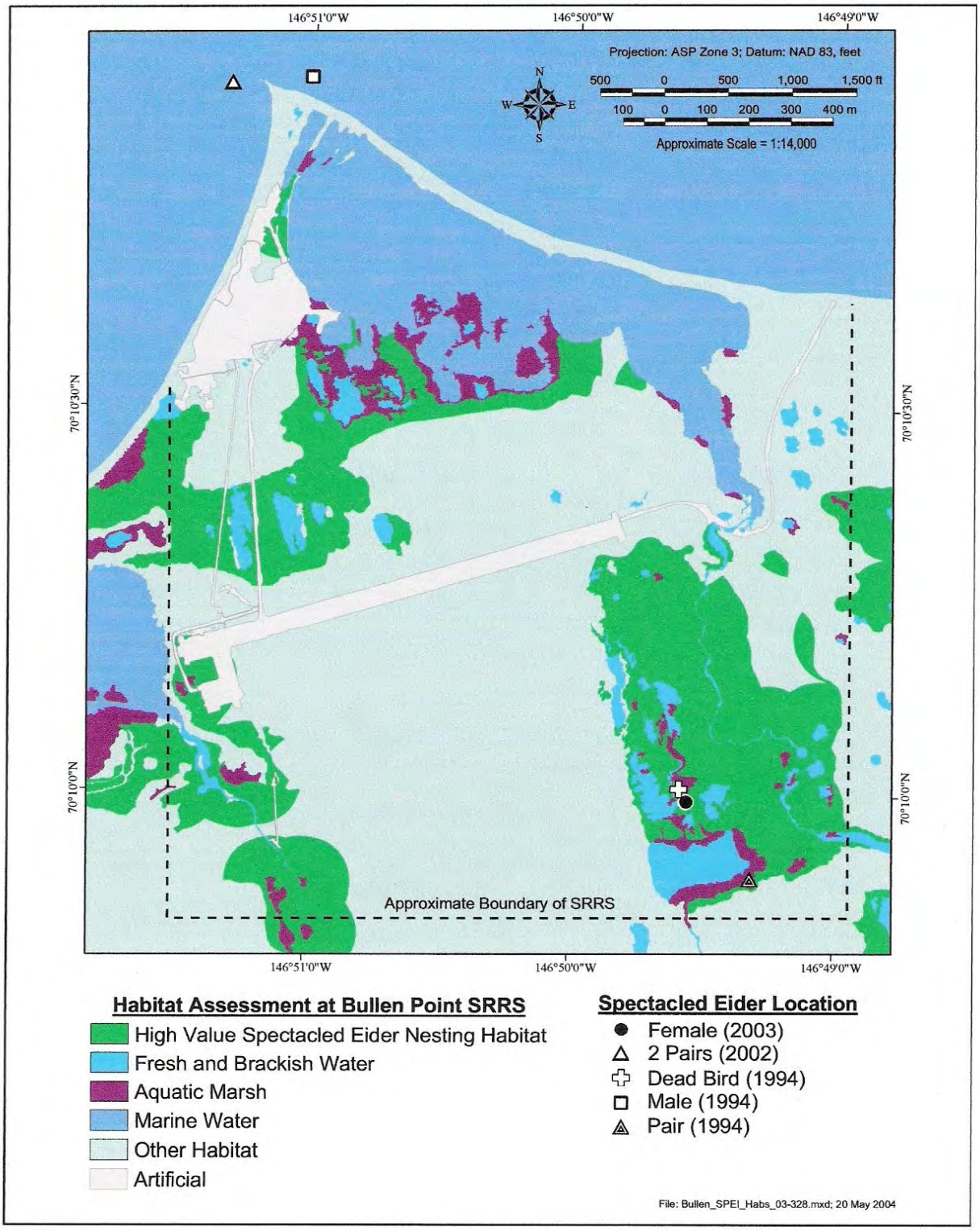

Figure H-118. 2003 Spectacled Eider Habitat Assessment at Bullen Point SRRS
(*Source*: Schick et al. 2004)

During 2002 surveys, two pairs of spectacled eiders were observed just offshore of the site. In 2003, a spectacled eider habitat assessment was conducted at the Bullen Point SRRS (Figure H-118). Although high-value spectacled eider nesting habitat was identified in the northern, western, and eastern portions of the site, no nesting spectacled eiders (or Steller's eiders) were recorded at the site during pre-breeding aerial surveys or ground-based nesting surveys. One spectacled eider female was observed in the southeastern area of the site (Schick et al. 2004).

Spectacled eiders were observed on the site during aerial surveys in 2006 but none were observed during later ground-based surveys (Frost et al. 2007). No spectacled eider nests have been recorded during any of the 5 years of surveys at the Bullen Point SRRS (1994, 2000, 2002, 2003, and 2006) (Day et al. 1995; Day and Rose 2000; Ritchie et al. 2003; Schick et al. 2004; Frost et al. 2007). However, in 2007, a failed spectacled eider nest and a female spectacled eider were observed at the Bullen Point SRRS (Oasis Environmental, Inc. 2008). Steller's eiders have not been observed on or in the vicinity of the Bullen Point SRRS.

Polar Bear. Polar bears often travel the shoreline of Bullen Point, especially in the fall when they travel east to west following the bowhead whale migration. Polar bears have been observed moving through and resting at this site, and the possibility of denning polar bears exists from November to May. During the 2002-03 winter season a polar bear denned in the snow drift of the airstrip ramp (PRSC 2020). Denning habitat is immediately south of the SRRS, and historical (1910-2010) denning sites are 2 miles to the south (ADNR 2014b; Smith et al. 2017). During the winter, male polar bears forage on sea-ice or terrestrial areas within the vicinity of the SRRS (Wynne 1993; Smith et al. 2017). As females emerge from their dens with their young in the spring, they will forage on the pack ice and nearshore areas of Bullen Point (Smith et al. 2017).

Although the Bullen Point SRRS has been excluded from polar bear critical habitat designation (USFWS 2010), the surrounding terrestrial area is within denning critical habitat and the nearby barrier islands are considered barrier island critical habitat that also includes a 1-mile no disturbance zone. In addition, the adjacent marine waters are considered sea ice critical habitat (see INRMP Figures 18, 19, and 20).

Ringed and Bearded Seals. Both ringed and bearded seals can be found along the coast of Bullen Point year-round (Smith et al. 2017). Ringed seals may den in the Bullen Point area during winter/spring (Smith et al. 2017) and the coastal waters are considered a major adult area in February-June (ADNR 2014b). In 2014, the marine waters adjacent to the Bullen Point site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (see INRMP Figure 21).

Bowhead. The offshore waters of Bullen Point are considered major adult areas for bowhead during June-September (ADNR 2014b) and are known to pass the Bullen Point site about 20 miles offshore during their westward fall migration (ICF Technology, Inc. 1996b). The offshore waters are also areas of concentrated bowhead use during spring and fall migration as well as during summer when calves accompany their mothers and feed along the nearshore waters of the Beaufort Sea (Smith et al. 2017).

Other MMPA-listed Species

Pacific Walrus. Although the summer range of walrus includes the southern Beaufort Sea and coastline, they are considered uncommon to rare in the Bullen Point area (Smith et al. 2017; PRSC 2020). There are two historical walrus haulouts 30 and 48 miles west of the Bullen Point SRRS (Figure H-91). Both of these supported fewer than 10 individuals and the last recorded use was during 2000-2010 (Fischbach et al. 2016).

Whales. The killer whale and beluga are uncommon in the offshore waters of the LRRS. Gray whales may occasionally occur in offshore waters in April-December (ADNR 2014b).

Seals. Spotted seals are common along the coast of Bullen Point during June-December (ADNR 2014b).

H.17.10 Other Natural Resources Information

H.17.10.1 Subsistence

The Point Bullen site is within the subsistence use area of the villages of Kaktovik (about 75 miles east) and Nuiqsut (about 98 miles west). A discussion of subsistence use by the villages of Kaktovik and Nuiqsut is found in Sections H.3.10.1 (Barter Island LRRS) and H.12.10.1 (Oliktok LRRS), respectively.

H.17.10.2 Outdoor Recreation

Outdoor recreational activities are limited due to the isolation, location, and extreme climatic conditions of Bullen Point. Access to the site is limited with aircraft providing the only year-round access. Sportsmen occasionally visit Bullen Point from the Prudhoe Bay area for Arctic char fishing in Mikkelsen Bay. Other recreation activities include camping, hiking, and wildlife viewing.

ATTACHMENT 8: NATURAL RESOURCES OF THE BULLEN POINT SITE

Table H-78. Vascular Plant Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name	Scientific Name	Observed
SHRUBS		
Alpine bearberry	*Arctostaphylos alpina*	
Red-fruit bearberry	*Arctostaphylos rubra*	
Dwarf Arctic birch	*Betula nana*	
Lapland cassiope	*Cassiope tetragona*	X
Bunchberry	*Cornus canadensis*	
Diapensia	*Diapensia lapponica*	
White mountain avens	*Dryas octopetala*	
Crowberry	*Empetrum nigrum*	
Narrowleaf Labrador tea	*Ledum palustre decumbens*	
Lapland rosebay	*Rhodedendron lapponicum*	
Cloudberry	*Rubus chamaemorus*	
Feltleaf willow	*Salix alaxensis*	
Arctic willow	*Salix arctica*	X
Barren-ground willow	*Salix brachycarpa*	
Alaska bog willow	*Salix fuscescens*	
Grayleaf willow	*Salix glauca*	
Richardson willow	*Salix lanata richardsonii*	X
Oval-leafed willow	*Salix ovalifolia*	X
Skeleton leaf willow	*Salix phlebophylla*	
Diamond-leaf willow	*Salix planifolia pulchra*	X
Polar willow	*Salix polaris*	
Netleaf willow	*Salix reticulata*	X
Least willow	*Salix rotundifolia*	X
Bog blueberry	*Vaccinium uliginosum*	
Low-bush cranberry	*Vaccinium vitis-idaea*	
HERBACEOUS		
Alpine foxtail	*Alopecurus alpinus*	X
Rock jasmine	*Androsace chamaejasme*	
Northern jasmine	*Androsace septentrionalis*	
Pasque flower	*Anemone drummondii*	
Narcissus-flower anemone	*Anemone narcissiflora*	
Northern anemone	*Anemone parviflora*	
Yellow anemone	*Anemone richardsonii*	
Pussytoes	*Antennaria friesiana*	
Cats paws	*Antennaria monocephala*	
Polar grass	*Arctagrostis latifolia*	X
Pendent grass	*Arctophila fulva*	X
Tall sandwort	*Arenaria capillaris*	
Alpine arnica	*Arnica alpina*	
Frigid arnica	*Arnica frigida*	
Lessing's arnica	*Arnica lessingii*	
Arctic wormwood	*Artemisia arctica*	
Northern wormwood	*Artemisia borealis*	
Purple wormwood	*Artemisia globularia*	X
Common wormwood	*Artemisia tilesii*	
Siberian aster	*Aster sibiricus*	
Alpine milkvetch	*Astragalus alpinus*	

Table H-78. Vascular Plant Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name	Scientific Name	Observed
Hairy Arctic milkvetch	*Astragalus umbellatus*	X
Mountain meadow bistort	*Bistorta plumosa*	
Alpine bistort	*Bistorta vivipara*	
Moonwort	*Botrychium lunaria*	
Purplish braya	*Braya purpurascens*	
Bluejoint grass	*Calamagrostis canadensis*	
Reed bent grass	*Calamagrostis* sp.	
Marsh marigold	*Caltha palustris*	
Bluebell	*Campanula lasiocarpa*	
Bittercress	*Cardamine digitata*	
Cuckoo flower	*Cardamine pratensis*	
Sedge	*Carex aquatilis*	X
Sedge	*Carex bigelowii*	X
Sedge	*Carex capitata*	X
Sedge	*Carex* sp.	
Sedge	*Carex subspathacea*	X
Sedge	*Carex ursina*	X
Elegant paintbrush	*Castilleja elegans*	
Paintbrush	*Castilleja* sp.	
Chickweed	*Cerastium beeringianum*	X
Mouse-ear chickweed	*Cerastium jenisejense*	
Cushion hawk's beard	*Cerpis nana*	
Arctic daisy	*Chrysanthemum arcticum*	
Entire-leaved chrysanthemum	*Chrysanthemum integrifolium*	
Bering Sea water carpet	*Chrysanthemum wrightii*	
Northern water carpet	*Chrysosplenium tetrandrum*	
Mackenzie water hemlock	*Cicuta mackenzienana*	
Alaska spring beauty	*Claytonia sarmentosa*	
Scurvy grass	*Cochlearia officinalis*	
Coral root	*Corallorrhiza trifida*	
Tansy mustard	*Descurainia sophioides*	
Frigid shooting star	*Dodecatheon frigidum*	
Ochotsk douglasia	*Douglasia ochotensis*	
Draba	*Draba alpina*	X
Draba	*Draba pseudopilosa*	X
Draba	*Draba lactea*	
Draba	*Draba nivalis*	
Arctic (mountain) avens	*Dryas integrifolia*	X
Tundra grass	*Dupontia fisheri*	X
Tundra grass	*Dupontia fisheri psilosantha*	
Lyme grass	*Elymus arenarius mollis*	
Dwarf fireweed	*Epilobium latifolium*	X
Common horsetail	*Equisetum arvense*	X
Variegated horsetail	*Equisetum variegatum*	
Dwarf fleabane	*Erigeron eriocephalus*	
Fleabane	*Erigeron humilis*	
Arctic fleabane	*Erigeron hyperboreus*	
Narrow-leafed cotton grass	*Eriophorum angustifolium*	X
Russet cotton grass	*Eriophorum russeolum*	
Arctic cotton grass	*Eriophorum scheuchzeri*	

Table H-78. Vascular Plant Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name	Scientific Name	Observed
Cotton grass	*Eriophorum triste*	
Sheated cotton grass	*Eriophorum vaginatum*	X
Arctic forget-me-not	*Eritichum aretioides*	
Edward's eutrema	*Eutrema edwardsii*	X
Alpine fescue	*Festuca brachyphylla*	X
Red fescue	*Festuca rubra*	
Glaucous gentian	*Gentiana glauca*	
Glacier avens	*Geum glaciale*	
Alpine eskimo potato	*Hedysarum hedysaroides*	
Alpine holy grass	*Hierochloe alpina*	X
Arctic holy grass	*Hierochloe pauciflora*	
Mare's tail	*Hippuris tetraphylla*	
Seabeach snadwort	*Honckenya peploides*	X
Rush	*Juncus biglumis*	
Glaucous weaselsnout	*Lagotis glauca*	X
Bladder pod	*Lesquerella arctica*	
Alp lily	*Lloydia serotina*	
Alpine azalea	*Loiseleuria procumbens*	
Arctic lupine	*Lupinus arctica*	X
Arctic woodrush	*Luzuca arcuata*	
Northern woodrush	*Luzula confusa*	
Many-flowered woodrush	*Luzula multiflora*	
Fir club moss	*Lycopodium selago*	
Bladder campion	*Melandrium apetalum*	X
Oysterleaf	*Mertensia maritima*	X
Arctic sandwort	*Minuartia arctica*	
Alpine forget-me-not	*Myosotis alpestris*	
Mountain sorrel	*Oxyria digyna*	X
Blackish oxytrope	*Oxytropis nigrescens*	
Lapland poppy	*Papaver lapponicum*	
Macoun's poppy	*Papaver macounii*	
Northern Grass of Parnassus	*Parnassia palustris*	
Grass of Parnassus	*Parnassia* sp.	X
Lousewort	*Pedicularis albolabiata*	
Capitate lousewort	*Pedicularis capitata*	
Wooly lousewort	*Pedicularis kanei*	X
Oeder's lousewort	*Pedicularis oederi*	
Lousewort	*Pedicularis sudetica*	X
Whorled leaf lousewort	*Pedicularis verticillata*	
Frigid coltsfoot	*Petasites frigidus*	
Snowgrass	*Phippsia algida*	X
Siberian phlox	*Phlox sibirica*	
Common bluegrass	*Poa alpigena*	
Alpine bluegrass	*Poa alpina*	
Arctic bluegrass	*Poa arctica*	X
Blue grass	*Poa glauca*	
Blue grass	*Poa* sp.	
Tall Jacob's ladder	*Polemonium acutiflorum*	
Boreal Jacob's ladder	*Polemonium boreale*	
Bistort	*Polygonum bistorta*	

Table H-78. Vascular Plant Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name	Scientific Name	Observed
Alpine meadow bistort	*Polygonum viviparum*	X
Two-flowered cinquefoil	*Potentilla biflora*	
Arctic cinquefoil	*Potentilla hyparctica*	X
Marsh fivefinger	*Potentilla palustris*	
Bright cinquefoil	*Potentilla pulchella*	
One-flowered cinquefoil	*Potentilla uniflora*	
Northern primrose	*Primula borealis*	X
Large-flowered wintergreen	*Pyrola grandiflora*	
Alkali grass	*Puccinellia andersonii*	X
Dwarf alkali grass	*Puccinellia langeana*	
Creeping alkali grass	*Puccinellia phryganodes*	X
Alkali grass	*Puccinellia* sp.	
Gmelin's buttercup	*Ranunculus gmelinii*	
Arctic buttercup	*Ranunculus hyperboreus*	
Buttercup	*Ranunculus pedatifidus*	X
Snow buttercup	*Ranunculus nivalis*	X
Pallas's buttercup	*Ranunculus pallasii*	
Pygmy buttercup	*Ranunculus pygmaeus*	
Buttercup	*Ranunculus* sp.	
Roceroot	*Rhodiola integrifolia*	
Arctic dock	*Rumex arcticus*	
Dock	*Rumex graminifolius*	
Snow pearlwort	*Sagina intermedia*	
Narrow-leafed saussurea	*Saussurea angustifolia*	X
Spotted saxifrage	*Saxifraga bronchialis*	
Tufted saxifrage	*Saxifraga caespitosa*	X
Bulblet saxifrage	*Saxifraga cernua*	
Spiderplant	*Saxifraga flagellaris*	
Foliolose saxifrage	*Saxifraga foliolosa*	
Hawkweed-leafed saxifrage	*Saxifraga hieracifolia*	X
Yellow marsh saxifrage	*Saxifraga hirculus*	X
Cordate-leaved saxifage	*Saxifraga punctata*	
Purple mountain saxifrage	*Saxifraga oppositifolia*	X
Alpine brook saxifrage	*Saxifrage rivularis*	
Thyme-leaved saxifrage	*Saxifraga serpyllifolia*	
Roseroot	*Sedum rosea*	
Arctic senecio	*Senecio atropurpureus frigidus*	X
Marsh fleawort	*Senecio congestus*	
Black-tipped groundsel	*Senecio lugens*	
Seabeach senecio	*Senecio pseudo-arnica*	
Alaska-Yukon senecio	*Senecio yukonensis*	
Moss campion	*Silene acaulis*	X
Smelowskia	*Smelowskia calycina*	
Goldenrod	*Solidago multiradiata*	
Fleshy stitchwort	*Stellaria crassifloria*	
Low chickweed	*Stellaria humifusa*	X
Long-stalked stitchwort	*Stellaria laeta*	
Lyrate dandelion	*Taraxacum alaskanum*	
Dandelion	*Taraxacum* sp.	
Wild chamomile	*Tripleurospermum phaecoephalum*	

Table H-78. Vascular Plant Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name	Scientific Name	Observed
Spiked trisetum	*Trisetum spicatum*	X
Common butterwort	*Utricularia vulgaris*	
Capitate valerian	*Valeriana capitata*	
Mountain heliotrope	*Valeriana sitchensis*	

Sources: Hulten 1968; Viereck and Little 1972; White 1974; Pratt 1991; 611 ASG 1995c; Elias et al. 1996.

Table H-79. Fish Species Known to Occur or Potentially Occurring on or near the Bullen Point Site

Common Name	Scientific Name
Arctic char	*Salvelinus alpinus*
Arctic cisco	*Coregonus autumnalis*
Arctic flounder	*Liopsetta glacialis*
Arctic grayling	*Thymallus arcticus*
Broad whitefish	*Coregonus nasus*
Chum salmon	*Oncorhynchus keta*
Dolly Varden	*Salvelinus malma*
Eelpout	*Lycodes* sp.
Fourhorn sculpin	*Myoxocephalus quadricornis*
Humpback whitefish	*Coregonus pidschian*
Pink salmon	*Oncorhynchus gorbuscha*
Rainbow smelt	*Osmerus mordax*
Saffron cod	*Eleginus gracilis*
Sardine cisco	*Coregonus sardinella*
Sheefish	*Stenodus leucichthys*

Sources: Morrow 1980; Craig 1984; USFWS 1986b; Minerals Management Service 1987a; Robbins et al. 1991; ICF Technology, Inc. 1996a; 611 ASG 1995c, 1999c; Braund and Associates 2004; Johnson and Blossom 2019b.

Table H-80. Mammal Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name (ESA Status)‡	Scientific Name	Observed
TERRESTRIAL		
Arctic fox	*Alopex lagopus*	X
Arctic ground squirrel	*Spermophilus parryii*	X
Brown bear	*Ursus arctos*	X
Caribou	*Rangifer tarandus*	X
Cinereus shrew	*Sorex cinereus*	
Ermine	*Mustela erminea*	
Least weasel	*Mustela nivalis*	
Moose	*Alces americanus*	
Muskox	*Ovibos moschatus*	X
Nearctic brown lemming	*Lemmus trimucronatus*	X
Nearctic collared lemming	*Dicrostonyx groenlandicus*	X
Red fox	*Vulpes vulpes*	X†
Root vole	*Microtus oeconomus*	X

Table H-80. Mammal Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name (ESA Status)‡	Scientific Name	Observed
Wolf	*Canis lupus*	
Wolverine	*Gulo gulo*	
MARINE*		
Arctic ringed seal (T)	*Phoca hispida hispida*	
Bearded seal (T)	*Erignathus barbatus*	
Beluga	*Delphinapterus leucas*	
Bowhead (E)	*Balaena mysticetus*	
Gray whale	*Eschrichtius robustus*	
Narwhal	*Monodon monoceros*	
Pacific walrus	*Odobenus rosmarus divergens*	X
Polar bear (T)	*Ursus maritimus*	X
Spotted seal	*Phoca largha*	

Notes: ‡E = endangered, T = threatened; †Tracks, den site, bones, skull observed. *All marine mammals are listed under the MMPA.

Sources: Hall 1972; Hart Crowser 1987; Minerals Management Service 1987b; Wynne 1993; Day et al. 1995; ICF Technology, Inc. 1996e, f; 611 ASG 1995c, 1999c; Bridges 2001; Frost et al. 2007; Ohms 2008.

Table H-81. Bird Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name (ESA Status)*	Scientific Name	Observed
Aleutian tern	*Onychoprion aleuticus*	
American golden-plover	*Pluvialis dominica*	X†
American pipit	*Anthus rubescens*	
American tree sparrow	*Spizelloides arborea*	
American wigeon	*Mareca americana*	X
Arctic tern	*Sterna paradisaea*	X
Baird's sandpiper	*Calidris bairdii*	X†
Bald eagle	*Haliaeetus leucocephalus*	
Barn swallow	*Hirundo rustica*	
Black-bellied plover	*Pluvialis squatarola*	
Black-legged kittiwake	*Rissa tridactyla*	
Brant	*Branta bernicla*	X
Bristle-thighed curlew	*Numenius tahitiensis*	
Buff-breasted sandpiper	*Calidris subruficollis*	X
Canada goose	*Branta canadensis*	X†
Canada jay	*Perisoreus canadensis*	
Common eider	*Somateria mollissima*	X†
Common raven	*Corvus corax*	X
Common redpoll	*Acanthis flammea*	X
Dunlin	*Calidris alpina*	X†
Eastern yellow wagtail	*Motaclla tschutschensis*	
Eurasian dotterel	*Charadrius morinellus*	
Glaucous gull	*Larus hyperboreus*	X
Glaucous-winged gull	*Larus glaucescens*	
Golden eagle	*Aquila chrysaetos*	
Greater scaup	*Aythya marila*	

Table H-81. Bird Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name (ESA Status)*	Scientific Name	Observed
Greater white-fronted goose	*Anser albifrons*	X
Green-winged teal	*Anas crecca*	
Gyrfalcon	*Falco rusticolus*	
Herring gull	*Larus argentatus*	
Hoary redpoll	*Acanthis hornemanni*	
Horned lark	*Eremophila alpestris*	
King eider	*Somateria spectabilis*	X
Kittlitz's murrelet	*Brachyramphus brevirostris*	
Lapland longspur	*Calcarius lapponicus*	X†
Least auklet	*Aethia pusilla*	
Least sandpiper	*Calidris minutilla*	
Lesser yellowlegs	*Tringa flavipes*	
Long-billed dowitcher	*Limnodromus scolopaceus*	X
Long-tailed duck	*Clangula hyemalis*	X†
Long-tailed jaeger	*Stercorarius longicaudus*	X
Mallard	*Anas platyrhynchos*	
Northern harrier	*Circus hudsonius*	
Northern pintail	*Anas acuta*	X
Northern shoveler	*Spatula clypeata*	X
Pacific loon	*Gavia pacifica*	X
Parasitic jaeger	*Stercorarius parasisticus*	X
Pectoral sandpiper	*Calidris melanotos*	X†
Peregrine falcon	*Falco peregrinus*	X
Pomarine jaeger	*Stercorarius pomarinus*	X
Red phalarope	*Phalaropus fulicarius*	X†
Red-breasted merganser	*Mergus serrator*	X
Red-necked Grebe	*Podiceps grisegena*	
Red-necked phalarope	*Phalaropus lobatus*	X†
Red-throated loon	*Gavia stellata*	X
Red-throated pipit	*Anthus cervinus*	
Rock ptarmigan	*Lagopus muta*	X
Rough-legged hawk	*Buteo lagopus*	X†
Ruddy turnstone	*Arenaria interpres*	
Sabine's gull	*Xema sabini*	
Sanderling	*Calidris alba*	
Sandhill crane	*Antigone canadensis*	X
Savannah sparrow	*Passerculus sandwichensis*	X
Semipalmated plover	*Charadrius semipalmatus*	X
Semipalmated sandpiper	*Calidris pusilla*	X†
Sharp-tailed sandpiper	*Calidris acuminata*	
Short-eared owl	*Asio flammeus*	
Snow bunting	*Plectrophenax nivalis*	X†
Snow goose	*Anser caerulescens*	
Spectacled eider (T)	*Somateria fischeri*	X
Steller's eider (T)	*Polysticta stelleri*	
Stilt sandpiper	*Calidris himantopus*	X
Surf scoter	*Melanitta perspicillata*	X
Tundra swan	*Cygnus columbianus*	X†
Western sandpiper	*Calidris mauri*	

Table H-81. Bird Species Observed or Potentially Occurring on or near the Bullen Point Site

Common Name (ESA Status)*	Scientific Name	Observed
Whimbrel	*Numenius phaeopus*	
White wagtail	*Motacilla alba*	
White-crowned sparrow	*Zonotrichia leucophrys*	
White-rumped sandpiper	*Calidris fuscicollis*	
White-winged ccoter	*Melanitta deglandi*	
Willow ptarmigan	*Lagopus lagopus*	
Wilson's snipe	*Gallinago delicata*	
Yellow-billed loon	*Gavia adamsii*	X

Notes: *T = threatened; †Breeding behavior and/or nests observed.

Sources: Hall 1972; Pitelka 1974; King 1977; Murray 1978; Spindler 1978, 1979; Robbins et al. 1983; Garner and Reynolds 1987; Gusey 1988; Norton et al. 1993; Day et al. 1995; 611 ASG 1995c; Armstrong 1998; Frost et al. 2007; Oasis Environmental, Inc. 2008.

H.18 CAMPION AFS (INACTIVE)

H.18.1 Location and Area

The former Campion AFS is located 7 miles east of the town of Galena, 270 miles west of Fairbanks and 375 miles northwest of Anchorage. The 1,632-acre site sits on a high terrace above the Yukon River (Figure H-119).

H.18.2 Installation History

Initially known as Galena II due to its proximity to the town of Galena, it was renamed Campion in 1954 to honor a radar observer, Lt. Allen Campion, who was killed in an aircraft accident at Galena in 1950. The Campion site was 1 of 12 original AC&W sites developed as part of the air defense system constructed in Alaska during the early 1950s. Campion became an active ground-controlled interception (GCI) site in 1952. In 1958, Campion was tied into the WACS system via the Kalakaket Creek site south of Galena. The WACS site was active until 1977 when it was replaced with a commercial satellite earth terminal. In 1984 a MAR unit was installed at the Galena Airport USAF Installation, and the Campion site was deactivated in 1985. In 1986 all facilities at Campion were demolished, and building materials were removed and buried (Argonne National Laboratory and CEMML 2013). POL remedial action was conducted in 2012 and land-farming of the excavated soil occurred from 2013 through 2018. Additional POL-contaminated soil remains and will require additional excavation and land-farming treatment. This project is planned for 2020. Military Munitions Response Program (MMRP) investigations are complete and a Record of Decision is ongoing (AFCEC/CZOP 2019).

H.18.3 Military Mission

The former Campion AFS is now closed; see Section H.18.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visits are currently scheduled for 2020 and 2022.

H.18.4 Surrounding Communities

Galena, 7 miles to the west of the Campion site, is the nearest community and is accessible by by road from the site. The population of Galena is 460 (2018 estimate) and is a mixture of Athabascan and non-native. Galena includes mostly residential and service land uses, including a privately owned store, school, which includes elementary through high school, restaurant, bar, gas station, liquor store, and Galena Commercial Company store. Galena is a trade and transportation center for the middle Yukon River area. Federal, state, city, school, and village government employment dominates, but Galena has other jobs in air transportation and retail businesses. Seasonal work, such as construction and BLM fire fighting, provides some income. There are no roads connecting Galena with outlying communities; and travel is by air, boat (summer), or snow machine (winter) (State of Alaska 2018, 2019).

H.18.5 Regional Land Use

The lands surrounding the Campion site are primarily Alaska Native Lands and Allotments. Further to the north and west lands are BLM lands and NWR lands managed by the USFWS. State lands are to the south and southeast (BLM 2019a).

H.18.6 Local and Regional Natural Areas

The Koyukuk and Innoko NWRs are to the north and west of the Campion site (Figure H-119).

Figure H-119. Overview of Former Campion AFS

H.18.7 Physical Environment

H.18.7.1 Climate

The Campion site has a cold, continental climate with large temperature differences between winter and summer. Average high temperatures in summer are in the 60s °F during June through August, and average winter lows are well below 0 °F from November through March (Table H-82). Annual precipitation averages 13 inches, with 63 inches of snowfall. Over half of rainfall occurs between June and September. Precipitation is comparatively low during winter with the majority of snow falling from October through March. The river is ice-free from mid-May through mid-October (State of Alaska 2019).

Table H-82. Monthly Climatic Averages for Galena, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (°F)	-2.0	2.4	16.4	32.2	52.9	66.1	67.9	62.2	50.4	29.1	10.9	-0.7
Avg. Low (°F)	-18.0	-15.8	-5.1	13.3	34.9	48.8	52.1	47.8	36.4	17.7	-2.3	-15.4
Avg. Precipitation (inches)	0.7	0.7	0.7	0.6	0.6	1.3	1.9	2.5	1.6	1.0	0.9	0.9
Avg. Snowfall (inches)	8.5	8.8	8.1	5.1	0.5	0	0	0	0.7	8.4	11.3	12.1

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.18.7.2 Topography

The Campion site is within the Central Yukon Subregion of the Yukon physiographic region of Alaska. The site lies geographically within the drainage area of the Yukon River between the confluence of the Yukon and Tanana rivers and the confluence of the Koyukuk and Yukon rivers. About 20% of the area within the Yukon-Tanana river basins consists of swampy lowlands. Elevations at the Campion site range from 100 to 350 ft MSL (Woodward-Clyde, Inc. 1991c).

H.18.7.3 Geology and Soils

The Campion site is located within the Yukon-Koyukuk Basin, an extensive structural trough, which extends from the Bering Sea to a point a few miles west of the Canadian border. The Yukon River system has developed in this area, depositing large quantities of sediments as it matures. The entire Yukon Region is characterized by meandering streams. The underlying alluvium includes lacustrine silt and silty sand. The geology of the site is dominated by Quaternary sediments deposited by the Yukon River to a depth greater than 400 ft below grade. The site is underlain by alluvial terrace deposits consisting of sand, silt, and clay.

Permafrost is discontinuous in the surrounding area. Permafrost has been encountered from immediately below the surface to about 380 ft below grade. Permafrost is thick and probably continuous at the site since the site is not affected by the Yukon River (Woodward-Clyde, Inc. 1991c).

H.18.8 Hydrology

The dominant surface water feature in the region is the Yukon River, which drains about 204,000 square miles of Alaska. Freshwater streams in the Yukon Region are classified as high quality. Some streams in the Central Yukon Subregion, principally those that drain lowlands, may contain noticeable amounts of iron (Woodward-Clyde, Inc. 1991c).

Nearly all streams and rivers in the vicinity of the site are characterized by low gradient, meandering courses, and spring flooding. The Campion site, situated on a high terrace, is not prone to flooding. Overland flow of surface water is directed radially from the site into unnamed drainages, Beaver Creek to the north of the site, or directly into the Yukon River. All drainages in the area eventually discharge into

the Yukon River. Three unnamed streams lead to lakes and wetlands east of the site, and Beaver Creek drains wetlands east and north of the site (Woodward-Clyde, Inc. 1991c).

Groundwater at the Campion site occurs below the permafrost zone in deep sand and gravel of unfrozen alluvium. Permafrost has been recorded as deep as 382 ft below grade. Two water supply wells that were drilled through permafrost into the river alluvium were used as the water supply for the site (Woodward-Clyde, Inc. 1991c).

H.18.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Campion AFS site. Attachment 9 contains lists of vascular plants (Table H-84), fish (Table H-85), mammals (Table H-86), and birds (Table H-87) known to occur or potentially occurring in the Campion area. ESA-listed species that may occur at or in the vicinity of the Campion site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.18.9.1 Ecoregion Classification

The Campion AFS site is located in the Yukon River Lowlands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.18.9.2 Vegetation/Habitat

A general vegetation/habitat map of the Campion site has not been prepared. Interior forest and bog vegetation are the dominant components of the Campion site. The vegetative cover can be broadly separated into taiga (birch and white spruce locally mixed with balsam poplar), birch stands, black spruce, muskeg, and open-grass and sedge bogs. Generally, undergrowth consists of dense shrubs, including alder, rose, and dogwood species. Larch/black spruce bogs are very open with scattered birch and diamond leaf willow shrubs and occasionally alder. Bog areas have thick moss hummocks with blueberry and Labrador tea, and cottongrass tussocks and dwarf Arctic birch. The forest floor generally has ferns, fireweed, lichens, herbs, and mosses. Previously cleared areas are revegetating to balsam poplar and feltleaf willow with lesser amounts of alder in well-drained areas. Previously cleared areas in bogs are revegetating to sedge-dominated meadow vegetation. Aspen stands were few and primarily located along the cliff area west of the site. Some riparian spruce dominated forest is present along Beaver Creek, north of the site (CH2M Hill 1993a; 611 ASG 2001b).

The incidence of fire in the Yukon-Koyukuk area is one of the highest in Alaska. Lowland areas burn about once every 108 years with a slightly longer fire cycle in upland areas. Fires have set vast areas back to earlier seral stages consisting of aspen, birch, and willow (611 ASG 1999d).

H.18.9.3 Wetlands

The current mapping of wetlands at the Campion site is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 1,638-acre Campion AFS site, 656 acres (or 40%) are considered wetlands per the NWI mapping (Table H-83 and Figure H-120). Freshwater forested/shrub wetlands make up the majority of the wetlands and occur along eastern portions of the site.

Table H-83. Campion AFS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Forested/Shrub	650.3	39.9%	245.3	15.1%
Freshwater Emergent	2.8	0.2%	10.2	0.6%
Freshwater Pond	1.4	<0.1%	1.9	0.1%
Riverine	1.2	<0.1%	3.5	0.2%
Wetlands Total	**655.7**	**40.2%**	**260.9**	**16.0%**
Upland	976.0	59.8%	1,366.2	84.0%
Site Total	**1,631.7**		**1,627.1**	

Notes: *See Figure H-120. †See Figure H-121.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

H.18.9.4 Fish and Wildlife

H.18.9.4.1 Fish

Although there are no streams or creeks on the Campion site, 19 fish species potentially occur within the vicinity of the site, primarily associated with the immediately adjacent Yukon River (Table H-85). King, coho, pink, sockeye, and chum salmon annually migrate up the Yukon River to spawning and rearing grounds. Arctic grayling, northern pike, burbot, and several species of whitefish are found throughout the main drainage of the Yukon River and most of its tributaries. Other species occurring in the Yukon River system are longnose sucker, inconnu/sheefish, lake chub, Alaska blackfish, slimy sculpin, and Arctic lamprey (ADFG 2019c; Johnson and Blossom 2019c).

H.18.9.4.2 Mammals

The Campion site and vicinity supports terrestrial mammal species typical for interior Alaska and 27 species occur or potentially occur on or in the vicinity of the Campion site (Table H-86). Common species in the Campion area include beaver, black bear, shrews, lemmings, voles, porcupine, red fox, red squirrel, and least weasel. Caribou from the Western Arctic herd have been known to migrate through or close to the general area of the Campion site. The marten is one of the most important furbearers to trappers in the Koyukuk area and is widely trapped by local residents (611 ASG 1999d).

H.18.9.4.3 Birds

Although only 20 bird species have been recorded from the Campion site, almost 100 additional species potentially occur on site or in the vicinity (Table H-87). Passerine species include American robin, yellow warbler, yellow-rumped warbler, hermit thrush, cliff swallow, and white-crowned sparrow. Numerous waterfowl, on their way to and from nesting areas, stop to feed and rest on the Yukon River and the lakes of the surrounding area including American wigeon, mallard, green-winged teal, loons, horned and red-necked grebe, northern pintail, surf and white-winged scoter, and Canada and white-fronted geese. This area also provides habitat for a variety of shorebirds such as Wilson's snipe, spotted sandpiper, solitary sandpiper and semi-palmated plover and occasionally whimbrel, godwit, and lesser yellowleg. Several raptors, notably bald eagle, osprey, red-tailed hawk, great grey owl, short-eared owl, and peregrine falcon, are occur in the area (611 ASG 1999d).

Figure H-120. Campion AFS Wetlands (2019 NWI)
(Source: USFWS 2019d. [2]Flagstad et al. 2018

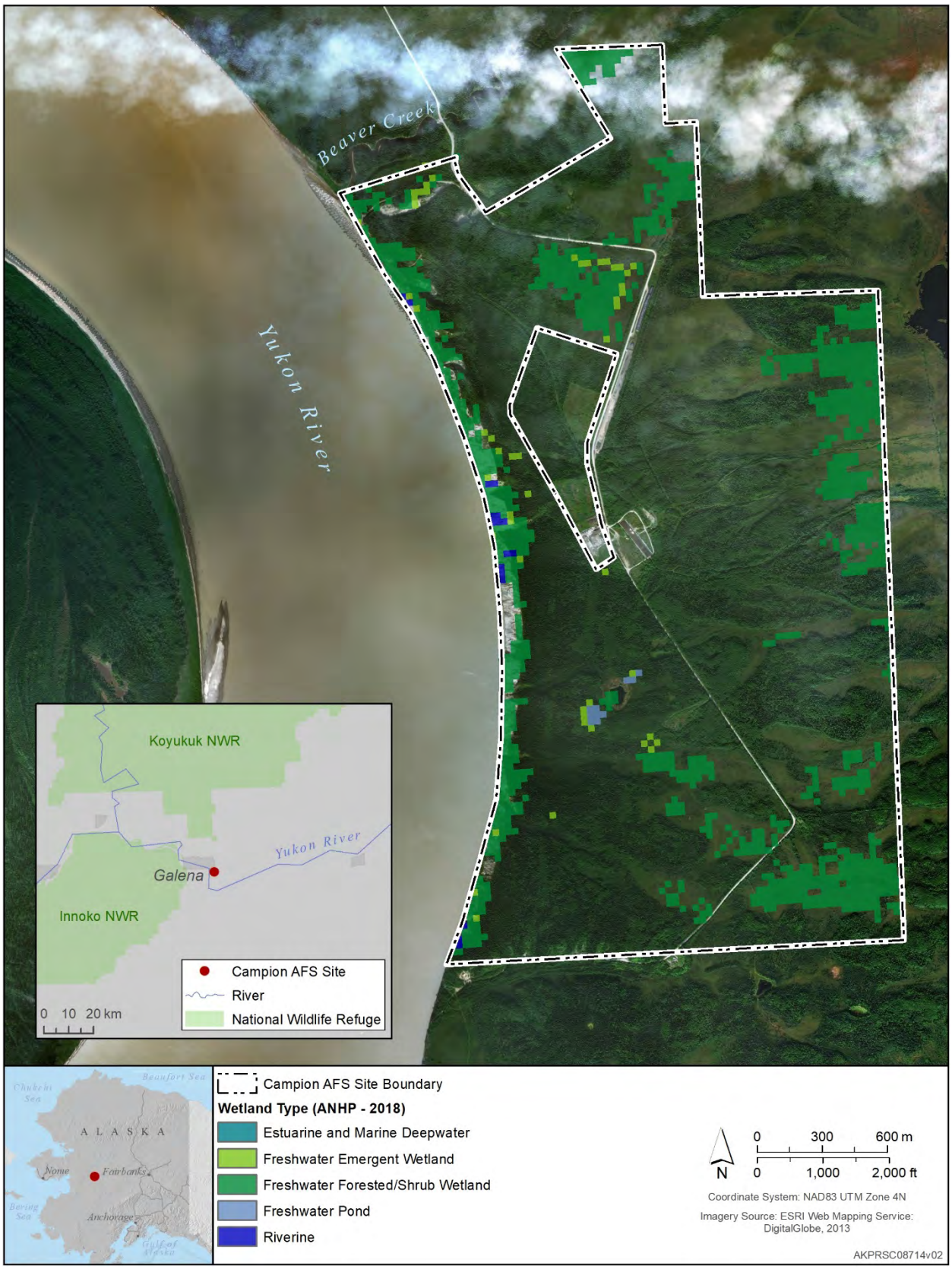

Figure H-121. Campion AFS Wetlands (2018 ANHP)
(Source: Flagstad et al. 2018)

H.18.9.5 ESA-listed Species

No ESA-listed species have been reported within the boundaries of the Campion AFS site. The Steller's eider has been observed in the vicinity of the nearby former USAF Galena Airport installation (611 ASG 1999d), although this should be considered an exceptional sighting and not a regularly occurring species in the area.

H.18.10 Other Natural Resource Information

H.18.10.1 Subsistence

The importance of subsistence to Galena residents is reflected in high participation rates of households that use (100%), harvest (93%), and share (95%) subsistence resources. Galena residents rely heavily on large mammals and fish. Specifically, chum salmon and moose account for about 78% of Galena's annual subsistence harvest in terms of edible pounds. Subsistence food sources also include whitefish and berries. The Koyukon Indians traditionally used seasonal camps to access resources. These camps are maintained and visited when time and money permit. Fish camps tend to be near Galena on the main channel of the Yukon River and on sloughs in the area. Hunting areas for moose and caribou extend downstream to Nulato and upstream almost 50 miles beyond Ruby, and in the Koyukuk River and its tributaries beyond Huslia. Moose and waterfowl are taken to the northeast in an area bounded by the Koyukuk and Dalbi rivers (Braund and Associates 2004).

H.18.10.2 Outdoor Recreation

The Campion site and the surrounding area provide excellent fishing and hunting opportunities and the community of Galena serves as the gateway to these fish and wildlife resources. The road to Campion provides wildlife viewing opportunities and access to ATV trails.

ATTACHMENT 9: NATURAL RESOURCES OF THE CAMPION AFS, LAKE LOUISE, BEAR CREEK, BEAVER CREEK, AND KALAKAKET CREEK SITES

Table H-84. Vascular Plant Species Observed or Potentially Occurring on or near the Campion (Ca), Lake Louise (LL), Bear Creek (BC), Beaver Creek (BvC), and Kalakaket Creek (KC) Sites

Common Name	Scientific Name	CA	KC	BC	BvC	LL	Observed
Common yarrow	*Achillea millefolium*			X	X	X	BC, BvC, LL
Siberian yarrow	*Achillea sibirica*	X	X	X	X	X	Ca, BC, LL
Monkshood	*Aconitium delphinifolium*	X	X	X	X	X	Ca
Baneberry	*Acatea rubra*	X	X	X	X	X	
Musk root	*Adoxa moschatellina*	X	X	X	X	X	C
Agrostis	*Agrostis scabra*					X	LL
Wild chives	*Allium schoenoprasum*	X	X	X	X	X	
American green alder	*Alnus crispa*	X	X	X	X	X	Ca, BC, BvC, LL
Sitka alder	*Alnus sinuata*				X	X	LL
Thinleaf alder	*Alnus tennuifolia*	X	X	X	X	X	C
Round leaf orchis	*Amerorchis rotundifolia*	X	X	X	X	X	
Bog rosemary	*Andromeda polifolia*	X	X	X	X	X	C
Pasque flower	*Anemone drummondii*	X	X	X	X	X	
Narcissus-flower anemone	*Anemone narcissiflora*	X	X	X	X	X	
Northern anemone	*Anemone parviflora*	X	X	X	X	X	
Yellow anemone	*Anemone richardsonii*	X	X	X	X	X	Ca, BC
Wild celery	*Angelica lucida*	X	X	X	X	X	
Pussytoes	*Antennaria friesiana*	X	X	X	X	X	
Pussytoes	*Antennaria isolespis*				X	X	BvC
Lyre-leaf rockcress	*Arabis lyrata*						
Pendent grass	*Arctophila fulva*	X	X	X	X	X	
Alpine bearberry	*Arctostaphylos alpina*	X	X	X	X	X	
Red-fruit bearberry	*Arctostaphylos rubra*	X	X	X	X	X	Ca, LL
Bearberry (kinikinik)	*Arctostaphylos uva-ursi*	X	X	X	X	X	BvC, LL
Frigid arnica	*Arnica fridgida*	X	X	X	X	X	
Lessing's arnica	*Arnica lessingii*	X	X	X	X	X	
Alaska sagebrush	*Artemisia alaskana*	X	X	X	X	X	
Northern wormwood	*Artemisia borealis*	X		X	X	X	
Common wormwood	*Artemisia tilesii*	X	X	X	X	X	Ca, BC
Arctic wormwood	*Artemisia arctica*	X		X	X	X	
Siberian aster	*Aster sibiricus*	X	X	X	X	X	C
Alpine milk vetch	*Astragalus alpinus*	X	X	X	X	X	Ca, BvC, LL
Wintercress	*Barbarea orthoceras*					X	LL
Beckmannia	*Beckmannia erucaeformis*	X	X	X	X	X	
Dwarf Arctic birch	*Betula nana*	X	X	X	X	X	Ca, BC, LL
Paper birch	*Betula papyrifera*	X	X	X	X	X	Ca, BC, BvC, LL
Broomrape	*Boschniakia rossica*	X	X	X	X	X	
Moonwort	*Botrychium lunaria*	X	X	X	X	X	
Alaska boykinia	*Boykinia richardsonii*	X	X	X	X	X	
Bluejoint grass	*Calamagrostis canadensis*	X	X	X	X	X	Ca, BC, BvC, LL
Calamagrostis grass	*Calamagrostis lapponica*					X	LL
Reed bentgrass	*Calamagrostia sp.*	X	X	X	X	X	
Wild calla lily	*Calla palustris*	X	X	X	X	X	

Table H-84. Vascular Plant Species Observed or Potentially Occurring on or near the Campion (Ca), Lake Louise (LL), Bear Creek (BC), Beaver Creek (BvC), and Kalakaket Creek (KC) Sites

Common Name	Scientific Name	CA	KC	BC	BvC	LL	Observed
Marsh marigold	*Caltha palustris*	X	X	X	X	X	
Bluebell	*Campanula lasiocarpa*	X	X	X	X	X	
Bitter cress	*Cardamine purpurea*	X	X	X	X	X	
Cuckoo flower	*Cardamine pratensis*	X	X	X	X	X	Ca
Sedge	*Carex aquatilis*	X	X	X	X	X	Ca, LL
Sedge	*Carex atherodes*	X	X	X	X	X	
Sedge	*Carex bigelowii*	X	X	X	X	X	Ca, BC
Sedge	*Carex rotundifolia*	X	X	X	X	X	C
Four-angled cassiope	*Cassiope tetragona*	X	X	X	X	X	
Paintbrush	*Castilleja* sp.	X	X	X	X	X	BvC, LL
Bering Sea chickweed	*Cerastrium berringianum*	X	X	X	X	X	
Leatherleaf	*Chamaecyparis calyculata*	X	X	X	X	X	
Chamaedaphne	*Chamaedaphne calyculata*	X		X	X	X	C
Strawberry blight	*Chenopodium capitatum*	X	X	X	X	X	
Mackenzie water hemlock	*Cicuta mackenzienana*	X	X	X	X	X	
Alaska spring beauty	*Claytonia sarmentosa*	X	X	X	X	X	
Coral root	*Corallorrhiza trifida*	X	X	X	X	X	BC, LL
Bunchberry	*Cornus canadensis*	X	X	X	X	X	Ca, BC
Red-osier dogwood	*Cornus stolonifera*	X	X	X	X	X	
Northern lady's slipper	*Cypripedium passerinum*	X	X	X	X	X	
Arctic larkspur	*Delphinium glaucum*	X	X	X	X	X	
Deschampsia	*Deschampsia brevifolia*	X	X	X	X	X	
Diapensia	*Diapensia lapponica*	X		X	X	X	
Frigid shooting star	*Dodecatheon frigidum*	X	X	X	X	X	
Douglasia	*Douglasia gormanii*	X	X	X	X	X	
Smoothing whitlow-grass	*Draba hirta*	X		X	X	X	
Round-leaved sundew	*Drosera rotundifolia*	X		X	X	X	C
Mountain avens	*Dryas interifolia*	X		X	X	X	
Crowberry	*Empetrum nigrum*	X	X	X	X	X	BC, BvC, LL
Fireweed	*Epilobium angustifolium*	X	X	X	X	X	Ca, BC, BvC, LL
Dwarf fireweed	*Epilobium latifolium*	X	X	X	X	X	LL
Common horsetail	*Equisetum arvense*	X	X	X	X	X	Ca, BC, LL
Horestail	*Equisetum* sp.	X	X	X	X	X	
Horsetail	*Equisetum palustre*	X	X	X	X	X	Ca
Horsetail	*Equisetum fluviatile*	X	X	X	X	X	Ca
Horsetail	*Equisetum pratense*				X	X	BvC
Horsetail	*Equisetum silvaticum*			X			Ca, BC, LL
Blue fleabane	*Erigeron acris*	X	X	X	X	X	
Tall cotton grass	*Eriophorum angustifolium*	X	X	X	X	X	Ca
Arctic Cotton grass	*Eriophorum scheuchzeri*	X	X	X	X	X	
Sheathed cotton grass	*Eriophorum vaginatum*	X	X	X	X	X	Ca
Arctic forget-me-not	*Eritichum aretioides*	X	X	X	X	X	
Fescue grass	*Festuca altaica*		X	X		X	LL
Fescue grass	*Festuca* sp.	X	X	X	X	X	
Northern bedstraw	*Galium boreale*	X	X	X	X	X	Ca, BC
Bedstraw	*Galium trifidium*	X	X	X	X	X	
Glaucous gentian	*Gentiana glauca*	X	X	X	X	X	
Geocaulon	*Geocaulon lividum*	X		X	X	X	Ca, BvC, LL
Wild geranium	*Geranium erianthum*	X	X	X	X	X	

Table H-84. Vascular Plant Species Observed or Potentially Occurring on or near the Campion (Ca), Lake Louise (LL), Bear Creek (BC), Beaver Creek (BvC), and Kalakaket Creek (KC) Sites

Common Name	Scientific Name	CA	KC	BC	BvC	LL	Observed
Eskimo potato	*Hedysarum* sp.	X		X	X	X	Ca
Squirreltail grass	*Hordeum jubatum*	X		X	X	X	Ca
Wild iris	*Iris setosa*	X	X	X	X	X	
Arctic rush	*Juncus arcticus*	X	X	X	X	X	
Common juniper	*Juniperus communis*	X	X	X	X	X	C
Tamarack	*Larix laricina*	X	X	X	X	X	C
Vetchling	*Lathyrus palustris*	X	X	X	X	X	
Narrowleaf Labrador tea	*Ledum decumbens*	X	X	X	X	X	
Labrador tea	*Ledum groenlandicum*	X	X	X	X	X	Ca, BvC, LL
Labrador tea	*Ledum palustre*	X	X	X	X	X	C, BC
Twin-flower	*Linnaea borealis*	X		X	X	X	Ca, BvC, LL
Alp lily	*Lloydia serotina*	X	X	X	X	X	
Alpine azalea	*Loiseleuria procumbens*	X	X	X	X	X	BC
Arctic lupine	*Lupinus arcticus*	X	X	X	X	X	
Lupine	*Lupinus polyphyllus*					X	LL
Wood rush	*Luzula parviflora*			X			BC
Wood rush	*Luzula rufescens*	X		X	X	X	C
Alpine club moss	*Lycopodium alpinum*	X	X	X	X	X	
Stiff clubmoss	*Lycopodium annotinum*			X	X	X	BC, BvC
Clubmoss	*Lycopodium clavatum*			X			BC
Clubmoss	*Lycopodium complanatum*						
Matricaria	*Matricaria matricarioides*	X		X	X	X	Ca
Bladder campion	*Melandrium apetalum*	X	X	X	X	X	
Bogbean (buckbean)	*Menyanthes trifoliata*	X	X	X	X	X	
Chiming bells	*Mertensia paniculata*	X	X	X	X	X	Ca, BvC
Wild snapdragon	*Mimulus guttatus*	X	X	X	X	X	
Arctic sandwort	*Minuartia arctica*	X	X	X	X	X	
Grove sandwort	*Moerhingia lateriflora*	X	X	X	X	X	Ca, BC, BvC, LL
Shy maiden	*Moneses uniflora*	X	X	X	X	X	BvC
Sweet gale	*Myrica gale*	X	X	X	X	X	
Yellow pond lily	*Nuphar polysepalum*	X	X	X	X	X	
Blackish oxytrope	*Oxytropis nigrescens*	X	X	X	X	X	
Grass of Parnassus	*Parnassia palustris*	X		X	X	X	Ca, LL
Parrya	*Parrya nudicaulis*	X	X	X	X	X	
Pedicularis	*Pedicularis labradorica*	X		X	X	X	C
Oeder's lousewort	*Pedicularis oederi*	X	X	X	X	X	
Bumblebee flower	*Pedicularis verticillata*	X	X	X	X	X	
Frigid coltsfoot	*Petasites frigidus*	X	X	X	X	X	Ca, LL
White spruce	*Picea glauca*	X	X	X	X	X	Ca, BvC, LL
Black spruce	*Picea mariana*	X	X	X	X	X	Ca, BC, LL
Plantain	*Plantago major*	X		X	X	X	Ca, BC, BvC
Small northern bog orchid	*Platanthera obtusata*	X	X	X	X	X	
Blue grass	*Poa* sp.	X	X	X	X	X	BC, BvC
Kentucky blue grass	*Poa pratensis*	X	X	X	X	X	
Tall Jacob's ladder	*Polemonium acutiflorum*	X	X	X	X	X	Ca, BC, BvC, LL
Bistort	*Polygonum bistorta*	X	X	X	X	X	
Alpine meadow bistort	*Polygonum viviparum*	X	X	X	X	X	

Table H-84. Vascular Plant Species Observed or Potentially Occurring on or near the Campion (Ca), Lake Louise (LL), Bear Creek (BC), Beaver Creek (BvC), and Kalakaket Creek (KC) Sites

Common Name	Scientific Name	CA	KC	BC	BvC	LL	Observed
Balsam poplar	*Populus balsamifera*	X	X	X	X	X	Ca, BC, BvC, LL
Quaking aspen	*Populus tremuloides*	X	X	X	X	X	Ca, BC, BvC, LL
Silverweed	*Potentilla anserina*	X	X	X	X	X	Ca, BC
Silverweed	*Potentilla egedii*	X	X	X	X	X	
Shrubby cinquefoil	*Potentilla fruticosa*	X		X	X	X	
Marsh fivefinger	*Potentilla palustris*	X	X	X	X	X	Ca, LL
Potentilla	*Potentilla multifida*						
Potentilla	*Potentilla norvgeica*			X	X	X	BC, BvC, LL
Potentilla	*Potentilla virbulata*					X	LL
Pasqueflower	*Pulsatilla patens*	X	X	X	X	X	
Pink pyrola	*Pyrola asarifolia*	X	X	X	X	X	
Wintergreen	*Pyrola chlorantha*				X	X	BvC, LL
Large-flowering wintergreen	*Pyrola grandiflora*	X	X	X	X	X	Ca, LL
Wintergreen	*Pyrola secunda*				X	X	BvC, LL
Buttercup	*Rapunculus* sp.	X	X	X	X	X	
Rhinanthus	*Rhinanthus minor*					X	LL
Northern black currant	*Ribes hudsonianum*	X		X	X	X	
Currant	*Ribes laxiflora*	X		X	X	X	Ca, BvC
Currant	*Ribes* sp.	X	X	X	X	X	
American red currant	*Ribes triste*	X	X	X	X	X	LL
Prickly rose	*Rosa acicularis*	X	X	X	X	X	Ca, BvC, LL
Nagoonberry	*Rubus arcticus*	X	X	X	X	X	C
Cloudberry	*Rubus chamaemorus*	X	X	X	X	X	Ca, BC, LL
American red raspberry	*Rubus idaeus* var. *strigosus*	X	X	X	X	X	BvC
Arctic dock	*Rumex arcticus*	X	X	X	X	X	
Dock	*Rumex graminifolius*	X	X	X	X	X	
Feltleaf willow	*Salix alaxensis*	X	X	X	X	X	Ca, BC
Littletree willow	*Salix arbusculoides*	X	X	X	X	X	Ca, BvC
Bebb's willow	*Salix bebbiana*	X	X	X	X	X	Ca, BC, BvC, LL
Alaska bog willow	*Salix fuscescens*	X	X	X	X	X	Ca
Grayleaf willow	*Salix glauca*	X	X	X	X	X	BvC, LL
Halberd willow	*Salix hastata*	X	X	X	X	X	
Sandbar willow	*Salix interior*	X	X	X	X	X	
Richardson willow	*Salix lanata richardsonii*	X	X	X	X	X	
Diamondleaf willow	*Salix planifolia pulchra*	X	X	X	X	X	Ca, BC
Scouler willow	*Salix scouleriana*					X	LL
Willow	*Salix sitchensis*			X			BC
Burnet	*Sanguisorba officianalis*	X	X	X	X	X	
Yellow marsh saxifrage	*Saxifraga hirculis*	X	X	X	X	X	
Spiked saxifrage	*Saxifraga spicata*	X	X	X	X	X	
Saxifrage	*Saxifraga tricuspidata*				X	X	BvC
Roseroot	*Sedum rosea*	X		X	X	X	
Ragwort	*Senecio* sp.	X	X	X	X	X	
Mastodon flower	*Senecio congestus*	X	X	X	X	X	C
Black-tipped groundsel	*Senecio lugens*	X	X	X	X	X	
Buffalo berry	*Shepherdia canadensis*	X		X	X	X	Ca, BvC, LL
Campion moss	*Silene acaulis*	X	X	X	X	X	

Table H-84. Vascular Plant Species Observed or Potentially Occurring on or near the Campion (Ca), Lake Louise (LL), Bear Creek (BC), Beaver Creek (BvC), and Kalakaket Creek (KC) Sites

Common Name	Scientific Name	CA	KC	BC	BvC	LL	Observed
Goldenrod	*Solidago multiradiata*	X	X	X	X	X	BvC
Green Mountain ash	*Sorbus scopulina*	X	X	X	X	X	
Bur-reed	*Sparganium augustifolium*	X	X	X	X	X	
Beauverd spirea	*Spiraea beauverdiana*	X	X	X	X	X	Ca, BC
Ladies' tresses	*Spiranthes romanzoffiana*	X	X	X	X	X	
Dandelion	*Taraxacum lucerum*	X		X	X	X	C
Dandelion	*Taraxacum offininale*	X		X	X	X	Ca, BC, BvC, LL
Dandelion	*Taraxacum* sp.	X	X	X	X	X	
False asphodel	*Tofieldia coccinea*			X			BC
Asphodel	*Tofieldia pusilla*					X	LL
Star flower	*Trientalis europea*	X	X	X	X	X	C
Trifolium	*Trifolium* sp.	X		X	X	X	C
Trisetum	*Trisetum spicatum*		X		X	X	BvC, LL
Bladderwort	*Utricularia intermedia*	X	X	X	X	X	
Bog cranberry	*Vaccinium oxycoccus*	X	X	X	X	X	
Bog blueberry	*Vaccinium uliginosum*	X	X	X	X	X	Ca, BC, BvC, LL
Low-bush cranberry	*Vaccinium vitis-idaea*	X	X	X	X	X	Ca, BC, BvC, LL
Capitate Valerian	*Valeriana capitata*	X	X	X	X	X	C
Mountain heliotrope	*Valeriana sitchensis*	X	X	X	X	X	
Highland cranberry	*Viburnum edule*	X	X	X	X	X	Ca, BvC
Two-flowered violet	*Viola biflora*	X	X	X	X	X	
Marsh violet	*Viola epipsila*			X			BC
Camass, death	*Zygadenus elegans*	X	X	X	X	X	

Sources: Viereck and Little 1972; White, 1974; Pratt, 1991; CH2M Hill 1993a, b; 611 ASG 1999d, 2000c.

Table H-85. Fish Species Potentially Occurring on or near the Campion (Ca), Kalakaket Creek (KC), Bear Creek (BC), Lake Louise (LL), and Beaver Creek (BvC) Sites

Common Name	Scientific Name	Ca	KC	BC	LL	BvC
Alaska blackfish	*Dallia pectoralis*	X		X		X
Arctic char	*Salvelinus alpinus*		X			
Arctic grayling	*Thymallus arcticus*	X	X	X	X	X
Arctic lamprey	*Lethenteron camtschaticum*	X		X		X
Bering cisco	*Coregonus laurettae*	X		X		X
Burbot	*Lota lota*	X		X	X	X
Chinook salmon	*Oncorhynchus tshawytscha*	X	X	X		X
Chum salmon	*Oncorhynchus keta*	X	X	X		X
Coho salmon	*Oncorhynchus kisutch*	X	X	X		X
Dolly varden	*Salvelinus malma*	X		X		X
Humpback whitefish	*Coregonus pidschian*	X		X	X	X
Lake chub	*Couesius plumbeus*	X		X		X
Lake trout	*Salvelinus namaycush*				X	
Longnose sucker	*Catostomus catostomus*	X		X	X	X
Northern pike	*Esox lucius*	X		X		X
Pink salmon	*Oncorhynchus gorbuscha*	X	X	X		X
Round whitefish	*Prosopium cylindraceum*	X	X	X	X	X
Sardine cisco	*Coregonus sardinella*	X		X		X

Table H-85. Fish Species Potentially Occurring on or near the Campion (Ca), Kalakaket Creek (KC), Bear Creek (BC), Lake Louise (LL), and Beaver Creek (BvC) Sites

Common Name	Scientific Name	Ca	KC	BC	LL	BvC
Sheefish	*Stenodus leucichthys*	X		X		X
Slimy sculpin	*Cottus cognatus*	X		X		X
Sockeye salmon	*Oncorhynchus nerka*	X	X	X		X

Sources: Morrow, 1980; Robbins et al. 1991; Cansler 1993; CH2M Hill 1993b; 1994b, c, e; 611 ASG 1997, 1998a, 1999d, 2000b, c; Johnson and Blossom 2019c, d.

Table H-86. Mammal Species Potentially Occurring on or near the Campion AFS, Kalakaket Creek, Bear Creek, Lake Louise, and Beaver Creek Sites

Common Name	Scientific Name	Campion AFS	Kalakaket Creek	Bear Creek	Lake Louise	Beaver Creek
American beaver	*Castor canadensis*	X**	X	X	X	X
American marten	*Martes americana*	X	X	X	X	X
American mink	*Neovison vison*	X	X	X	X	X
American pygmy shrew	*Sorex hoyi*	X	X	X	X	X
Arctic ground squirrel	*Spermophilus parryii*			X		
Black bear	*Ursus americanus*	X**	X	X	X	X
Brown bear	*Ursus arctos*	X	X	X	X	X
Canadian lynx	*Lynx canadensis*	X	X	X	X	X
Caribou	*Rangifer tarandus*	X	X			X
Cinereus shrew	*Sorex cinereus*	X	X			
Common muskrat	*Ondatra zibethicus*	X	X			X
Coyote	*Canis latrans*				X	
Ermine	*Mustela erminea*	X	X			
Hoary marmot	*Marmota caligata*			X		
Least weasel	*Mustela nivalis*	X	X			
Meadow jumping mouse	*Zapus hudsonius*	X	X	X	X	X
Meadow vole	*Microtus pennsylvanicus*	X	X			
Moose	*Alces americanus*	X*	X	X**	X**	X**
North American porcupine	*Erethizon dorsata*	X*	X			X
North American river otter	*Lontra canadensis*	X	X	X		X
Northern bog lemming	*Synaptomys borealis*	X	X			
Northern red-backed vole	*Myodes rutilus*	X	X	X	X	X
Red fox	*Vulpes vulpes*	X*	X	X	X	X
Red squirrel	*Tamiasciurus hudsonicus*	X*	X		X*	X*
Root vole	*Microtus oeconomus*	X	X	X	X	X
Shrew	*Sorex sp.*			X		
Singing vole	*Microtus miurus*			X	X	X
Snowshoe hare	*Lepus americanus*	X*	X		X*	X*
Taiga vole	*Microtus xanthognathus*	X	X	X	X	X
Vagrant shrew	*Sorex vagrans*	X	X	X	X	X
Wolf	*Canis lupus*	X	X	X	X	X
Wolverine	*Gulo gulo*	X	X	X	X	X

Notes: * = observed; ** = tracks, den site, bones, or skull observed. †All marine mammals are listed under the MMPA.
Sources: CH2M Hill 1994b, c, e; University of Alaska 1998; 611 ASG 1997, 1999d, 2000b, c; USFWS 2007a.

Table H-87. Bird Species Observed or Potentially Occurring on or near the Campion (Ca), Kalakaket Creek (KC), Bear Creek (BC), Beaver Creek (BvC), and Lake Louise (LL) Sites

Common Name	Scientific Name	Ca	KC	BC	BvC	LL	Observed
Alder flycatcher	*Empidonax alnorum*	X	X	X	X	X	Ca, BC, LL
American dipper	*Cinclus mexicanus*	X	X	X	X	X	
American golden-plover	*Pluvialis dominica*	X	X	X	X	X	
American kestrel	*Falco sparverius*	X	X	X	X	X	
American pipit	*Anthus rubescens*	X	X	X	X	X	
American robin	*Turdus migratorius*	X	X	X	X	X	Ca, BC, BvC, LL
American three-toed woodpecker	*Picoides dorsalis*	X	X	X	X	X	LL
American tree sparrow	*Spizelloides arborea*	X	X	X	X	X	LL
American wigeon	*Mareca americana*	X	X	X	X	X	LL
Arctic tern	*Sterna paradisaea*	X	X	X	X	X	LL
Arctic warbler	*Phylloscopus borealis*			X	X	X	LL
Baird's sandpiper	*Calidris bairdii*	X	X	X	X	X	
Bald eagle	*Haleaeetus leucocephalus*	X	X	X	X	X	LL
Bank swallow	*Riparia riparia*	X	X	X	X	X	Ca, LL
Barrow's goldeneye	*Bucephala islandica*	X	X	X	X	X	LL
Belted kingfisher	*Megaceryle alcyon*	X	X	X	X	X	LL
Black scoter	*Melanitta americana*	X	X	X		X	
Black-bellied plover	*Pluvialis squatarola*	X	X				
Black-billed magpie	*Pica hudsonia*				X	X	LL
Black-capped chickadee	*Poecile atricapilla*	X	X	X	X	X	Ca, LL
Blackpoll warbler	*Setophaga striata*	X	X	X	X	X	LL
Blue-winged teal	*Spatula discors*				X	X	
Bohemian waxwing	*Bombycilla garrulous*	X	X	X	X	X	LL
Bonaparte's gull	*Chroicocephalus philadelphia*	X	X	X	X	X	LL
Boreal chickadee	*Poecile hudsonica*	X	X	X	X	X	BvC, LL
Boreal owl	*Aegolius funereus*	X	X	X	X	X	
Brant	*Branta bernicla*	X	X				
Buff-breasted sandpiper	*Calidris subruficollis*	X	X				
Bufflehead	*Bucephala albeola*	X	X	X	X	X	LL
Canada goose	*Branta canadensis*	X	X	X	X	X	LL
Canada jay	*Perisoreus canadensis*	X	X	X	X	X	Ca, BvC, LL
Canvasback	*Aythya valisineria*	X	X	X	X	X	
Chipping sparrow	*Spizella passerina*	X	X	X	X	X	LL
Cliff swallow	*Petrochelidon pyrrhonota*	X	X	X	X	X	LL
Common goldeneye	*Bucephala clangula*	X	X	X	X	X	LL
Common loon	*Gavia immer*	X	X	X	X	X	LL
Common merganser	*Mergus merganser*				X	X	
Common raven	*Corvus corax*	X	X	X	X	X	Ca, BvC, LL
Common redpoll	*Acanthis flammea*	X	X	X	X	X	LL
Dark-eyed junco	*Junco hyemalis*	X	X	X	X	X	Ca, BC, BvC, LL
Double-crested cormorant	*Phalacrocorax auritus*					X	LL
Downy woodpecker	*Dryobates pubescens*	X	X	X	X	X	
Eastern yellow wagtail	*Motacilla flava*	X	X	X			
Fox sparrow	*Passerella iliaca*	X	X	X	X	X	BC, LL
Gadwall	*Mareca strepera*					X	LL
Glaucous gull	*Larus hyperboreus*	X	X	X			
Glaucous-winged gull	*Larus glaucescens*	X	X	X	X	X	LL
Golden eagle	*Aquila chrysaetos*	X	X	X	X	X	
Golden-crowned sparrow	*Zonotrichia atricapilla*	X	X	X	X	X	
Gray-cheeked thrush	*Catharus minimus*	X	X	X	X	X	LL
Gray-crowned rosy-finch	*Leucosticte ephrocotis*	X	X	X	X	X	LL
Great gray owl	*Strix nebulosa*	X	X	X		X	LL
Great horned owl	*Bubo virginianus*	X	X	X	X	X	Ca, LL

Table H-87. Bird Species Observed or Potentially Occurring on or near the Campion (Ca), Kalakaket Creek (KC), Bear Creek (BC), Beaver Creek (BvC), and Lake Louise (LL) Sites

Common Name	Scientific Name	Ca	KC	BC	BvC	LL	Observed
Greater scaup	*Aythya marila*	X	X	X	X	X	
Greater white-fronted goose	*Anser albifrons*	X	X	X	X	X	
Greater yellowlegs	*Tringa melanoleuca*	X	X	X		X	LL
Green-winged teal	*Anas crecca*	X	X	X	X	X	LL
Gyrfalcon	*Falco rusticolus*	X	X	X	X	X	
Hairy woodpecker	*Dryobates villosus*	X	X	X	X	X	LL
Hammond's flycatcher	*Empidonax hammondii*	X	X	X	X	X	
Harlequin duck	*Histrionicus histrionicus*	X	X	X	X	X	
Hermit thrush	*Catharus guttatus*	X	X	X	X	X	LL
Herring gull	*Larus argentatus*	X	X	X	X	X	LL
Hoary redpoll	*Acanthis hornemanni*	X	X	X	X	X	
Horned grebe	*Podiceps auritus*	X	X	X	X	X	
Horned lark	*Eremophila alpestris*	X	X	X	X	X	
Killdeer	*Charadrius vociferus*				X	X	
Lapland longspur	*Calcarius lapponicus*	X	X	X	X	X	
Least sandpiper	*Calidris minutilla*	X	X	X	X	X	
Lesser scaup	*Aythya affinis*	X	X	X	X	X	LL
Lesser yellowlegs	*Tringa flavipes*	X	X	X	X	X	LL
Lincoln's sparrow	*Melospiza lincolnii*	X	X	X	X	X	Ca, LL
Long-billed dowitcher	*Limnodromus scolopaceus*	X	X	X	X	X	
Long-tailed duck	*Clangula hyemalis*	X	X	X	X	X	LL
Long-tailed jaeger	*Stercorarius longicaudus*	X	X	X	X	X	
Mallard	*Anas platyrhynchos*	X	X	X	X	X	LL
Merlin	*Falco columbarius*	X	X	X	X	X	
Mew gull	*Larus canus*	X	X	X	X	X	Ca, LL
Mountain bluebird	*Sialia currucoides*	X	X	X	X	X	
Northern flicker	*Colaptes auratus*	X	X	X	X	X	LL
Northern goshawk	*Accipiter gentiles*	X	X	X	X	X	
Northern harrier	*Circus hudsonius*	X	X	X	X	X	LL
Northern hawk owl	*Surnia ulula*	X	X	X	X	X	LL
Northern pintail	*Anas acuta*	X	X	X	X	X	
Northern shoveler	*Spatula clypeata*	X	X	X	X	X	
Northern shrike	*Lanius borealis*	X	X	X	X	X	
Northern waterthrush	*Parkesia noveboracensis*	X	X	X	X	X	Ca, LL
Northern wheatear	*Oenanthe oenanthe*	X	X	X	X	X	
Olive-sided flycatcher	*Contopus cooperi*	X	X	X	X	X	Ca, LL
Orange-crowned warbler	*Oreothlypis celata*	X	X	X	X	X	Ca, BC, LL
Osprey	*Pandion haliaetus*	X	X	X	X	X	LL
Pacific loon	*Gavia pacifica*	X	X	X	X	X	LL
Parasitic jaeger	*Stercorarius parasisiticus*	X	X				
Pectoral sandpiper	*Calidris melanotos*	X	X	X	X	X	
Peregrine falcon	*Falco peregrinus*	X	X	X	X	X	
Pine grosbeak	*Pinicola enucleator*	X	X	X	X	X	LL
Pine Siskin	*Pinus spinus*	X	X	X	X	X	LL
Red-breasted merganser	*Mergus serrator*	X	X	X	X	X	
Red-breasted nuthatch	*Sitta canadensis*	X	X	X	X	X	LL
Redhead	*Aythya americana*	X	X	X	X	X	
Red-necked grebe	*Podiceps grisegena*	X	X	X	X	X	LL
Red-necked phalarope	*Phalaropus lobatus*	X	X	X	X	X	LL
Red-tailed hawk	*Buteo jamaicensis*	X	X	X	X	X	LL
Red-throated loon	*Gavia stellata*	X	X	X	X	X	LL
Ring-necked duck	*Aythya collaris*	X	X	X	X	X	LL
Rock ptarmigan	*Lagopus muta*	X	X	X	X	X	

Table H-87. Bird Species Observed or Potentially Occurring on or near the Campion (Ca), Kalakaket Creek (KC), Bear Creek (BC), Beaver Creek (BvC), and Lake Louise (LL) Sites

Common Name	Scientific Name	Ca	KC	BC	BvC	LL	Observed
Rough-legged hawk	*Buteo lagopus*	X	X	X	X	X	
Ruby-crowned kinglet	*Regulus calendula*	X	X	X		X	Ca, BC, LL
Ruddy turnstone	*Arenaria interpres*	X	X	X	X	X	
Ruffed grouse	*Bonasa umbellus*	X	X	X	X		
Rusty blackbird	*Euphagus carolinus*	X	X	X	X	X	LL
Sabine's gull	*Zema sabini*	X					
Sandhill crane	*Antigone canadensis*	X	X	X	X	X	
Savannah sparrow	*Passerculus sandwichensis*	X	X	X	X	X	Ca, LL
Say's phoebe	*Sayornis saya*			X	X	X	
Semipalmated plover	*Charadrius semipalmatus*	X	X	X	X	X	LL
Semipalmated sandpiper	*Calidris pusilla*	X	X	X	X	X	
Sharp-shinned hawk	*Accipiter striatus*	X	X	X	X	X	LL
Sharp-tailed grouse	*Tympanuchus phasianellus*			X	X	X	
Short-eared owl	*Asio flammeus*	X	X	X	X	X	LL
Snow bunting	*Plectrophenax nivalis*	X	X	X	X	X	
Snow goose	*Anser caerulescens*	X	X	X	X	X	
Snowy owl	*Bubo scandiacus*	X	X	X		X	
Solitary sandpiper	*Tringa solitaria*	X	X	X	X	X	LL
Spotted sandpiper	*Actitis macularius*	X	X	X	X	X	LL
Spruce grouse	*Falcipennis canadensis*	X	X	X	X	X	LL
Surf scoter	*Melanitta persicillata*	X	X	X	X	X	LL
Surfbird	*Calidris virgata*	X	X	X	X	X	
Swainson's thrush	*Catharus ustalatus*	X	X	X	X	X	Ca, BC, BvC, LL
Townsend's solitaire	*Myadestes townsendi*			X	X	X	
Townsend's warbler	*Setophaga townsendi*				X		BvC, LL
Tree swallow	*Tachycineta bicolor*	X	X	X	X	X	LL
Trumpeter swan	*Cygnus buccinator*	X	X	X	X	X	LL
Tundra swan	*Cygnus columbianus*	X	X	X	X	X	
Upland sandpiper	*Bartramia longicauda*	X	X	X	X	X	
Varied thrush	*Ixoreus naevius*	X	X	X	X	X	LL
Violet-green swallow	*Tachycineta thalassina*	X	X	X	X	X	LL
Wandering tattler	*Heteroscelus incanus*	X	X	X	X	X	
Western sandpiper	*Calidris mauri*					X	
Western woodpewee	*Contopus sordidulus*				X	X	LL
Whimbrel	*Numerius phaeopus*	X	X	X	X	X	
White-crowned sparrow	*Zonotrichia leuophrys*	X	X	X	X	X	Ca, BC, LL
White-winged crossbill	*Loxia leucoptera*	X	X	X	X	X	LL
White-winged scoter	*Melanitta deglandi*	X	X	X	X	X	LL
Willow ptarmigan	*Lagopus lagopus*	X	X	X	X	X	
Wilson's snipe	*Gallinago delicata*	X	X	X	X	X	Ca, LL
Wilson's warbler	*Cardellina pusilla*	X	X	X	X	X	Ca, LL
Yellow warbler	*Setophaga petechia*	X	X	X	X	X	BC, LL
Yellow-rumped warbler	*Setophaga coronata*	X	X	X	X	X	Ca, BC, BvC, LL

Sources: Gibson 1993; Armstrong 1998; Johnson 1998; 611 ASG 1998a, 1999d; 2000c; Pardieck et al. 2018.

H.19 LAKE LOUISE RECREATION SITE (INACTIVE)

H.19.1 Location and Area

The former Lake Louise Recreation Site is about 40 miles northwest of Glennallen and 130 miles northeast of Anchorage. The 26-acre site is on the west shore of Lake Louise at the juncture with Lake Dinty (Figure H-122). The site is not completely accessible by road; wading, boating, or a 4-wheel drive vehicle is required to cross a 20-ft wide waterway.

H.19.2 Installation History

The Lake Louise site was purchased as two parcels in 1955 and 1957. Though use of the site began in 1949, according to real estate records it was first named Elmendorf/Lake Louise Recreation Annex in 1958 and then became the Lake Louise Recreation Annex. Located midway between Eielson AFB and Elmendorf AFB, the site was developed as a recreation camp to provide recreational fishing and boating opportunities and facilities for Air Force personnel and their families. Facilities at the camp consisted of a lodge, dining hall, dormitory, boat shop and fueling point, generator building, water pump house, check-in building, shower house, several small cabins, and a picnic area. A 1964 earthquake caused extensive damage to facilities, and use of the site was discontinued in 1965. Facilities at the site were demolished in 1971, and debris was either removed or buried (Cansler 1993). Clean Sweep occurred in 2010-2012.

H.19.3 Military Mission

The former Lake Louise Recreation Site is now closed; see Section H.19.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is scheduled for 2020.

H.19.4 Surrounding Communities

The closest community to the Lake Louise site is Glennallen, approx. 40 miles to the southeast. The community of Glennallen lies along the Glenn Highway at its juncture with the Richardson Highway and is the supply hub of the Copper River region. The 2018 estimated population is 456, the majority (96%) is non-native. State highway maintenance and federal offices, such as the BLM, and state government offices, such as Alaska State Troopers and ADFG are in Glennallen. Glennallen was named for Maj. Edwin Glenn and Lt. Henry Allen, both leaders in early explorations of the Copper River region (State of Alaska 2018, 2019).

H.19.5 Regional Land Use

The surrounding lands are primarily state lands with a few Native Allotments to the west (BLM 2019a).

H.19.6 Local and Regional Natural Areas

The Lake Louise site is adjacent to the Lake Louise State Recreation Area.

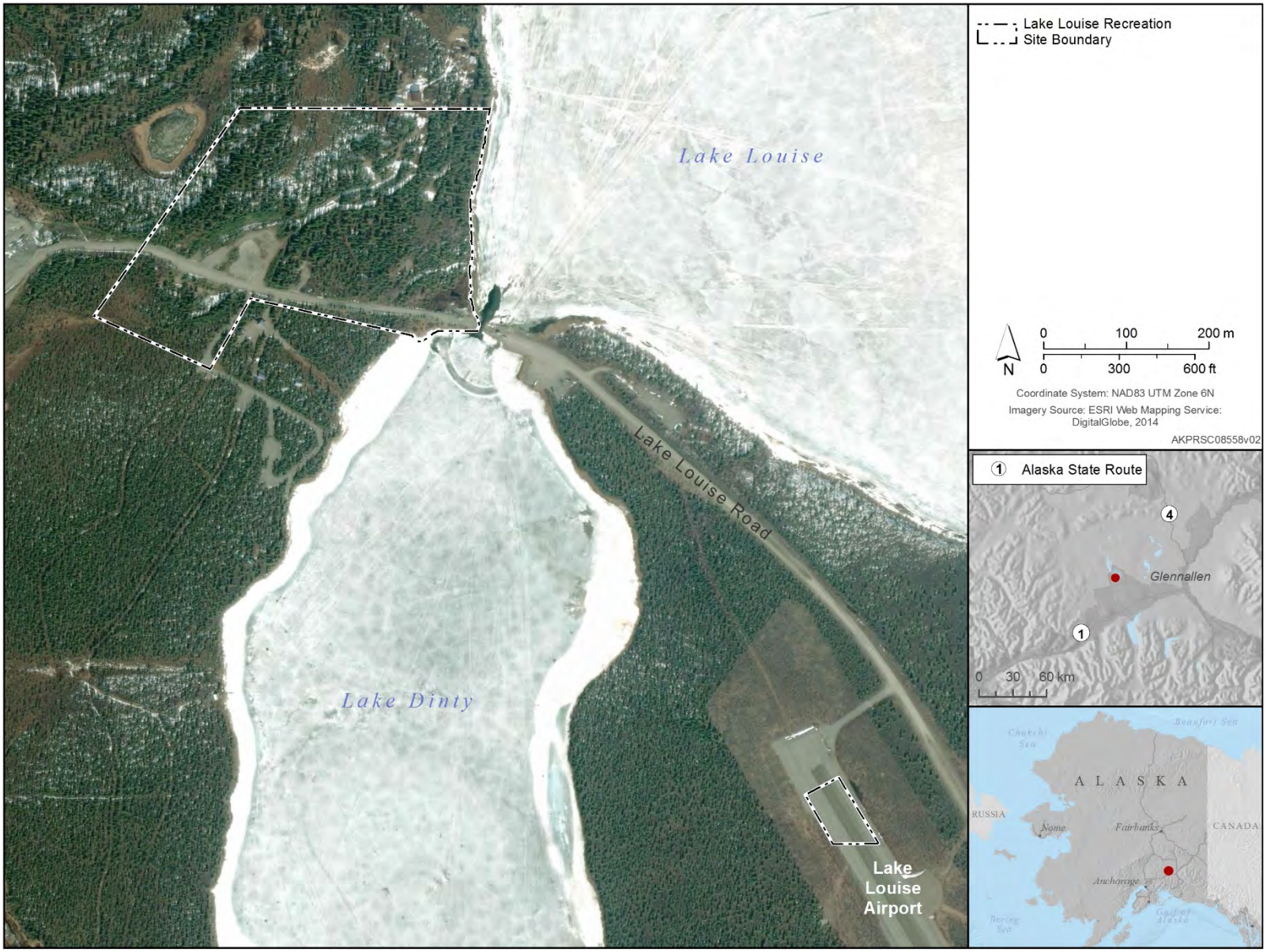

Figure H-122. Overview of Former Lake Louise Recreation Site

H.19.7 Physical Environment

H.19.7.1 Climate

The Lake Louise site has a continental climate, with long, cold winters, and relatively warm summers. Average monthly highs in June-August are in the upper 60s and low 70s ºF, while monthly winter tempeatures from November through March average below 0 ºF (Table H-88). Total annual precipitation is about 11 inches, most of which occurs during the summer months. Snowfall averages 51 inches per year.

Table H-88. Monthly Climatic Averages for Glennallen, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	4.1	15.2	29.4	44.3	57.6	67.2	70.6	66.5	55.5	36.5	14.5	7.4
Avg. Low (ºF)	-17.2	-10.8	-1.7	18.0	29.9	39.2	43.3	38.9	30.2	15.5	-5.8	-13.0
Avg. Precipitation (inches)	0.6	0.6	0.4	0.2	0.6	1.4	1.6	1.7	1.3	1.0	0.8	1.3
Avg. Snowfall (inches)	7.7	7.4	4.5	2.5	0.5	0	0	0	0.5	7.6	9.7	10.9

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.19.7.2 Topography

The Lake Louise site is in the Copper River Basin in southcentral Alaska, which is characterized as flat and poorly drained with numerous freshwater lakes. The region is physically delineated by the Alaska Range, Wrangell Mountains, Chugach Mountains, and Talkeetna Mountains. Elevations range from about 2,000 to 3,000 ft MSL. The site is at an elevation of about 2,400 ft MSL and generally slopes east toward Lake Louise. The property rises steeply about 50 ft in elevation from the lake shore, then levels to gentle to undulating slopes. A low ridge extends through the site from north to south.

H.19.7.3 Geology and Soils

Rocks bordering the Copper River Basin consist of schist, greenstone, graywacke, shale, and sandstone. During one or more early Pleistocene glaciations, glaciers from surrounding mountains covered the entire basin floor. The central basin was covered with a large proglacial lake, and lacustrine sediments deposited in the lake partially buried older glacial features. Broad level terraces are the most extensive geologic features in the area. Terraces consist of clayey lacustrine sediments from the proglacial lake. Wind-blown sediments of varying thicknesses mantle stream and lacustrine terraces in the area (Clark and Kautz 1999).

Permafrost underlies the entire basin at varying depths, except on floodplains and under lakes. Where a thick organic mat overlies the mineral soil, permafrost and a perched water table can occur within the soil profile (Clark and Kautz 1999).

H.19.8 Hydrology

The area surrounding the site is dotted with numerous fresh water lakes. The Copper, Tazlina, Maclaren, and Susitna rivers are the major surface water drainage features in the area. The site is on the shore of Lake Louise, one of the largest lakes in the area. The Lake Louise site has no flowing surface water on the site. Surface water runoff flows directly into Lake Louise or percolates directly into the ground. Groundwater resources in the area are unknown (11 CEOS 1995g). However, subsurface water throughout much of the Copper River Basin is under artesian pressure beneath fine-grained material and/or permafrost (Clark and Kautz 1999).

H.19.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on

the Lake Louise site. Attachment 9 contains lists of vascular plants (Table H-84), fish (Table H-85), mammals (Table H-86), and birds (Table H-87) known to occur or potentially occurring in the Lake Louise area. ESA-listed species that may occur at or in the vicinity of the Lake Louise site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.19.9.1 Ecoregion Classification

The Lake Louise site is located in the Copper River Basin ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.19.9.2 Vegetation/Habitat

A general vegetation/habitat map of the Lake Louise site has not been prepared. The Lake Louise site is primarily a mixed white and black spruce forest with few large birch or aspen. The understory has scattered shrub/small tree-sized Bebb's willow, grayleaf willow, and a few Scouler willow. Disturbed areas around old foundations and other cleared areas have regenerated to a thick cover of American green alder, Bebb's willow, grayleaf willow, and some white spruce. Patches of wet sedge meadow occur along the lakeshore (11 CEOS 1995g).

H.19.9.3 Wetlands

The current mapping of wetlands at the Lake Louise site is based on 2018 ANHP data (Flagstad et al. 2018); NWI data are not available. Of the approximate 26-acre Lake Louise site, 3 acres (or 13%) are considered wetlands per the ANHP mapping (Table H-89 and Figure H-123).

Table H-89. Lake Louise Recreation Site Wetland Types Based on 2018 ANHP Data

Wetland Type	Area (acres)	Proportion
Lake	2.2	8.3%
Freshwater Forested/Shrub	0.9	3.4%
Freshwater Emergent	0.3	1.1%
Wetlands Total	**3.4**	**12.8%**
Upland	23.1	87.2%
Site Total	**26.5**	

Note: See Figure H-123.
Source: Flagstad et al. 2018.

H.19.9.4 Fish and Wildlife

H.19.9.4.1 Fish

Lake Louise supports lake trout, burbot, Arctic grayling, whitefish, and suckers (11 CEOS 1995g) (Table H-85).

H.19.9.4.2 Mammals

Although only 3 mammal species have been recorded from the site (moose, red squirrel, snowshoe hare), 17 additional species are likely present on site or in the vicinity including black and brown bear, wolf, coyote, caribou, voles, shrews, red fox, American mink, marten, and beaver (Table H-86). The Copper River Valley area has some of the highest densities of coyotes in the state. The annual migration of the Nelchina caribou herd occurs in the area each October through November (ADFG 2019a; ADNR 2019).

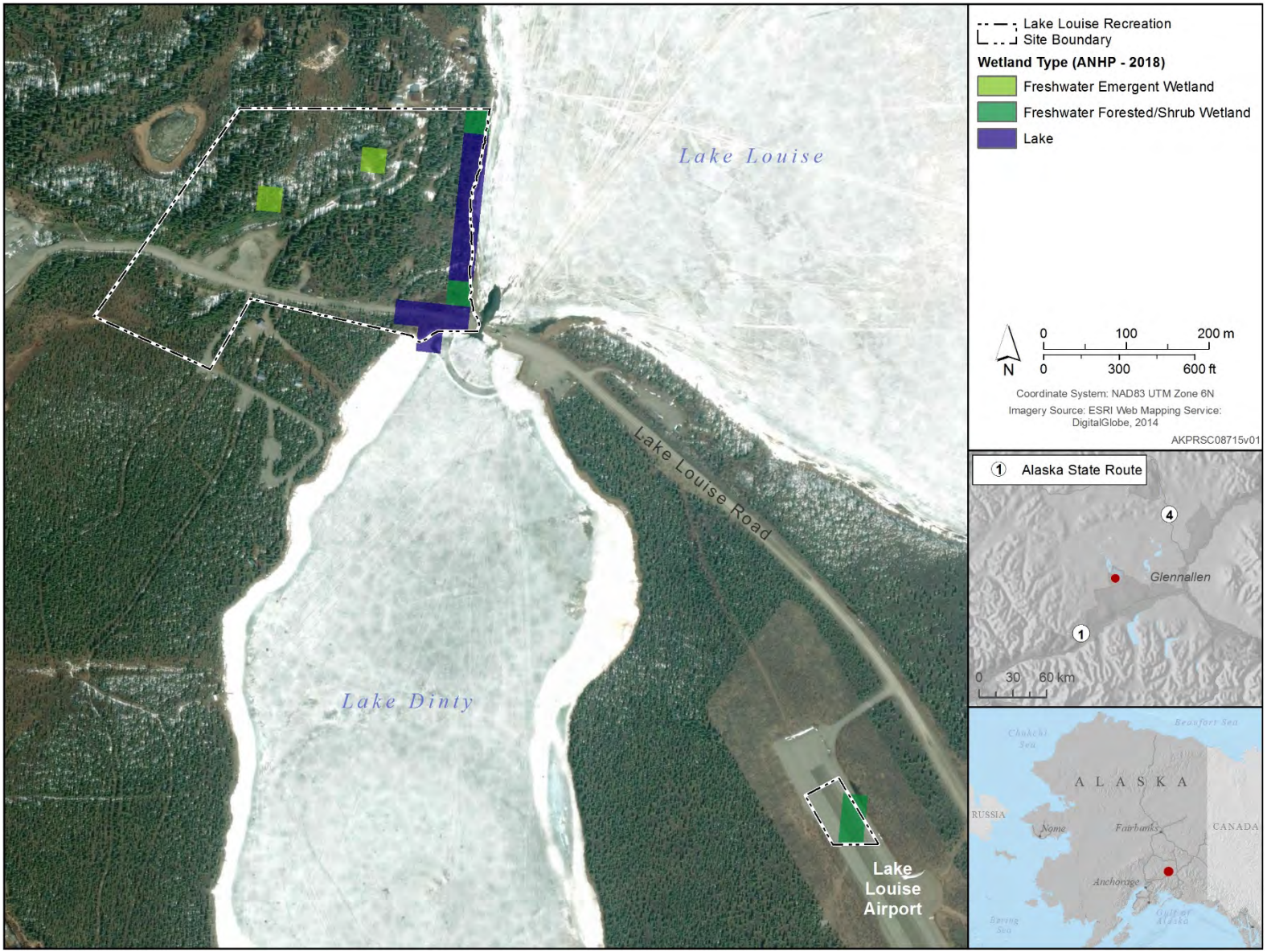

Figure H-123. Lake Louise Recreation Site Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.19.9.4.3 Birds

Almost 90 species of birds have been recorded on the Lake Louise site, and numerous other species potentially occur (Table H-87). Concentrations of nesting waterfowl use Lake Louise and it is the only known recorded freshwater nesting site for cormorants. This nesting site, known as Bird Island, is also a rare inland nesting site for gulls (ADNR 2019). The Lake Louise area is the summer home to trumpeter swans, loons and many other water fowl. Lake Louise is also used by trumpeter swans for nesting and brood-rearing. Species commonly observed at the site include American robin, Swainson's thrush, yellow warbler, yellow-rumped warbler, alder flycatcher, dark-eyed junco, white-crowned sparrow, fox sparrow, savannah sparrow, northern flicker, mew gull, Arctic tern, double-crested cormorant, and red-throated loon. Bald eagles have nested on the Lake Louise site.

H.19.9.5 ESA-listed Species

No ESA-listed species have been reported within the boundaries of the Lake Louise Recreation site.

H.19.10 Other Natural Resource Information

H.19.10.1 Subsistence

There is significant use of subsistence resources by people in the Lake Louise community. In particular, fish and large land mammals are sought, and products are exchanged by local residents. Residents at Lake Louise utilize a subsistence use area that includes Lake Louise; the Tyone River; West Fork, Fish, Ewan, and Crosswind lakes; and the Gulkana River (Braund and Associates 2004).

H.19.10.2 Outdoor Recreation

There are several commercial lodges near the site, and Lake Louise is very popular year-round with sportsmen. There is a public boat launch and parking area at the end of the road, directly across the narrow waterway that must be crossed to access the site. Several permanent residences are in the immediate area, and these residents, as well as others from more distant areas, practice subsistence harvest of fish, wildlife, and berries. Other recreation activities include camping, hiking, and wildlife viewing.

H.20 POINT LAY LRRS (INACTIVE)

H.20.1 Location and Area

Located south of the mouth of the Kokolik River, the former Point Lay LRRS is immediately south of the native village of Point Lay and about 185 air miles southwest of Point Barrow. The 1,433-acre former Point Lay site sits on the eastern side of Kasegaluk Lagoon and the Chukchi Sea (Figure H-124).

H.20.2 Installation History

The Point Lay LRRS was activated in 1955 as an auxiliary DEW Line station. The station initially consisted of one 24-module train, rotating radar in a radome, and support facilities, including a warehouse, hangar, gravel runway, and a garage. In the mid-1980s Point Lay was upgraded to an LRRS. The site was deactivated and closed in 1998 (611 CES/CEVR and AFCEC 2005). Clean Sweep building demolition and debris removal occurred in 2005 and all structures were removed except for an aircraft hanger and a small storage building. Remedial actions are ongoing.

H.20.3 Military Mission

The former Point Lay LRRS is now closed; see Section H.20.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. Additional characterization of remaining structures will be performed in 2020, with demolition of three structures proposed in 2022. Cleanup of the IRP site is planned for 2022. The next site visit is currently scheduled for 2021.

H.20.4 Surrounding Communities

Point Lay had a 2018 estimated population of 287 consisting of 74% Alaska Native (primarily Inupiat). Point Lay is relatively isolated and is the smallest village in the region, which affects economic opportunities. Most year-round employment opportunities are with the borough government. Other jobs are provided by a store, the school, a clinic, and various construction projects for community facilities and housing. Local crafts provide some income and include the manufacture of ivory carvings and Eskimo clothing. Electricity is provided by the North Slope Borough.

H.20.5 Regional Land Use

The surrounding lands consist of Alaska Native Allotments which are used for subsistence hunting, gathering, and fishing.

H.20.6 Local and Regional Natural Areas

The barrier islands to the west of the former Point Lay site are within the Alaska Maritime NWR. The Alaska Maritime NWR was established to conserve marine mammals, seabirds and other migratory birds, and the marine resources upon which they rely. The Refuge's 3.4 million acres is spread along most of the 47,300 miles of Alaska’s coastline and includes the spectacular volcanic islands of the Aleutian chain, the seabird cliffs of the remote Pribilofs, and icebound lands washed by the Chukchi Sea, providing essential habitat for some 40 million seabirds, representing more than 30 species. Activities focus on long-term ecosystem monitoring, marine resources research, and invasive species management (USFWS 1988).

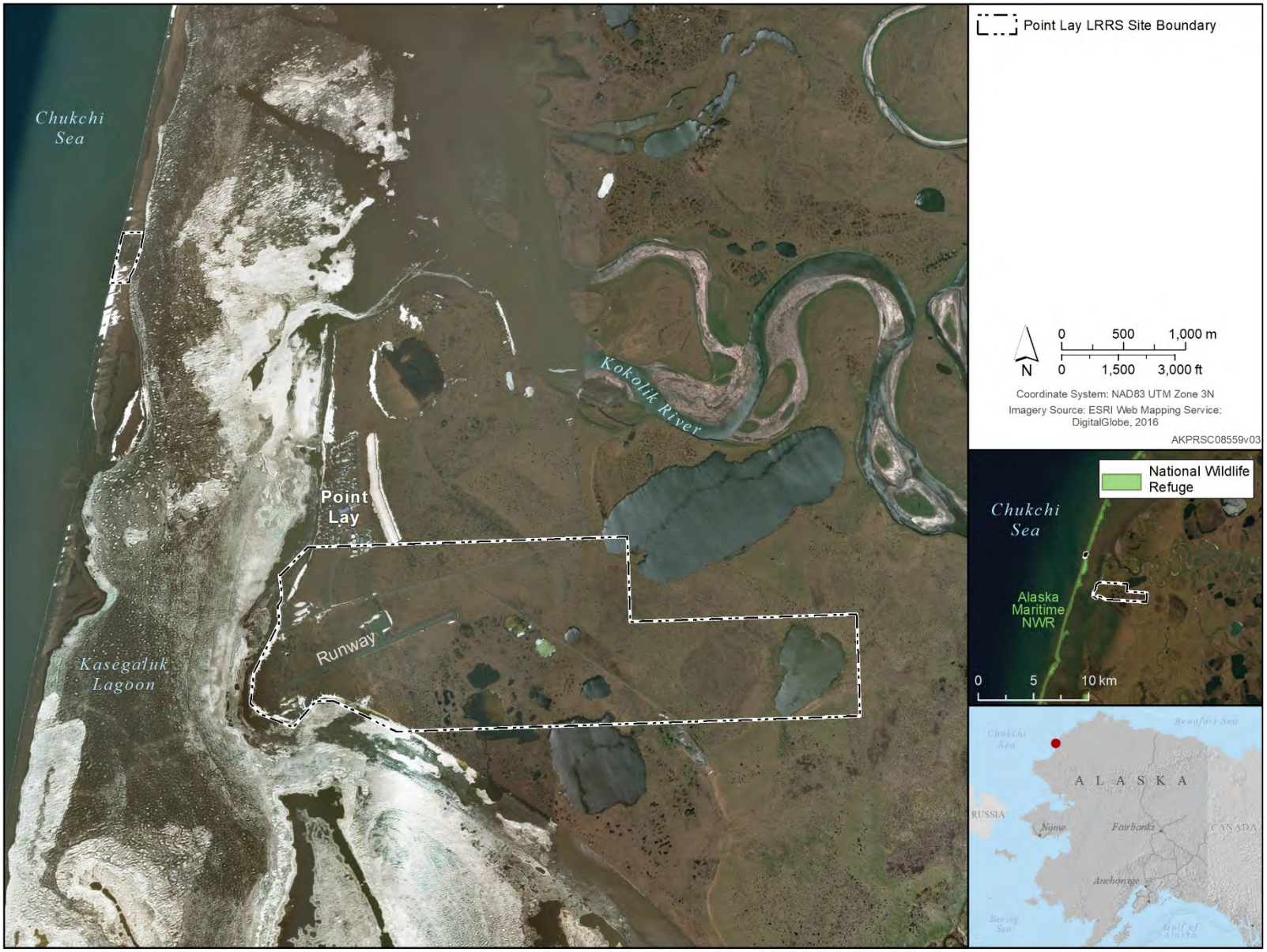

Figure H-124. Overview of Former Point Lay LRRS

H.20.7 Physical Environment

H.20.7.1 Climate

Point Lay's climate is arctic, with winter low temperatures averaging -20 to -30 °F. Average high summer temperatures rarely reach 55 °F (Table H-90). Precipitation is light, averaging 6 inches annually, with 17 inches of snow. The Chukchi Sea is ice-free from late June until September.

Table H-90. Monthly Climatic Averages for Point Lay, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	-3.7	-15.3	-7.4	11.7	29.6	44.3	51.6	50.8	39.9	25.4	10.0	-6.0
Avg. Low (ºF)	-20.2	-30.5	-22.4	-4.5	17.7	32.7	38.5	38.9	31.3	15.2	-2.3	-19.6
Avg. Precipitation (inches)	0.2	0	0.1	0.2	0	0.3	1.7	1.8	0.7	0.4	0.1	0.1
Avg. Snowfall (inches)	1.5	0.2	1.7	3.7	0.4	0	0	0	0	5.5	1.9	2.1

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.20.7.2 Topography

Point Lay is within the Arctic Coastal Plain physiographic region. Point Lay village and the site are located south of the Kokolik River on the tundra near the shore of Kasegaluk Lagoon on a low coastal bluff. The site is generally flat with local topographic features that include high- and low-centered polygons and small thaw lakes and ponds. The old village site, also known as the summer village, is on an offshore gravel barrier island in the Chukchi Sea. The island is part of a lengthy barrier island-spit complex bounding Kasegaluk Lagoon, which rises to approximately 15 ft MSL (University of Alaska 1978).

H.20.7.3 Geology and Soils

The Point Lay site is underlain by permanently frozen sediments of the Quaternary Gubik Formation - mixtures and lenses of marine and alluvial clay, silt, sand, and gravel. This formation is more silty at Point Lay than at other 611 ASG North Slope sites. It is the characteristic formation that is deposited throughout the shallow, near-shore shelf marine environment. Frequent sea level changes have alternately exposed and inundated the Coastal Plain, depositing, reworking, and mixing sediments. Erosion potential in the Point Lay area is moderate overall, although streambank and shoreline erosion on ponds, coastal lakes, and along coastal shorelines is extensive, particularly in early summer.

The soil that predominates at the Point Lay site is a poorly drained peat with a silty loam texture. The permafrost table is near the surface, generally thawing to not more than 18 inches in summer.

H.20.8 Hydrology

The former Point Lay site is near the Kokolik River and Kasegaluk Lagoon, dominant surface water features in the area. Rivers west of the Colville River exhibit drowned coastal features, indicating subsidence of the Coastal Plain. Due to the low elevation of Point Lay, it is moderately susceptible to coastal flooding. The village has been relocated twice due to continual erosion of the riverbank and seasonal flooding during spring thaw and breakup of river ice.

Surface drainage on the Arctic Coastal Plain occurs as sheetflow and shallow creek runoff from near the coast. Runoff may also follow natural depressions and improved ditches. Infiltration may occur to a limited extent down to the permafrost table during summer.

Permafrost throughout the area precludes the development of groundwater as a drinking water source. A large freshwater lake, south of Point Lay, provides drinking water for the village.

H.20.9 Biotic Environment

INRMP Section 2.3 (Biotic Environment) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the former Point Lay site. Attachment 10 contains lists of vascular plants (Table H-93), fish (Table H-94), mammals (Table H-95), and birds (Table H-96) known to occur or potentially occurring in the Point Lay area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Point Lay site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.20.9.1 Ecoregion Classification

The former Point Lay site is located in the Beaufort Coastal Plain ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.20.9.2 Vegetation/Habitat

A general vegetation map of the Point Lay site was prepared in 1995 (611 ASG 1995c). Further improvements in vegetation mapping at Point Lay occurred in 2002 when flora and fauna surveys were conducted and a wildlife habitat map was prepared (Ritchie et al. 2003). Schick et al. (2004) made significant improvements in vegetation mapping at Point Lay site using 2000 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 5 habitat classes were identified (Table H-91 and Figure H-125). Table H-93 provides a list of the vascular plant species observed or potentially occurring on the Point Lay site.

Table H-91. Habitat Classes at the Former Point Lay LRRS (2017)

Habitat Class	Acres	Proportion
Marsh	819.8	57.2%
Tussock Tundra	272.4	19.0%
Open Water	160.7	11.2%
Developed & Barren Land	100.6	7.0%
Shrub or Scrub	79.0	5.5%
Total	**1,432.6**	

Source: CEMML 2019a.

Habitats at the Point Lay site are primarily lacustrine, lowland tundra types, and wetland complexes with no riverine and little upland habitat types present. Deep and shallow waterbodies are scattered throughout the site, but occur primarily in the center of the site; one large lake occurs at the eastern end of the property (Schick et al. 2004).

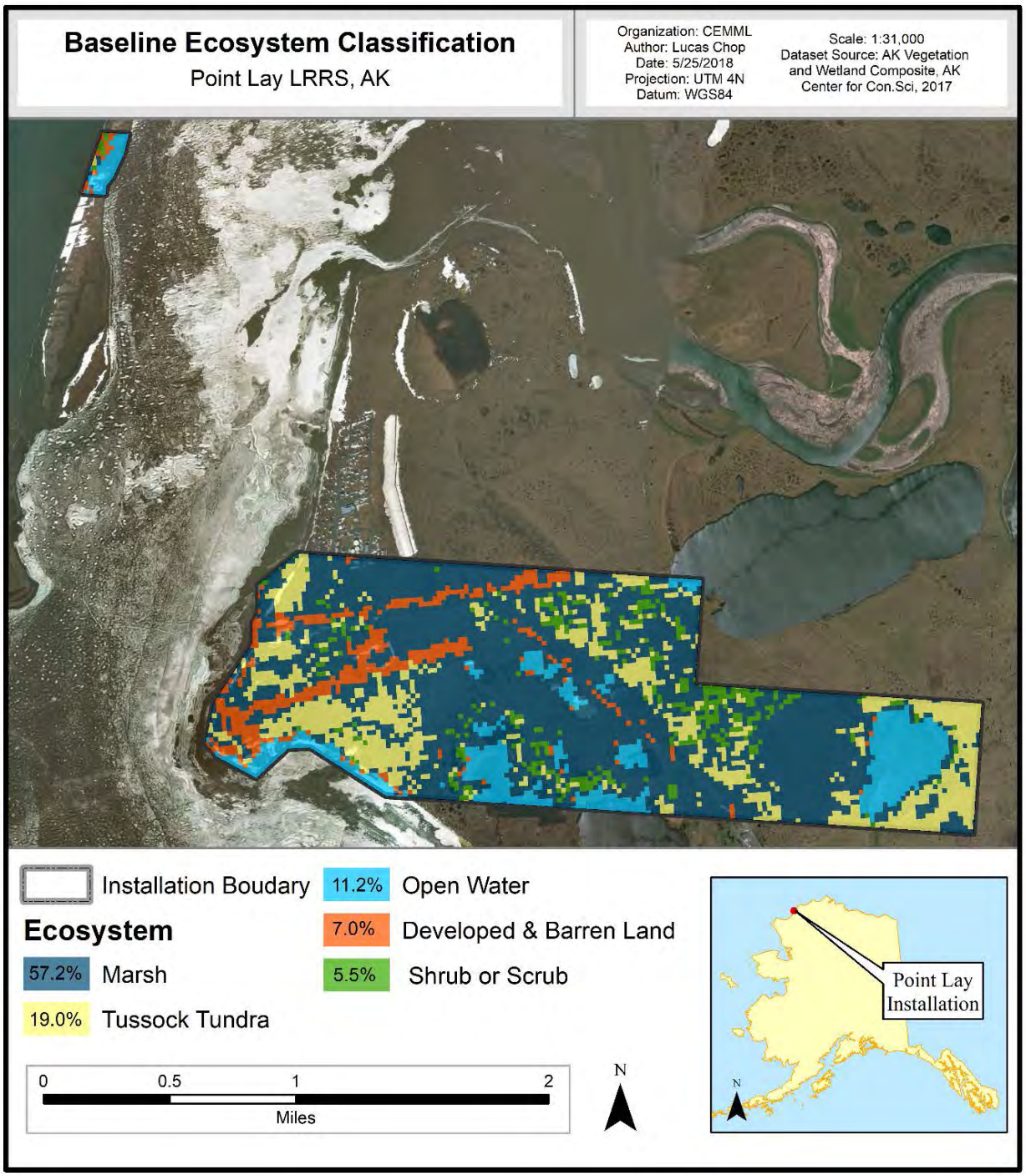

Figure H-125. Former Point Lay LRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

H.20.9.3 Wetlands

The current mapping of wetlands at the Point Lay site is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 1,433-acre Point Lay site, 1,419 acres (or 99%) are considered wetlands per the NWI mapping (Table H-92 and Figure H-126). Freshwater forested/shrub wetlands make up the majority of the wetlands and occur throughout the site.

Table H-92. Point Lay LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	1,007.4	70.3%	1,071.7	74.8
Freshwater Forested/Shrub	207.2	14.5%	1.1	<0.1
Freshwater Pond/Lake	147.7	10.3%	123.2	8.6
Estuarine and Marine Deepwater	42.5	3.0%	10.2	0.7
Estuarine and Marine	14.5	1.0%	5.0	0.3
Riverine	0	0	120.9	8.4
Wetlands Total	**1,419.3**	99.1%	**1,332.1**	**93.0**
Upland	13.3	0.9%	100.5	7.0
Site Total	**1,432.6**		**1,432.6**	

Notes: *See Figure H-126. †See Figure H-127.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

Most wetlands of Point Lay are classified as palustrine, persistent emergent/broad-leaved deciduous shrub. These areas are typically moist and wet tundra and are either saturated or seasonally flooded, depending on microtopography and landscape position. Some lower, wetter, and seasonally flooded areas lack the shrub component. Deep and shallow open water habitats are also common, including lakes and ponds, sometimes with emergent vegetation (e.g., *Arctophila fulva* and *Carex aquatilis*) growing in permanently flooded shallow margins (Ritchie et al. 2003). Freshwater lakes and ponds with islands and/or polygonized margins occur at Point Lay, but they are not common (Schick et al. 2004).

H.20.9.4 Fish and Wildlife

H.20.9.4.1 Fish

Species commonly found in Kasegaluk Lagoon include Arctic char, Arctic flounder, Pacific herring, Arctic grayling, and rainbow smelt (Minerals Management Service 1987a). The Kokolik River supports chum and pink salmon and Dolly Varden (Johnson and Blossom 2019b).

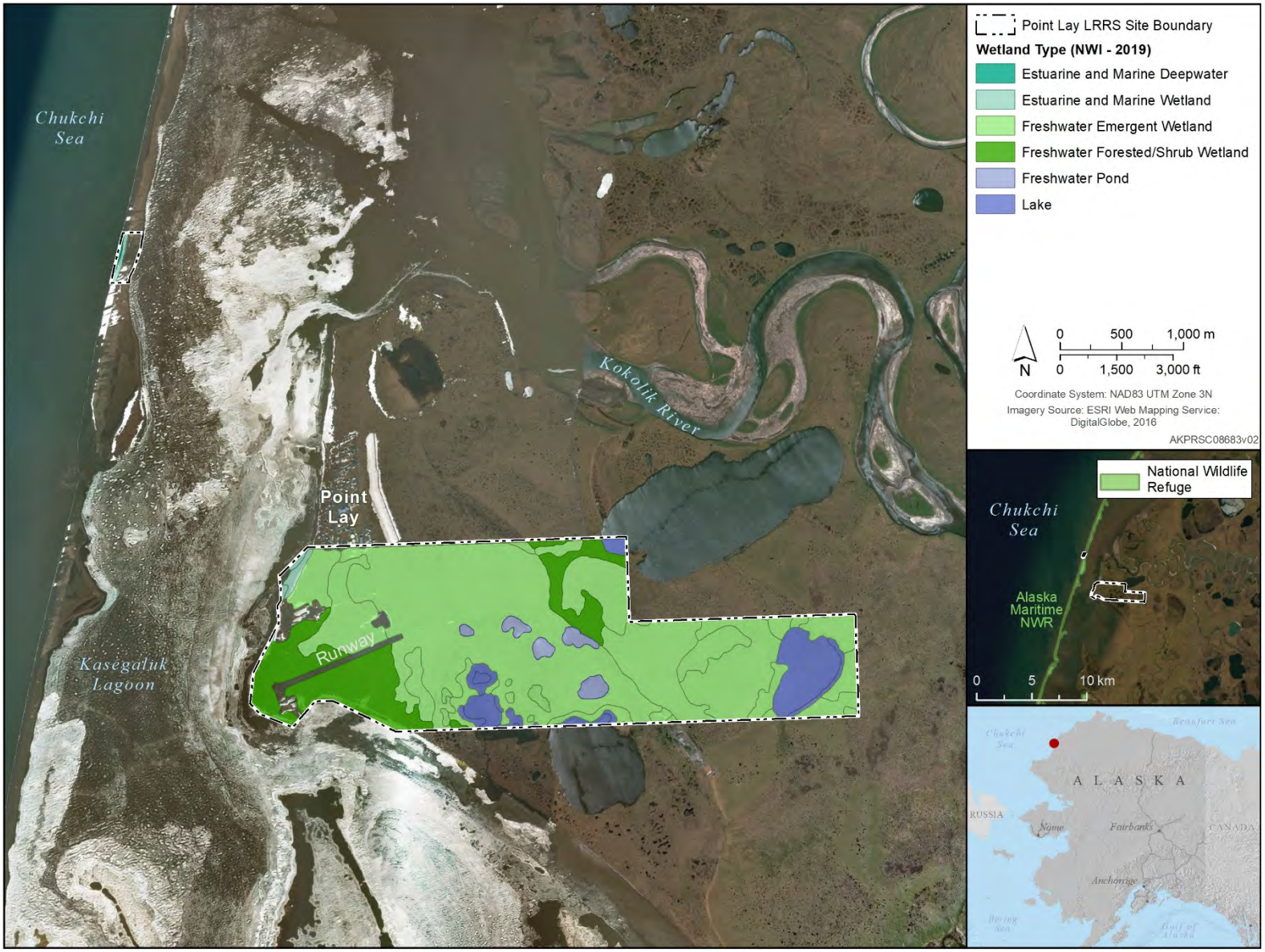

Figure H-126. Point Lay LRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

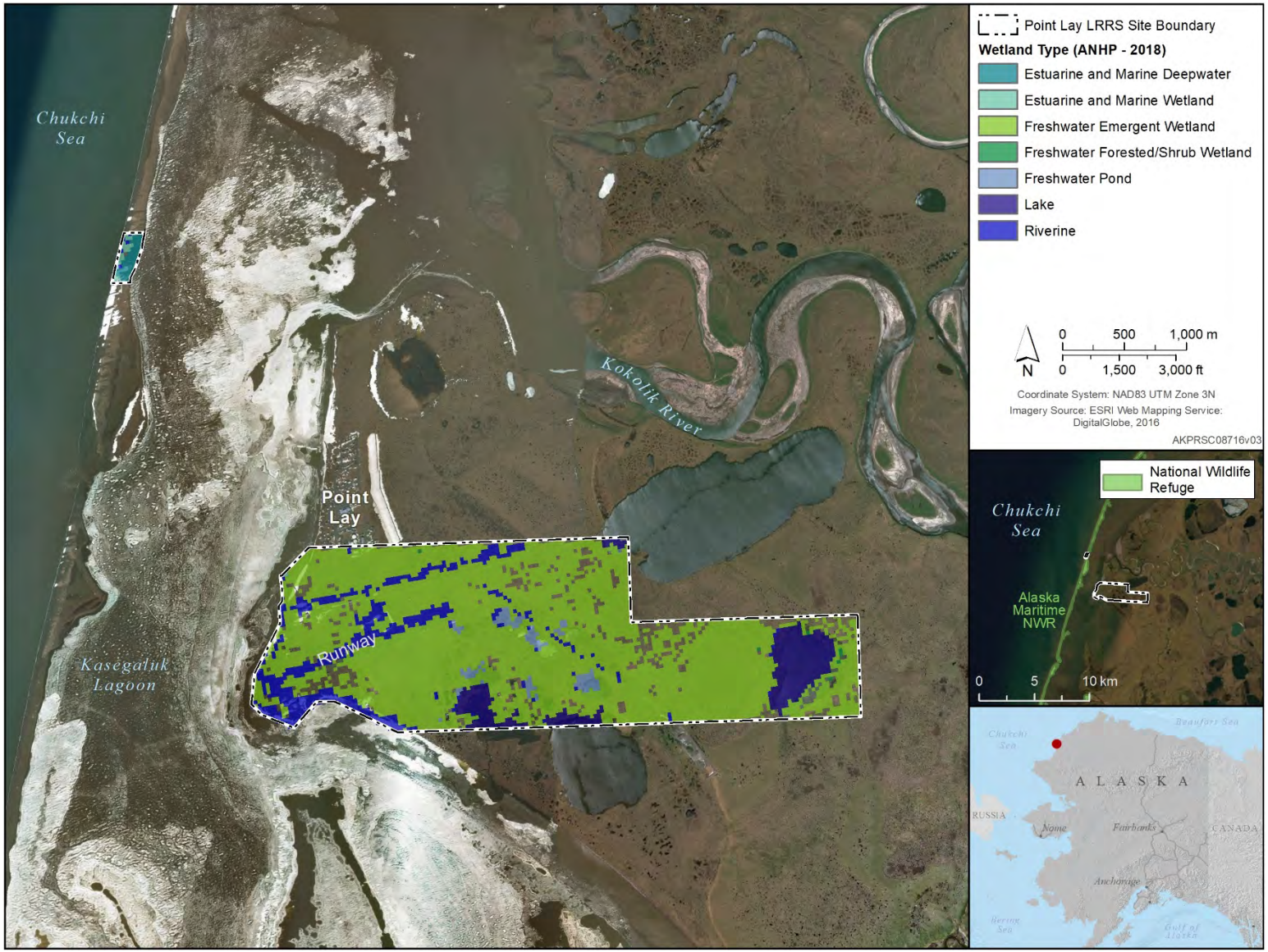

Figure H-127. Point Lay LRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.20.9.4.2 Mammals

Terrestrial Mammals

A fairly diverse range of terrestrial mammals inhabits northwestern Alaska and 21 species are expected to occur on or in the vicinity of the Point Lay site (Table H-95). Caribou are the most wide-ranging and conspicuous species. Point Lay is within the summer range of the Western Arctic herd. Wolves inhabit the entire region and travel extensively, generally along water courses. They prey on a wide variety of wildlife such as Arctic hare, Arctic ground squirrel, and waterfowl; however, caribou are their principal prey. Other mammals likely inhabiting the area include muskox, Arctic fox, wolverine, lemmings, shrews, voles, tundra hares, porcupine, short-tailed weasel, American mink, and Canadian lynx. Brown bears are uncommon in the Point Lay area but are occasionally harvested by hunters (Gusey 1988; 611 ASG 1995c).

Marine Mammals

Pacific walrus, polar bear, four species of seal, five species of whale, and one porpoise species occur in the region (Table H-95). Marine mammals are discussed in detail in Section H.20.9.5 (ESA- and MMPA-listed Species).

H.20.9.4.3 Birds

The wet tundra environment within and adjacent to the site as well as Kasagaluk Lagoon provides nesting and foraging habitat for a wide variety of bird species. A total of 54 species have been recorded on or in the vicinity of the Point Lay site, with an additional 21 species potentially occurring (Table H-96). The Point Lay area is frequented by large numbers of waterfowl during the post-breeding molt and fall migration. Waterfowl are hunted by local natives at Point Lay throughout the summer. Waterfowl species commonly using the area include white-fronted goose, snow goose, tundra swan, brant, mallard, northern pintail, green-winged teal, greater scaup, common and king eiders, long-tailed duck, red-breasted merganser, and red-throated and Pacific loons. Passerine species found in the area include snow bunting, Lapland longspur, yellow wagtail, savannah sparrow, and common redpoll. Shorebirds using the area include semipalmated, western, and pectoral sandpipers, American golden-plover, dunlin, long-billed dowitcher, and red-necked and red phalaroped. Pomarine, parasitic, and long-tailed jaegers, glaucous and glaucous-winged gulls, Arctic tern, Sandhill crane, snowy owl, common raven, and willow ptarmigan are common.

Barrier islands west of Point Lay provide resting substrate for several seabird colonies. These barrier islands are probably of long-term importance for nesting birds, including common eiders, Arctic terns, and glaucous gulls (Sowls et al. 1978). During post-breeding molt and the fall migration, shores of these islands and salt water lagoons are used by large numbers of long-tailed duck, brant, phalaropes, and other shorebirds and waterfowl.

Important Bird Areas (IBAs)

The former Point Lay LRRS is adjacent to the Kasegaluk Lagoon IBA (Figure H-29). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. Kasegaluk Lagoon is one of the longest lagoon-barrier island systems in the world. It extends along the coast of northwest Alaska for over 100 miles. The lagoon is protected from the Chukchi Sea by a series of barrier islands and is fed by five major rivers. The Kasegaluk Lagoon IBA has been designated by Audubon Alaska as a globally important IBA due to the presence of large numbers of shorebirds (>25,000 individuals), including 19 different species, within the IBA (Audubon Alaska 2014).

H.20.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Six ESA-listed species occur or potentially occur on or in the vicinity of the former Point Lay LRRS: threatened spectacled and Steller's eider, polar bear, and ringed and bearded seals; and the endangered bowhead (Table H-95 and Table H-96).

Spectacled and Steller's Eiders. A 1994 survey confirmed the spectacled eider at the Point Lay site, and the site was also confirmed as a brood-rearing location (Day et al. 1995). The site was one of four remote USAF sites in Alaska (Bullen Point, Oliktok, and Point Lonely are the others) with the greatest potential for Steller's eider nesting. No spectacled eider nests have been recorded at the site during surveys in 1994, 2000, 2002, 2003, and 2006 (Day et al. 1995; Day and Rose 2000; Ritchie et al. 2003; Schick et al. 2004; Frost et al. 2007). However, Oasis Environmental, Inc. (2008) found a failed spectacled eider nest at the Point Lay site.

In 2003, a spectacled eider habitat assessment was conducted at the Point Lay site (Figure H-128). Although high-value spectacled eider nesting habitat was identified in the central and eastern portions of the former LRRS, no spectacled eiders (or Steller's eiders) were recorded at the site during pre-breeding aerial surveys or ground-based nesting surveys (Schick et al. 2004).

Both eider species are known to occur in the adjacent offshore waters of Ledyard Bay, which is one of the primary molting grounds for spectacled eiders breeding on the North Slope. During molt (late June through mid-October), they congregate in large, dense flocks that may be particularly susceptible to disturbance as the birds are flightless for a few weeks. As Ledyard Bay was identified as an important molting area for spectacled eiders, it was designated as critical habitat in 2001 (USFWS 2001a). Critical habitat within marine waters extends from 1 nm offshore of the mean low tide line to approximately 20 miles offshore from Cape Lisburne to Icy Cape (Figure H-39).

Polar Bear. Polar bears are common in this area traveling along the Chukchi coastline in search of food. Historically, the Point Lay area provided denning habitat from November to March, and historical (1910-2000) denning sites are within the vicinity of the former LRRS (Audubon et al. 2016). During the winter, male polar bears forage on sea-ice or terrestrial areas within the vicinity of the LRRS (Wynne 1993; Smith et al. 2017). As females emerge from their dens with their young in the spring, they will forage on the pack ice and nearshore areas of Point Lay (Smith et al. 2017).

Although the former Point Lay LRRS has been excluded from polar bear critical habitat designation (USFWS 2010), the nearby barrier islands are considered barrier island critical habitat that also includes a 1-mile no disturbance zone. In addition, the adjacent marine waters are considered sea ice critical habitat (Figure H-31 and Figure H-32).

Ringed Seal. The Point Lay area is considered a high concentration area for ringed seals during winter and spring (Audubon et al. 2016; Smith et al. 2017). In 2014, the marine waters adjacent to the Point Lay site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bearded Seal. The Point Lay area is considered a year-round concentration area for beared seals. A haulout is located just south of Point Lay (Audubon et al. 2016; Smith et al. 2017).

Bowhead. Bowhead occur in offshore waters on a regular basis, particularly during spring and fall migration (Audubon et al. 2016; Smith et al. 2017).

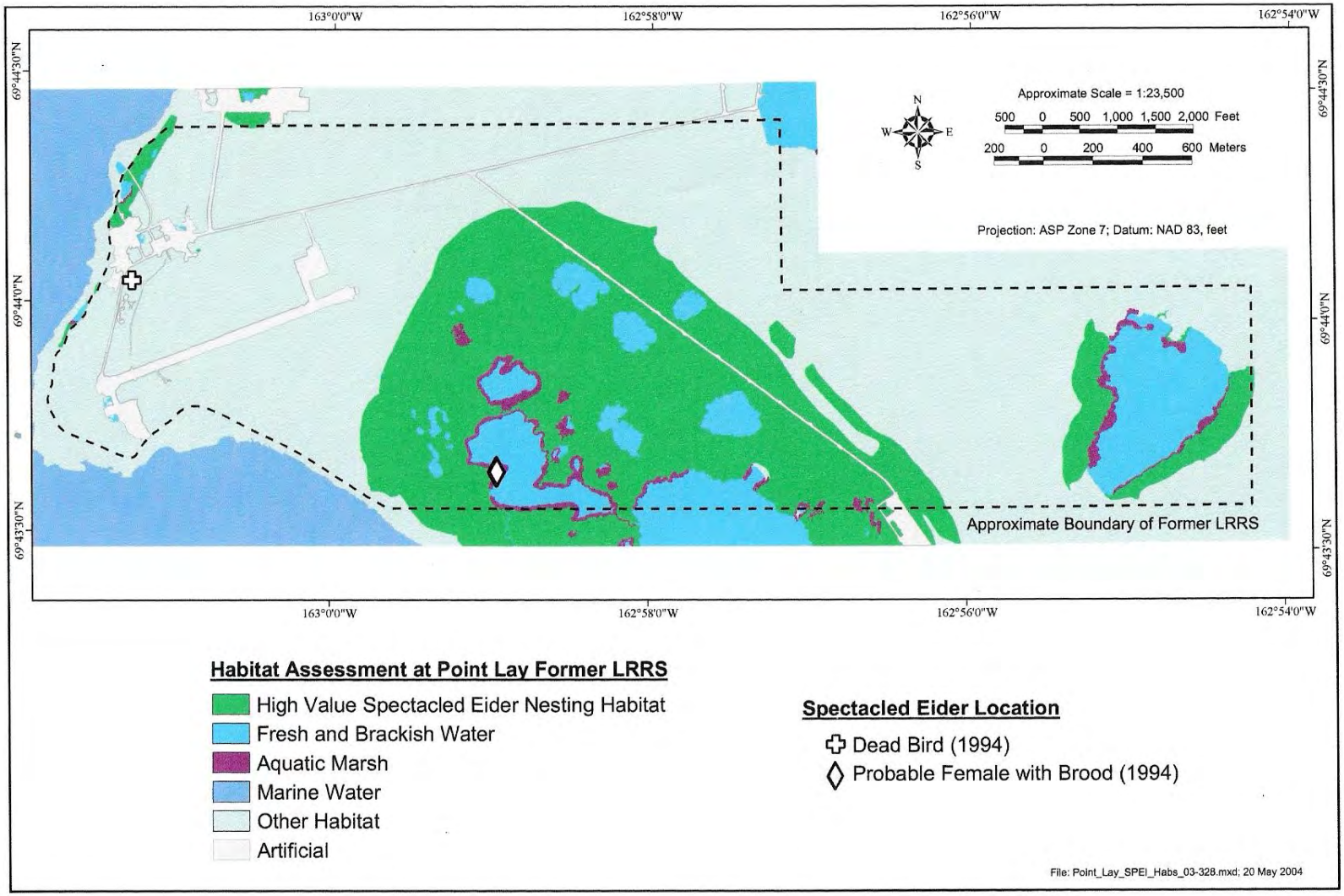

Figure H-128. Spectacled Eider Habitat Assessment at the Former Point Lay LRRS

Other MMPA-listed Species

Pacific Walrus. The Point Lay area supports some of the larger walrus haulouts on the northern coast of the Chukchi Sea, with upwards of 20,000 individuals (Audubon et al. 2016; Fischbach et al. 2016; Smith et al. 2017). The haulout north of Point Lay has been used by up to 10,000 individuals, predominantly females and dependent calves, during July-December (Figure H-129) (Fischbach et al. 2016). In recent years, land-based walrus haulouts at Point Lay have increased substantially – a trend that is expected to continue as late summer sea ice recedes earlier and further north due to climate warming (Audubon et al. 2016).

Figure H-129. Historical Walrus Haulout in the Vicinity of the Former Point Lay LRRS
(*Source*: Fischbach et al. 2016)

Beluga. The Point Lay area has been identified as a beluga summer high concentration area within the Eastern Chukchi Stock Summer Core Area and the offshore waters are within the spring migration corridor (Audubon et al. 2016; Smith et al. 2017).

Common Minke, Gray, and Killer Whales and Harbor Porpoise. Common minke, gray, and killer whales and harbor porpoise are expected to be infrequent visitors to the area. The offshore waters are within an identified gray whale reproduction area that extends from Point Lay to Point Barrow (Audubon et al. 2016;.

Spotted and Ribbon Seals. The Point Lay area supports a number of spotted seal haulout sites and is considered a year-round concentration area. Ribbon seals are expected to occur year-round within the deeper offshore waters (Audubon et al. 2016; Smith et al. 2017).

H.20.10 Other Natural Resources Information

H.20.10.1 Subsistence

The Point Lay area has an abundant diversity of marine and terrestrial mammals, fish, birds, and other resources. Traditional subsistence activities in the Point Lay area have revolved principally around caribou and marine mammals, especially beluga. Fish, waterfowl, and furbearers are also important subsistence resources. Residents of Point Lay utilize a large subsistence area that extends along the coast from Wainwright to Cape Sabine and inland along the Utukok and Kokolik rivers and their associated tributaries. Beluga, caribou, migratory birds, and walrus account for about 87% of Point Lay's annual subsistence harvest in terms of edible pounds (Braund & Associates 2004).

Some villagers hunt and trap furbearers, particularly in winter. Traditional subsistence activities in the Point Lay area have revolved principally around caribou and marine mammals, especially beluga. Fish, waterfowl, and furbearers are also important subsistence resources (Braund & Associates 2004).

H.20.10.2 Outdoor Recreation

Outdoor recreation opportunities available at or near the Point Lay site include game and waterfowl hunting, ATV riding along gravel roads, boating in Kasegaluk Lagoon, and limited fishing opportunities in the Kokolik River north of Point Lay Village.

ATTACHMENT 10: NATURAL RESOURCES OF THE POINT LAY AND POINT LONELY SITES

Table H-93. Vascular Plant Species Observed or Potentially Occurring on or near the Point Lay and Point Lonely Sites

Common Name	Scientific Name	Point Lonely	Point Lay	Observed
SHRUBS				
Alpine bearberry	*Arctostaphylos alpine*		X	
Red-fruit bearberry	*Arctostaphylos rubra*	X	X	
Lapland cassiope	*Cassiope tetragona*	X	X	PL, Lay
Bunchberry	*Cornus canadensis*	X		
Diapensia	*Diapensia lapponica*		X	
White mountain avens	*Dryas octopetala*		X	
Crowberry	*Empetrum nigrum*		X	Lay
Narrowleaf Labrador tea	*Ledum palustre decumbens*	X	X	
Lapland rosebay	*Rhodedendron lapponicum*		X	
Cloudberry	*Rubus chamaemorus*	X	X	
Feltleaf willow	*Salix alaxensis*	X	X	
Arctic willow	*Salix arctica*	X	X	Lay
Barren-ground willow	*Salix brachycarpa*	X	X	
Alaska bog willow	*Salix fuscescens*	X	X	
Grayleaf willow	*Salix glauca*	X	X	
Richardson willow	*Salix lanata richardsonii*	X	X	
Oval-leafed willow	*Salix ovalifolia*	X	X	
Skeleton leaf willow	*Salix phlebophylla*	X	X	
Diamond-leaf willow	*Salix planifolia pulchra*	X	X	PL
Polar willow	*Salix polaris*	X	X	PL
Netleaf willow	*Salix reticulata*	X	X	PL
Least willow	*Salix rotundifolia*	X	X	PL
Bog blueberry	*Vaccinium uliginosum*		X	
Low-bush cranberry	*Vaccinium vitis-idaea*	X	X	PL
HERBACEOUS				
Alpine foxtail	*Alopecurus alpinus*	X		PL
Rock jasmine	*Androsace chamaejasme*	X	X	
Northern jasmine	*Androsace septentrionalis*	X	X	
Pasque flower	*Anemone drummondii*		X	
Narcissus-flower anemone	*Anemone narcissiflora*		X	
Northern anemone	*Anemone parviflora*	X	X	
Yellow anemone	*Anemone richardsonii*	X	X	
Pussytoes	*Antennaria friesiana*	X	X	
Cats paws	*Antennaria monocephala*	X	X	
Polar grass	*Arctagrostis latifolia*			PL
Pendent grass	*Arctophila fulva*	X	X	PL
Tall sandwort	*Arenaria capillaries*		X	
Alpine arnica	*Arnica alpine*	X		
Frigid arnica	*Arnica frigida*	X	X	
Lessing's arnica	*Arnica lessingii*		X	
Arctic wormwood	*Artemisia arctica*	X	X	
Northern wormwood	*Artemisia borealis*	X	X	
Purple wormwood	*Artemisia globularia*		X	

Table H-93. Vascular Plant Species Observed or Potentially Occurring on or near the Point Lay and Point Lonely Sites

Common Name	Scientific Name	Point Lonely	Point Lay	Observed
Siberian aster	*Aster sibiricus*	X	X	
Alpine milkvetch	*Astragalus alpinus*	X	X	
Hairy Arctic milkvetch	*Astragalus umbellatus*	X	X	
Moonwort	*Botrychium lunaria*		X	
Bluejoint grass	*Calamagrostis canadensis*		X	Lay
Reed bent grass	*Calamagrostis* sp.	X	X	
Marsh marigold	*Caltha palustris*	X	X	
Bluebell	*Campanula lasiocarpa*	X	X	
Bittercress	*Cardamine digitata*		X	
Cuckoo flower	*Cardamine pratensis*	X	X	
Sedge	*Carex aquatilis*	X	X	PL, Lay
Sedge	*Carex bigelowii*	X		PL
Sedge	*Carex* sp.	X		PL
Elegant paintbrush	*Castilleja elegans*		X	
Paintbrush	*Castilleja* sp.		X	
Chickweed	*Cerastium beeringianum*	X	X	PL
Cushion hawk's beard	*Cerpis nana*		X	
Arctic daisy	*Chrysanthemum arcticum*		X	
Entire-leaved chrysanthemum	*Chrysanthemum integrifolium*	X	X	
Alaska spring beauty	*Claytonia sarmentosa*		X	
Scurvy grass	*Cochlearia officinalis*			PL
Coral root	*Corallorrhiza trifida*	X		
Frigid shooting star	*Dodecatheon frigidum*	X	X	
Ochotsk douglasia	*Douglasia ochotensis*	X	X	
Draba	*Draba alpina*			PL
Smoothing whitlow-grass	*Draba hirta*		X	
Draba	*Draba pseudopilosa*	X		PL
Arctic avens	*Dryas integrifolia*	X	X	PL
Eight petaled dryas	*Dryas octopetala*		X	
Tundra grass	*Dupontia fisheri*	X		PL
Dwarf fireweed	*Epilobium latifolium*	X	X	
Cutleaf fleabane	*Erigeron compositus*		X	
Fleabane	*Erigeron humilis*		X	
Arctic fleabane	*Erigeron hyperboreus*		X	
Narrow-leafed cotton grass	*Eriophorum angustifolium*			PL
Arctic cotton grass	*Eriophorum scheuchzeri*	X	X	Lay
Sheated cotton grass	*Eriophorum vaginatum*			PL
Arctic forget-me-not	*Eritichum aretioides*	X	X	
Fescue grass	*Festuca* sp.		X	Lay
Alpine fescue	*Festuca brachyphylla*	X		PL
Glaucous gentian	*Gentiana glauca*		X	
Glacier avens	*Geum glaciale*		X	PL
Alpine eskimo potato	*Hedysarum hedysaroides*		X	
Alpine holy grass	*Hierochloe alpina*			PL
Glaucous weaselsnout (lagotis)	*Lagotis glauca*		X	
Bladder pod	*Lesquerella arctica*	X	X	
Alp lily	*Lloydia serotina*	X	X	
Alpine azalea	*Loiseleuria procumbens*		X	

Table H-93. Vascular Plant Species Observed or Potentially Occurring on or near the Point Lay and Point Lonely Sites

Common Name	Scientific Name	Point Lonely	Point Lay	Observed
Arctic lupine	*Lupinus arctica*	X	X	PL
Bladder campion	*Melandrium apetalum*	X	X	
Arctic sandwort	*Minuartia arctica*		X	
Alpine forget-me-not	*Myosotis alpestris*		X	
Mountain sorrel	*Oxyria digyna*			PL
Blackish oxytrope	*Oxytropis nigrescens*	X	X	
Lapland poppy	*Papaver lapponicum*	X	X	PL
Macoun's poppy	*Papaver macounii*	X		
Northern grass of Parnassus	*Parnassia palustris*	X	X	
Lousewort	*Pedicularis albolabiata*		X	
Capitate lousewort	*Pedicularis capitata*	X		
Wooly lousewort	*Pedicularis kanei*			PL
Oeder's lousewort	*Pedicularis oederi*		X	
Lousewort	*Pedicularis sudetica*	X	X	PL, Lay
Whorled leaf lousewort	*Pedicularis verticillata*	X	X	Lay
Snowgrass	*Phippsia algida*			PL
Siberian phlox	*Phlox sibirica*		X	
Alpine bluegrass	*Poa alpina*		X	
Arctic bluegrass	*Poa arctica*			PL
Blue grass	*Poa glauca*	X	X	Lay
Blue grass	*Poa* sp.	X	X	PL
Tall Jacob's ladder	*Polemonium acutiflorum*	X	X	
Bistort	*Polygonum bistorta*	X	X	
Alpine meadow bistort	*Polygonum viviparum*	X	X	
Two-flowered cinquefoil	*Potentilla biflora*		X	
Arctic cinquefoil	*Potentilla hyparctica*			PL
Marsh fivefinger	*Potentilla palustris*	X	X	
One-flowered cinquefoil	*Potentilla uniflora*	X	X	
Northern primrose	*Primula borealis*	X	X	PL
Large-flowered wintergreen	*Pyrola grandiflora*	X	X	PL
Alkali grass	*Puccinellia andersonii*			PL
Creeping alkali grass	*Puccinellia phryganodes*			PL
Buttercup	*Ranunculus pedatifidus*		X	
Snow buttercup	*Ranunculus nivalis*			PL
Pallas's buttercup	*Ranunculus pallasii*			PL
Buttercup	*Ranunculus* sp.	X		
Arctic dock	*Rumex arcticus*	X	X	
Dock	*Rumex graminifolius*		X	Lay
Narrow-leafed saussurea	*Saussurea angustifolia*		X	
Spotted saxifrage	*Saxifraga bronchialis*	X	X	
Tufted saxifrage	*Saxifraga caespitosa*			PL
Bulblet saxifrage	*Saxifraga cernua*	X	X	PL
Spiderplant	*Saxifraga flagellaris*	X	X	
Hawkweed-leafed saxifrage	*Saxifraga hieracifolia*	X	X	PL
Yellow marsh saxifrage	*Saxifraga hirculus*	X	X	PL
Cordate-leaved saxifage	*Saxifraga punctata*	X	X	PL
Brook saxifrage	*Saxifraga nelsoniana*		X	
Purple mountain saxifrage	*Saxifraga oppositifolia*	X	X	PL

Table H-93. Vascular Plant Species Observed or Potentially Occurring on or near the Point Lay and Point Lonely Sites

Common Name	Scientific Name	Point Lonely	Point Lay	Observed
Thyme-leaved saxifrage	*Saxifraga serpyllifolia*		X	
Marsh fleawort	*Senecio congestus*	X	X	
Black-tipped groundsel	*Senecio lugens*	X	X	
Seabeach scenecio	*Senecio pseudo-arnica*	X		
Moss campion	*Silene acaulis*		X	
Smelowskia	*Smelowskia calycina*		X	
Goldenrod	*Solidago multiradiata*	X	X	
Low chickweed	*Stellaria humifusa*			PL
Dandelion	*Taraxacum* sp.	X	X	PL
Capitate valerian	*Valeriana capitata*	X	X	

Sources: Hulten 1968; Viereck and Little, 1972; White, 1974; Pratt, 1991; Elias et al. 1996; 611 ASG 1995c, 1999c, 2001a.

Table H-94. Fish Species Potentially Occurring on or near the Point Lonely and Point Lay Sites

Common Name	Scientific Name	Point Lonely	Point Lay
Arctic char	*Salvelinus alpinus*	X	X
Arctic cisco	*Coregonus autumnalis*	X	X
Arctic flounder	*Liopsetta glacialis*	X	X
Arctic grayling	*Thymallus arcticus*	X	X
Bering cisco	*Coregonus laurettae*	X	X
Broad whitefish	*Coregonus nasus*	X	X
Burbot	*Lota lota*	X	X
Capelin	*Mallotus villosus*		X
Chum salmon	*Oncorhynchus keta*	X	X
Eelpout	*Lycodes* sp.		X
Fourhorn sculpin	*Myoxocephalus quadricornis*	X	X
Humpback whitefish	*Coregonus pidschian*	X	X
Least cisco	*Coregonus sardinella*	X	X
Northern pike	*Esox lucius*		X
Pacific herring	*Clupea pallasi*	X	X
Pink salmon	*Oncorhynchus gorbuscha*	X	X
Polar cod	*Boreogadus saida*	X	X
Rainbow smelt	*Osmerus mordax*	X	X
Round whitefish	*Prosopium cylindraceum*	X	X
Saffron cod	*Eleginus gracilis*		X
Sheefish	*Stenodus leucichtys*	X	
Starry flounder	*Platichthys stellatus*		X

Sources: Flock and Hubbard 1979; Morrow 1980; Craig 1984; Minerals Management Service 1987a; USFWS 1988; Robbins et al. 1991; USACE 1991; CH2M Hill 1994c, d; ICF Technology, Inc. 1996d; 611 ASG 1995b, 1999b, c, 2000a, b; Johnson and Blossom 2019a.

Table H-95. Mammal Species Potentially Occurring on or near the Point Lonely and Point Lay Sites

Common Name (ESA Status)‡	Scientific Name	Point Lonely	Point Lay
TERRESTRIAL			
Arctic fox	*Alopex lagopus*	X*	X*
Arctic ground squirrel	*Spermophilus parryii*	X*	X*
Arctic shrew	*Sorex arcticus*	X	X
Brown bear	*Ursus arctos*	X	X
Canadian lynx	*Lynx canadensis*	X	X
Caribou	*Rangifer tarandus*	X*	X*
Cinereus shrew	*Sorex cinereus*	X	
Ermine	*Mustela erminea*	X	X
Hoary marmot	*Marmota caligata*		X
Least weasel	*Mustela nivalis*	X	X
Moose	*Alces americanus*		X*
Muskox	*Ovibos moschatus*	X	X
Nearctic brown lemming	*Lemmus trimucronatus*	X†	X
Nearctic collared lemming	*Dicrostonyx groenlandicus*	X†	X
Palearctic collared lemming	*Dicrostonyx torquatus*	X	X
Red fox	*Vulpes vulpes*		X*
Root vole	*Microtus oeconomus*	X	X
Singing vole	*Microtus miurus*	X	X
Snowshoe hare	*Lepus americanus*	X	X
Tundra shrew	*Sorex tundrensis*	X	X
Wolf	*Canis lupus*	X	X
Wolverine	*Gulo gulo*	X	X
MARINE**			
Arctic ringed seal (T)	*Phoca hispida hispida*	X	X
Bearded seal (T)	*Erignathus barbatus*	X	X
Beluga	*Delphinapterus leucas*	X	X
Bowhead (E)	*Balaena mysticetus*	X*	X
Common minke whale	*Balaenoptera acutorostrata*	X	X
Gray whale	*Eschrichtius robustus*	X	X
Harbor porpoise	*Phocoena phocoena*	X	X
Killer whale	*Orcinus orca*	X	X
Narwhal	*Monodon monoceros*	X	
Pacific walrus	*Odobenus rosmarus divergens*	X	X
Polar bear (T)	*Ursus maritimus*	X*	X*
Ribbon seal	*Histriophoca fasciata*	X	X
Spotted seal	*Phoca largha*	X	X

Notes: ‡E = endangered, T = threatened; * = observed; † = tracks, den site, bones, or skull observed.
**All marine mammals are listed under the MMPA.

Sources: USFWS undated (b); Hart Crowser 1987; Minerals Management Service 1987b; Wynne 1993; Day et al. 1995; EMCON Alaska, Inc. 1996a; ICF Technology, Inc. 1996a; DOWL/Ogden Joint Venture 1998; 611 ASG 1995c, 1999b, c, 2000a, b, c; Frost et al., 2007.

Table H-96. Bird Species Observed or Potentially Occurring on or near the Point Lonely and Point Lay Sites

Common Name (ESA Status)†	Scientific Name	Point Lonely	Point Lay
Aleutian tern	*Onychoprion aleuticus*	X	
American golden-plover	*Pluvialis dominica*	X*	X*
American robin	*Turdus migratorius*	X	
Arctic tern	*Sterna paradisaea*	X*	X*
Baird's sandpiper	*Calidris bairdii*	X*	X*
Barn swallow	*Hirundo rustica*	X*	X*
Bar-tailed godwit	*Limosa lapponica*	X	X*
Black guillemot	*Cepphus grille*	X	
Black-bellied plover	*Pluvialis squatarola*	X	X*
Black-legged kittiwake	*Rissa tridactyla*		X
Brant	*Branta bernicla*	X*	X*
Buff-breasted sandpiper	*Calidris subruficollis*	X*	X
Canada goose	*Branta canadensis*	X*	
Common eider	*Somateria mollissima*	X	X*
Common raven	*Corvus corax*	X*	X*
Common redpoll	*Acanthis flammea*	X*	X*
Dark-eyed Junco	*Junco hyemalis*	X*	
Dunlin	*Calidris alpina*	X*	X*
Eastern kingbird	*Tyrannus tyrannus*		X*
Eastern yellow wagtail	*Motacilla flava*	X*	X*
Glaucous gull	*Larus hyperboreus*	X*	X*
Glaucous-winged Gull	*Larus glaucescens*		X*
Greater scaup	*Aythya marila*	X*	X*
Greater white-fronted goose	*Anser albifrons*	X*	X*
Green-winged teal	*Anas crecca*	X*	X*
Gyrfalcon	*Falco rusticolus*		X*
Hermit thrush	*Catharus guttatus*	X*	
Hoary redpoll	*Acanthis hornemanni*	X*	X*
Killdeer	*Charadrius vociferus*	X	
King eider	*Somateria spectabilis*	X*	X*
Kittlitz's murrelet	*Brachyramphus brevirostris*	X	X*
Lapland longspur	*Calcarius lapponicus*	X*	X*
Least sandpiper	*Calidris minutilla*		X
Long-billed dowitcher	*Limnodromus scolopaceus*	X*	X*
Long-tailed duck	*Clangula hyemalis*	X*	X*
Long-tailed jaeger	*Stercorarius longicaudus*	X*	X*
Mallard	*Anas platyrhynchos*		X*
Northern pintail	*Anas acuta*	X*	X*
Northern shoveler	*Spatula clypeata*		X*
Pacific loon	*Gavia pacifica*	X*	X*
Parasitic jaeger	*Stercorarius parasisticus*	X*	X*
Pectoral sandpiper	*Calidris melanotos*	X*	X*
Peregrine falcon	*Falco peregrinus*	X*	X
Pomarine jaeger	*Stercorarius pomarinus*	X*	X*
Red phalarope	*Phalaropus fulicarius*	X*	X*
Red-breasted merganser	*Mergus serrator*	X	X*
Red-legged kittiwake	*Rissa brevirostris*		X*
Red-necked phalarope	*Phalaropus lobatus*	X*	X*
Red-throated loon	*Gavia stellata*	X*	X*

Table H-96. Bird Species Observed or Potentially Occurring on or near the Point Lonely and Point Lay Sites

Common Name (ESA Status)†	Scientific Name	Point Lonely	Point Lay
Red-throated pipit	*Anthus cervinus*		X
Rough-legged hawk	*Buteo lagopus*	X*	X
Ruddy turnstone	*Arenaria interpres*	X	X
Sabine's gull	*Xema sabini*	X*	X*
Sanderling	*Calidris alba*		X
Sandhill crane	*Antigone canadensis*		X*
Savannah sparrow	*Passerculus sandwichensis*	X*	X*
Semipalmated plover	*Charadrius semipalmatus*	X*	X*
Semipalmated sandpiper	*Calidris pusilla*	X*	X*
Sharp-tailed sandpiper	*Calidris acuminata*	X	X
Snow bunting	*Plectrophenax nivalis*	X*	X*
Snow goose	*Anser caerulescens*	X*	X*
Snowy owl	*Bubo scandiacus*	X*	X*
Spectacled eider (E)	*Somateria fischeri*	X*	X*
Steller's eider (E)	*Polysticta stelleri*	X*	X*
Surf scoter	*Melanitta perspicillata*	X	X*
Tundra swan	*Cygnus columbianus*	X*	X*
Varied thrush	*Ixoreus naevius*	X*	
Western sandpiper	*Calidris mauri*	X	X*
White wagtail	*Motacilla alba*		X
White-crowned sparrow	*Zonotrichia leucophrys*	X	
White-rumped sandpiper	*Calidris fuscicollis*	X	X
White-winged scoter	*Melanitta deglandi*	X	
Willow ptarmigan	*Lagopus lagopus*	X	X*
Wilson's snipe	*Gallinago delicata*	X*	X*
Yellow-billed loon	*Gavia adamsii*	X*	X*
Yellow-rumped warbler	*Setophaga coronata*	X	

Note: †E = endangered; * = observed.

Sources: Pitelka 1974; King 1977; Murray 1978; Spindler 1978, 1979; Robbins et al. 1983; Garner and Reynolds 1987; Gusey 1988; Norton et al. 1993; Day et al. 1995; 611 ASG 1995c; Andres and Brann 1997; Armstrong 1998; Frost et al. 2007; Oasis Environmental, Inc. 2008.

H.21 POINT LONELY SRRS (INACTIVE)

H.21.1 Location and Area

The former 1,873-acre Point Lonely SRRS is located on the Beaufort Sea coast 1 mile west of Pitt Point and between Smith and Harrison bays (Figure H-130).The nearest communities are Nuiqsut, located 75 miles to the southeast, and Utqiagvik, located approximately 85 miles to the northwest. The Point Lonely site is on lands managed by the BLM.

H.21.2 Installation History

The Point Lonely site was activated in 1953 as an auxiliary DEW Line station and was closed in 1989. The DEW Line facilities included a 5,000-ft gravel airstrip, one 25-module train, a hangar, a warehouse, a garage, a fixed POL tank and four communications antennas. In 1993, the Point Lonely site was converted to an SRRS with a MAR, which operated until 2005. The MAR site included a radar structure, support building, fuel tanks, and a helicopter landing area. Clean Sweep activities were conducted at Point Lonely in 2006-2009 and remedial activities were completed in 2017 (611 CES 2008b; ADEC 2017). Final remedial activities and land exchange discussions with BLM are ongoing.

H.21.3 Military Mission

The former Point Lonely SRRS is now closed; see Section H.21.2, Installation History.

H.21.4 Surrounding Communities

The closest community is Nuiqsut, about 75 miles southeast. Refer to the discussion under the Oliktok LRRS (Section H.12.4).

H.21.5 Regional Land Use

The site is located within lands of the National Petroleum Reserve – Alaska that are managed by the BLM.

H.21.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the former Point Lonely site.

H.21.7 Physical Environment

H.21.7.1 Climate

There are no metereological stations in the vicinity of the Point Lonely site. The climate is expected to be similar to that at Oliktok LRRS 93 miles east-southeast (see Section H.12.7.1) or Point Barrow 83 miles west-northwest (see Section H.13.7.1).

H.21.7.2 Topography

The Point Lonely site is located in the northern portion of the Arctic Coastal Plain physiographic region on the coast of the Beaufort Sea. The site is west of Pitt Point, a broad point of land extending northward toward the Beaufort Sea with elevations ranging from about 6 to 24 ft MSL. The site is on a low, broad, east-west trending slope. A large salt-water lagoon is situated between the site and the Beaufort Sea with bluffs on the southern side of the lagoon up to 20 ft high. Swampy, ponded areas occur south and west of the site, and the Smith River is about 1.8 miles east of the site.

Figure H-130. Overview of the Former Point Lonely SRRS

H.21.7.3 Geology and Soils

The Arctic Coastal Plain is one of the principal areas that was not glaciated (Wahrhaftig 1965). Thus, periglacial features, such as polygonal ground, sorted circles, pingos, and ice wedges, can be observed. At the Point Lonely site tundra mat overlies organic-rich peaty horizons that contain silt, with the Barrow unit of the Gubik Formation underlying the organic mats. Incorporation of organics into lower soil layers is often facilitated by frost churning and/or burial through processes involved with the thaw lake cycle. Soils of the Point Lonely area are moderately frost susceptible due to the high percentage of fine-grained material (Selkregg 1975).

The Arctic Slope is underlain by thick continuous permafrost. The interval between permafrost and ground surface is the active zone due to freeze/thaw activity associated with seasonal weather changes. The thickness of the active zone at Point Lonely varies from 1 to 6 ft.

H.21.8 Hydrology

Surface drainage on the Point Lonely site occurs radially away from the site as sheetflow and ephemeral streams that drain into larger streams or directly into the sea. Point Lonely's terrain is swampy with low-centered polygons and several small ponds. A large (over 1 mile long and 0.4 mile wide) salt-water lagoon lies dominates the northeastern corner of the site adjacent to the Beaufort Sea. The Smith River is about 0.75 mile east of the site and flows north to the Beaufort Sea.

When Point Lonely was active, potable water was obtained from a lake about 0.7 mile south of the site. During the winter potable water was taken from a larger, deeper lake about 6 miles from the site (ICF Technology, Inc. 1996d).

The Point Lonely groundwater regime is controlled by an extensive permafrost layer underlying the entire region. Groundwater use is limited due to the ephemeral nature of the active zone, and because much of the groundwater is brackish. Suprapermafrost groundwater, groundwater occurring above the permafrost zone, occurs only in summer thaw months. With saturated conditions exist during portions of the summer thaw period, it is difficult to delineate between surface water and this groundwater.

H.21.9 Biotic Environment

INRMP Section 2.3 (Biotic Environment) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the former Point Lonely site. Attachment 10 contains lists of vascular plants (Table H-93), fish (Table H-94), mammals (Table H-95), and birds (Table H-96) known to occur or potentially occurring in the Point Lonely area. ESA- and MMPA-listed species that may occur at or in the vicinity of the Point Lonely site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.21.9.1 Ecoregion Classification

The former Point Lonely site is located in the Beaufort Coastal Plain ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.21.9.2 Vegetation/Habitat

The Point Lonely site is characterized by coastal tundra typical of the central Beaufort Sea area. Much of the site is covered with high-centered polygons with little topographic relief (< 0.5 m, sometimes referred to as "flat-topped polygons"). Vegetative cover in these areas typically is almost 100% and is dominated by vascular plants, such as *Carex aquatilis*, *Carex bigelowii*, *Salix planifolia*, and *Dryas integrifolia*, and various moss and lichen species. Shallow low-centered polygons (< 0.5 m relief), dominated by moist

tundra vegetation, are also present. Lake and pond complexes with moist strangmoor ridges, peninsulas, and islands are also present. Large drained lake basins, which are covered with wet, non-patterned tundra dominated by *Carex aquatilis* and *Eriophorum angustifolium* (Ritchie et al. 2003).

A small sandy/cobbly spit forms a large lake between the coast and the site. Some areas of flat tundra along the immediate coast are saline-influenced from storm surges and have patches of driftwood and bare peat and mud. These areas support a mixture of typical moist tundra plants and more halophytic species, such as *Stellaria humifusa* and *Cochlearia officinalis*. The Smith River is nearby and has extensive areas of arctic saltmarsh with islands that are dominated by *Carex subspathacea* and *Puccinellia phryganodes* (Ritchie et al. 2003).

A general vegetation map of the Point Lonely site was prepared in 1995 (611 ASG 1995c). Further improvements in vegetation mapping at Point Lonely occurred in 2002 when flora and fauna surveys were conducted and a wildlife habitat map was prepared (Ritchie et al. 2003). Schick et al. (2004) made significant improvements in vegetation mapping using 2000 digital aerial photos, conducting flora and fauna surveys, and preparation of a wildlife habitat map. In 2019, CEMML updated the vegetation classification or habitat classes based upon 2017 data from the Alaska Center for Conservation Science, University of Alaska, Anchorage (CEMML 2019a). A total of 5 habitat classes were identified (Table H-97 and Figure H-131). Table H-93 provides a list of the vascular plant species observed or potentially occurring on the Point Lonely site.

Table H-97. Habitat Classes at the Former Point Lonely SRRS (2017)

Habitat Class	Acres	Proportion
Marsh	1220.6	65.2%
Open Water	224.5	12.0%
Developed & Barren Land	168.4	9.0%
Tundra	166.3	8.9%
Shrub or Scrub	93.3	5.0%
Total	**1,873.0**	

Source: CEMML 2019a.

H.21.9.3 Wetlands

The current mapping of wetlands at the Point Lonely site is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

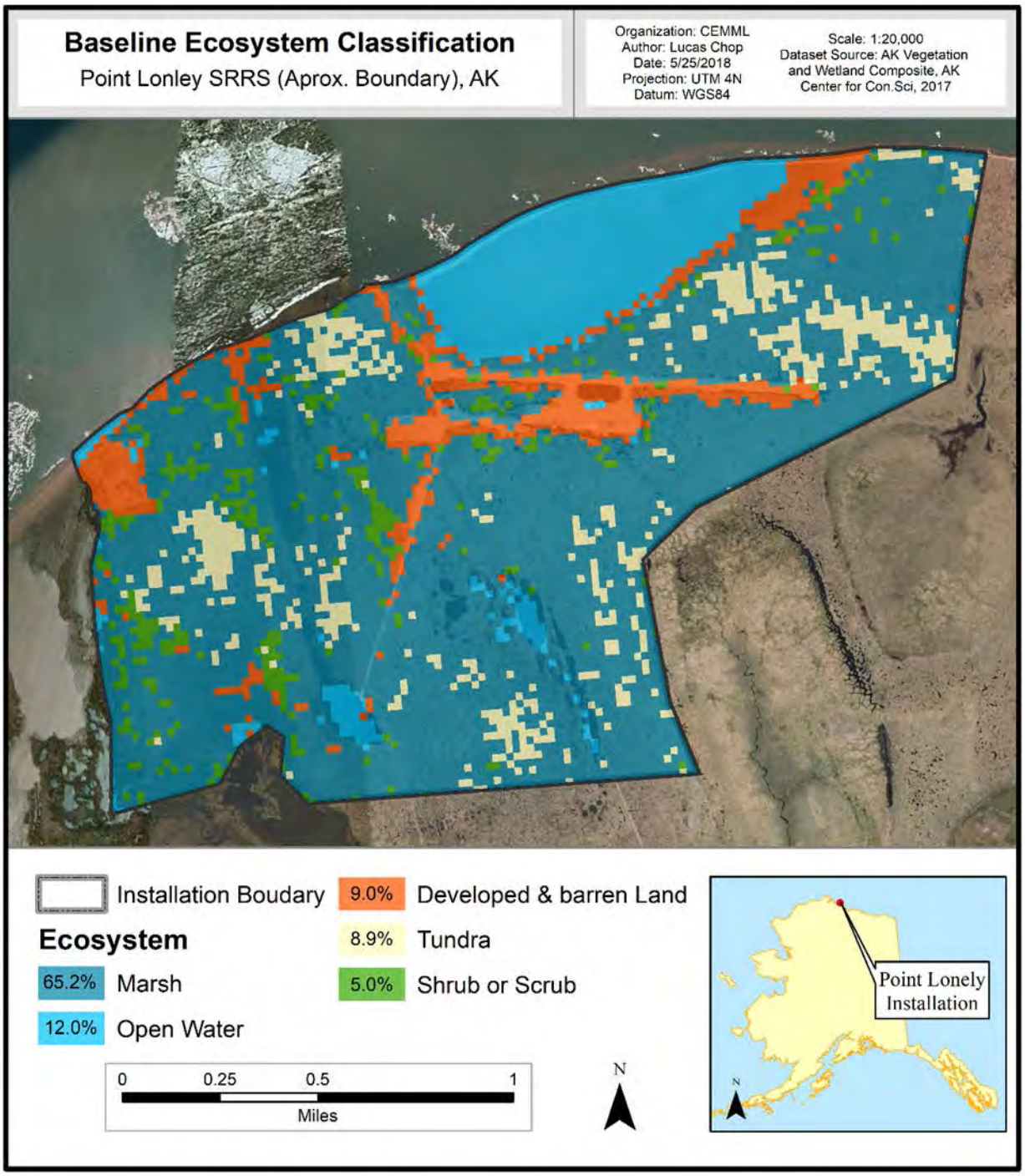

Figure H-131. Former Point Lonely SRRS Habitat Classes (2017)
(*Source*: CEMML 2019a)

Of the 1,873-acre Point Lonely site, 1,809 acres (or 97%) are considered wetlands per the NWI mapping (Table H-98 and Figure H-132). Freshwater emergent wetlands make up the majority of the wetlands and occur throughout the site.

Table H-98. Point Lonely LRRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Emergent	1,408.9	75.2%	1,311.3	70.0
Freshwater Forested/Shrub	0	0	8.3	0.4
Freshwater Pond	10.7	0.6%	16.9	0.9
Lake	0	0	265.0	14.1
Estuarine and Marine Deepwater	322.6	17.2%	15.8	0.8
Estuarine and Marine	66.4	3.5%	28.9	1.5
Riverine	0	0	114.9	6.1
Wetlands Total	**1,808.6**	**96.6%**	**1,761.1**	94.0
Upland	64.4		111.9	6.0
Site Total	**1,873.0**		**1,873.0**	

Notes: *See Figure H-132. †See Figure H-133.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

Wetlands of the Point Lonely site consist of moist tussock tundra (i.e., low-relief wet meadow) and extensive patches of wetlands (especially low-centered permafrost polygons with low-relief wet meadows) occurring within drained-lake basin complexes. The northern edge of the site borders a large, brackish lagoon (Ritchie et al. 2003).

H.21.9.4 Fish and Wildlife

H.21.9.4.1 Fish

Freshwater and anadromous fish likely use the interconnected lakes and ponds of the Smith River system for spawning, rearing, migration, and feeding. Anadromous fish found in the Smith River include Dolly Varden, whitefish, and least cisco (Johnson and Blossom 2019b). Species common to the Point Lonely area include Arctic cisco, Arctic char, Arctic grayling, ninespine stickleback, and Alaska blackfish (National Petroleum Reserve in Alaska Task Force 1978) (Table H-94).

H.21.9.4.2 Mammals

Terrestrial Mammals

Although only 5 terrestrial mammal species have observed on or in the vicinity of the Point Lonely site, an additional 14 species potentially occur on the site (Table H-95). The most common mammals within the area are brown and collared lemmings, least weasel, ermine, red fox, Arctic fox, and Arctic ground squirrel. Caribou and muskox are the most conspicuous terrestrial mammals occurring in and around the former Point Lonely site. The former SRRS and surrounding area have been identified as a summer calving area for the Teshekpuk caribou herd; the Western Arctic caribou herd may also occur within the area (ICF Technology, Inc. 1996b, c; ADNR 2014b; North Slope Borough 2019b).

Marine Mammals

Pacific walrus, polar bear, four species of seal, six species of whale, and one porpoise species occur in the region (Table H-95). Marine mammals are discussed in detail in Section H.21.9.5 (ESA- and MMPA-listed Species).

Figure H-132. Former Point Lonely SRRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

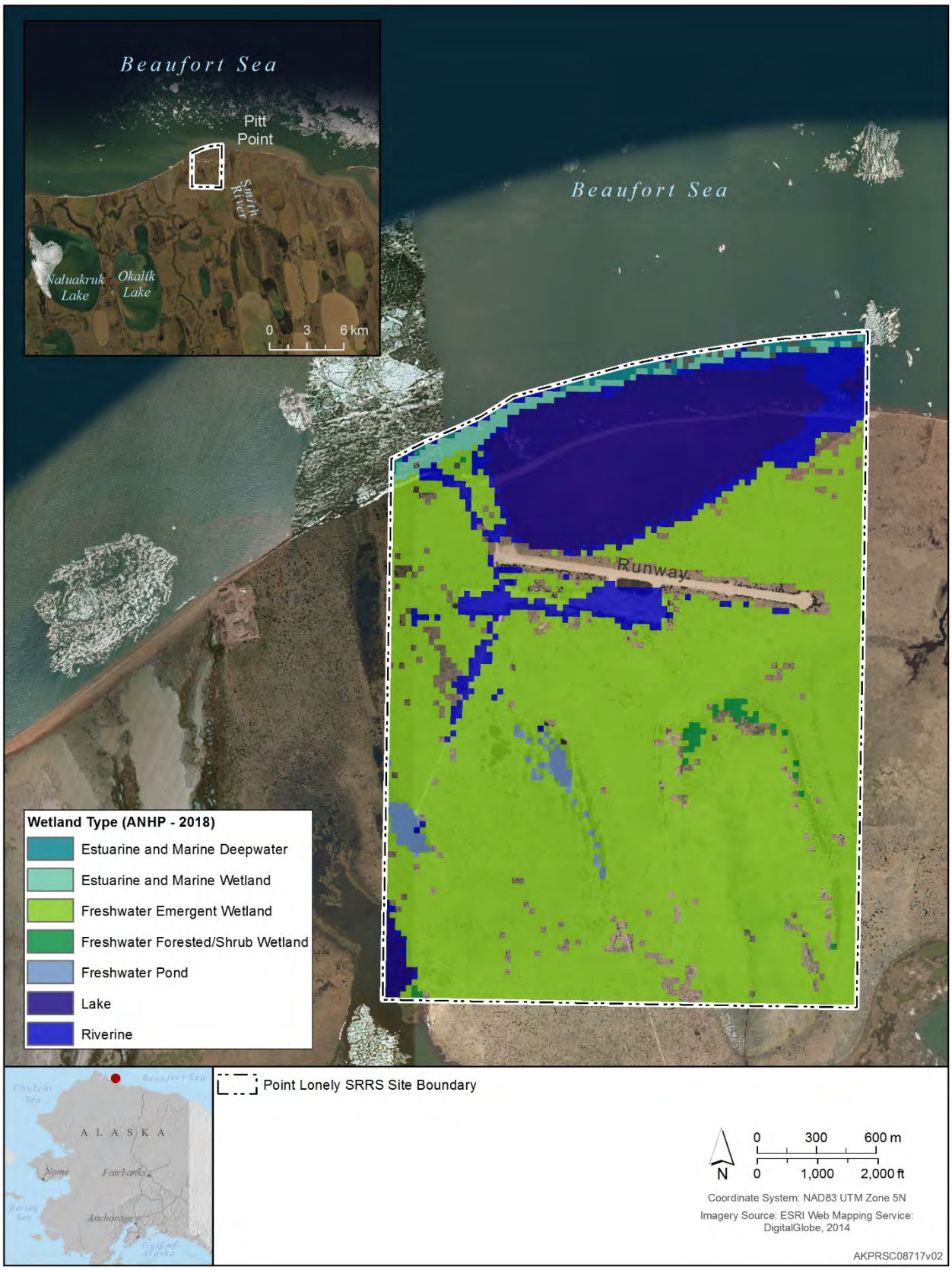

Figure H-133. Former Point Lonely SRRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.21.9.4.3 Birds

A total of 46 bird species have been recorded at the former Point Lonely SRRS, with an additional 17 species that may occur (Table H-96). The wet tundra environment within and adjacent to the site provides nesting and foraging habitat for a wide variety of bird species. The Teshekpuk Lake area, 15 miles southwest of the site, contains some of the best waterbird breeding, molting, and premigratory staging habitat in arctic Alaska (Derksen et al. 1981). Several million migratory birds of at least 150 species use the area during their migratory cycle. The primary breeding passerine is the Lapland longspur, which some are thought to overwinter in the area (ICF Technology, Inc. 1996b). Year-round residents include snow bunting, snowy owl, common raven, and willow ptarmigan (Hart Crowser 1987).

Greater white-fronted geese were the most common nesting species observed at the site in 2003. Several species of sandpipers and plovers, and red and red-necked phalaropes have been observed nesting on the site. Loons, northern pintail, scaups, and common eider are some of the more commonly occurring waterfowl species in the area. Sea ducks that frequent nearshore areas include long-tailed duck, scoters, and red-breasted merganser. Predatory species, such as snowy owl and jaegers, are common in the area, particularly when lemming and ground squirrel populations are high (Schick et al. 2004).

Important Bird Areas (IBAs)

The former Lonely Point SRRS is adjacent to the Barrow Canyon and Smith Bay IBA and Teshekpuk Lake Area IBA (Figure H-29). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The Barrow Canyon and Smith Bay IBA occupies 4,600 mi^2 of pelagic open water habitat in the Beaufort-Chukchi Coastal-Shelf ecoregion within the Beaufort Sea-continental coast and shelf. The Barrow Canyon and Smith Bay area is an IBA for large breeding populations of long-tailed duck, black-legged kittwake, king eider, Arctic tern, red phalarope, and glaucous gull (Audubon Alaska 2014; BirdLife International 2019).

The Teshekpuk Lake Area IBA covers 3,100 mi^2 of the Arctic Coastal Plain and encompassing much of the Teshekpuk Lake, the largest lake on the coastal plain. Much of this region is known to support high densities of nesting waterfowl and shorebirds. The large thaw lakes just to the northeast of Teshekpuk Lake, and southwest of the Point Lonely site, support the largest goose molting concentration in the Arctic including >50,000 molting snow, cackling, and greater white-fronted geese, and up to 30% of the Pacific Flyway brant population (Audubon Alaska 2014).

H.21.9.5 ESA- and MMPA-listed Species

Six ESA-listed species potentially occur on or in the vicinity of the former Point Lonely SRRS: threatened spectacled and Steller's eiders, threatened polar bear, threatened ringed and bearded seals, and endangered bowhead (Table H-95 and Table H-96 and INRMP Table 6). The polar bear, ringed and bearded seals, and bowhead are also listed under the MMPA. Six additional species are listed under the MMPA and occur on site or in the vicinity: Pacific walrus, killer whale, gray whale, beluga, harbor porpoise, and spotted seal.

Spectacled and Steller's Eiders. The former Point Lonely SRRS has been identified as one of five PRSC sites along the northern Arctic coast (Point Lay, Point Barrow, Bullen Point, and Oliktok are the others) with the greatest potential for nesting spectacled eiders and little potential for nesting Steller's eiders. In a 1994 study, a pair of spectacled eiders were observed and one spectacled eider nest was found at the Point Lonely site; at least two eggs hatched at this nest (Figure H-134). During brood-rearing surveys two female Steller's eiders were observed at the site (Day et al. 1995). During eider surveys in 2002, two spectacled eiders were observed at the Point Lonely site (Ritchie et al. 2003) (Figure H-134).

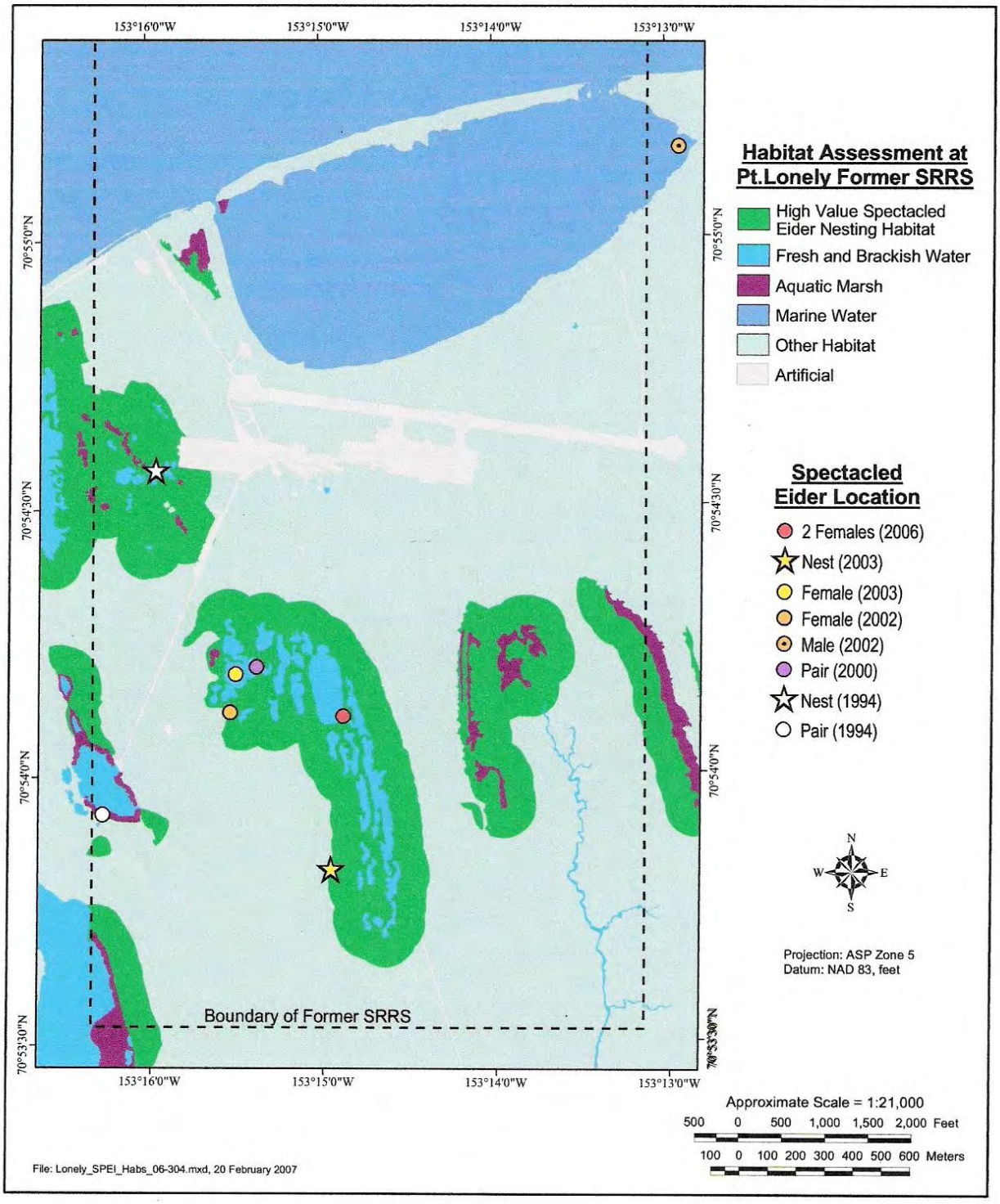

Figure H-134. 2003 Spectacled Eider Habitat Assessment at the Former Point Lonely SRRS
(*Source*: Schick et al. 2004)

In 2003, a spectacled eider habitat assessment was conducted at the former Point Lonely SRRS (Figure H-134). Spectacled eiders were recorded at two locations on the Point Lonely site during eider surveys in 2003: one female on a lake and one successful spectacled eider nest. Nest remains indicated that at least two eggs had successfully hatched (Schick et al. 2004). A 2007 monitoring effort did not locate any active nests or observe Spectacled or Steller's eiders at the Point Lonely site (Oasis Environmental, Inc. 2008).

Polar Bear. Polar bears often travel the shoreline of the Point Lonely area, especially in the fall when they travel east to west following the bowhead whale migration. Natives of the village Nuiqsut hunt whales in the fall and polar bears feed on the butchered whale carcasses along the coast (PRSC 2020). Although they are dormant, denning (female) polar bears may be present from November to March (PRSC 2020). During the winter, male polar bears forage on sea-ice or terrestrial areas within the vicinity of the LRRS (Wynne 1993; Smith et al. 2017). As females emerge from their dens with their young in the spring, they will forage on the pack ice and nearshore areas of Point Lonely (ADNR 2014b; Smith et al. 2017).

Although the former Point Lonely SRRS has been excluded from polar bear critical habitat designation (USFWS 2010), the surrounding terrestrial area is within denning critical habitat and the barrier islands west of the site near Pogik Bay are considered barrier island critical habitat that also includes a 1-mile no disturbance zone (Figure H-30 and Figure H-31). In addition, the adjacent marine waters are considered sea ice critical habitat (Figure H-32).

Ringed and Bearded Seals. Both ringed and bearded seals can be found along the coast of Point Lonely year-round (Smith et al. 2017). Ringed seals may den in the Point Lonely area during winter/spring (Smith et al. 2017) and the coastal waters are considered a major adult area in February-June (ADNR 2014b). In 2014, the marine waters adjacent to the Point Lonely site extending from the shoreline out to 200 NM were proposed as critical habitat for the Arctic ringed seal (NMFS 2014) (Figure H-33).

Bowhead. The offshore waters of Point Lonely are considered major adult areas for bowhead during June-September (ADNR 2014b). The offshore waters are also areas of concentrated bowhead use during spring and fall migration as well as during summer when calves accompany their mothers and feed along the nearshore waters of the Beaufort Sea (Smith et al. 2017).

Other MMPA-listed Species

Pacific Walrus. Although the summer range of walrus includes the southern Beaufort Sea and coastline, they are considered uncommon to rare in the Point Lonely area (Smith et al. 2017; PRSC 2020). There are no known historical walrus haulouts within the vicinity of the Point Lonely site (Fishbach et al. 2016).

Killer Whale, Beluga, Gray Whale, and Harbor Porpoise. The killer whale, beluga, and harbor porpoise are uncommon in the offshore waters of the former SRRS. Gray whales may occasionally occur in offshore waters in April-December (ADNR 2014b).

Spotted Seal. Spotted seals are common along the coast of Point Lonely during June-December (ADNR 2014b).

H.21.10 Other Natural Resources Information

H.21.10.1 Subsistence

The nearest communities are Nuiqsut, located 75 miles to the southeast, and Utqiagvik (previously known as Barrow), located approximately 85 miles to the northwest. Both communities are 1 of 10 Alaska Eskimo Whaling Commission communities. Hunting bowhead is a key activity in the organization of social relations in the community. Of all subsistence activities, bowhead whaling represents one of the greatest

concentrations of effort, time, money, group symbolism, and significance. The Barrow and Nuiqsut subsistence use areas include a large geographic area extending from Wainwright to Smith Bay. Native residents rely heavily on large land and marine mammals and fish. Bowhead, caribou, walrus, and whitefish account for about 85-88% of Barrow's and Nuiqsut's annual subsistence harvest in terms of edible pounds (Braund & Associates 2004).

H.21.10.2 Outdoor Recreation

Outdoor recreation at the Point Lonely site is very limited due primarily to the remote location. The only year-round access is by charter aircraft. Teshekpuk Lake, 15 miles southwest of Point Lonely, provides opportunities for sport fishing during limited times of the year.

H.22 ANVIL MOUNTAIN RRS (INACTIVE) AND NOME FIELD POL SITE (INACTIVE)

H.22.1 Location and Area

The former 30-acre Anvil Mountain RRS (consisting of two parcels) and the 7-acre Nome Field POL site are on the Seward Peninsula near Nome, which is 540 miles northwest of Anchorage. The former Anvil Mountain RRS is comprised of two separate parcels: a 12-acre site on Anvil Mountain that previously supported the radar operations (Figure H-135) (hereafter the upper Anvil Mountain site) and an 18-acre site 4.5 miles south of Anvil Mountain and 0.5 mile west of Nome that provided support to the RRS (hereafter the lower Anvil Mountain site) (Figure H-136 and Figure H-137).

Figure H-135. WACS Tropospheric Antennas at the Former Anvil Mountain RRS Site

The 7-acre Nome Field POL site is north and immediately adjacent to the lower Anvil Mountain site immediately west of Nome (Figure H-136 and Figure H-137).

Figure H-136. Ground-level View of Former Nome Field POL Site with Anvil Mountain RRS Support Site in the Foreground

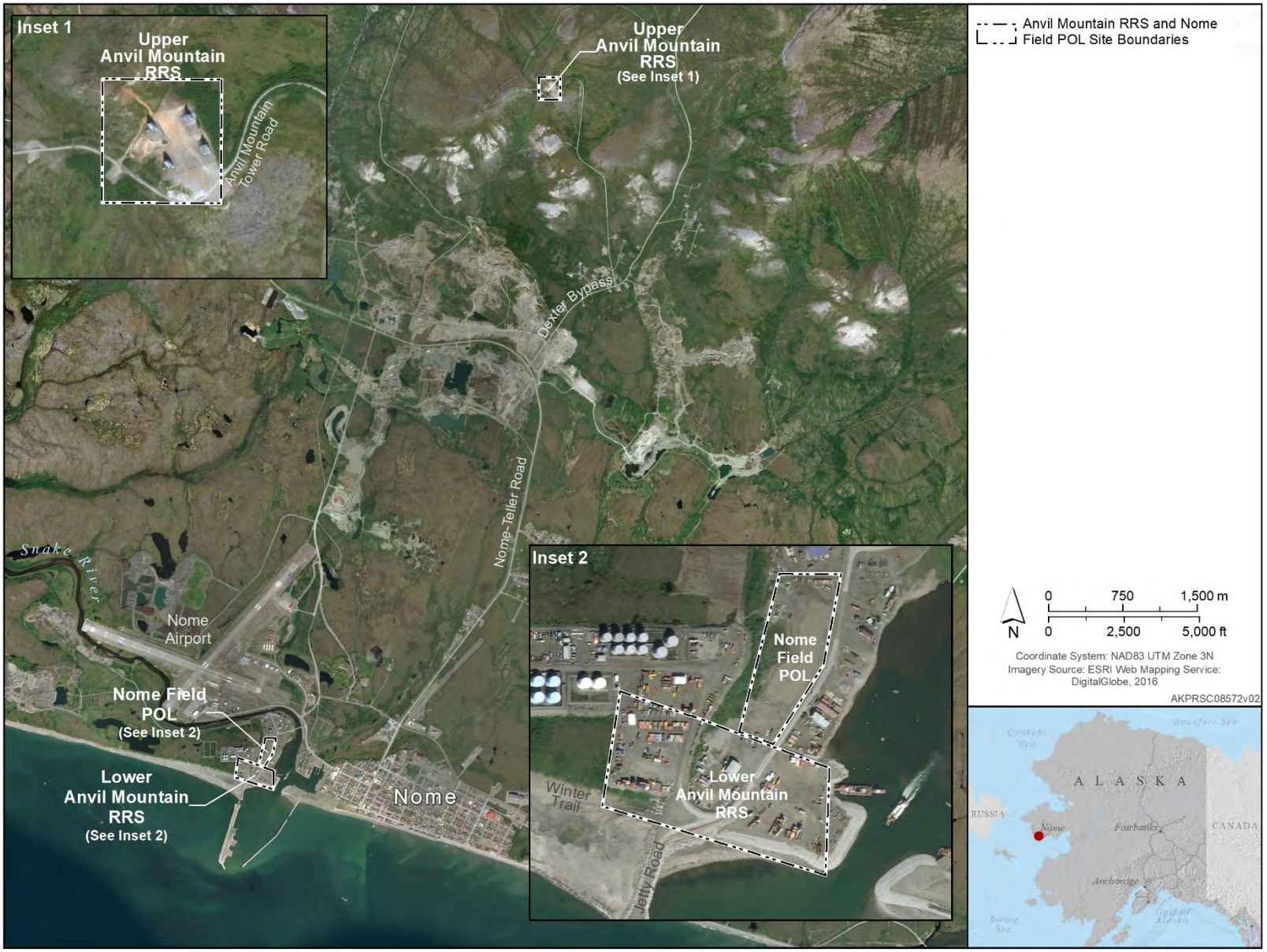

Figure H-137. Overview of the Former Anvil Mountain RRS and Nome Field POL Site

H.22.2 Installation History

Established in 1944, the Anvil Mountain site was one of six temporary radar sites of the Alaskan AC&WS or the "Lash-up" system that operated from 1949 to 1952. The Anvil Mountain site was developed in 1956 as a RRS to support the air defense system during the early 1950s. In 1957, a WACS was constructed on the site. The installation consisted of a composite building, a vehicle operations building (temporary garage), a vehicle maintenance building, four WACS antennas, two 70,000-gallon fuel storage tanks, several above-ground tanks for antenna heating systems, and associated fuel distribution piping. The WACS site was inactivated in 1980 when it was replaced with a commercial satellite earth terminal. The site was declared excess in 1981. Portions of the Anvil Mountain site were leased to various tenants from 1979 to 1993. In 1989, the fuel tanks and the vehicle maintenance building were transferred to the Nome Public School District. Demolition of remaining facilities, except the four WACS tropospheric antennas and the concrete slab where the temporary garage had been, occurred in 1999-2000. In 2010-2011, PCB contamination was remediated and all additional structures were demolished and removed.

The Nome Field POL site (also known as the West Nome Tank Farm) was established as a POL storage facility in 1944 to support the former Marks AFB, which was decommissioned in the 1950s. The Nome Field POL site was leased to various companies for commercial use from 1957 to 1991. The site was partially dismantled, primarily the tanks, and demolished in 1992. Some underground piping and the pumphouse were not removed. The POL pipeline over the Snake River was removed in 1994. Although the property was declared surplus in 1974, the Air Force still retains ownership.

H.22.3 Military Mission

The former Anvil Mountain RRS and Nome Field POL sites are now closed. See Section H.17.2, Installation History, for further details. The sites are visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is scheduled for 2020.

H.22.4 Surrounding Communities

Nome has an estimated 2018 population of 3,662, half of which is Alaska Native, primarily Inupiat. Nome is the supply, service, and transportation center of the Bering Strait region. Government services provide most employment. Retail services, transportation, mining, medical and other businesses provide year-round employment. Nome has facilities common to most contemporary communities, such as a library, museum, visitor's center, recreation center, two radio stations, a fire department, two meeting/conference facilities, a hospital, and about 200 businesses. Nome is the finish line for the 1,100-mile Iditarod Trail Sled Dog Race from Anchorage, held each March. (State of Alaska 2018, 2019).

H.22.5 Regional Land Use

The lands surrounding all three sites are Alaska Native Lands.

H.22.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the the Anvil Mountain site.

H.22.7 Physical Environment

H.22.7.1 Climate

The Nome area has a cold maritime climate characterized by high humidity, considerable cloudiness, frequent fog, and light rain or snow. Winter low temperatures average -3 °F with highs in the teens. Summer

highs are in the mid-50s with lows in the mid-50s °F (Table H-99). Average annual precipitation is 16 inches, with 63 inches of snowfall.

Table H-99. Monthly Climatic Averages for Nome, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	13.2	13.7	17.1	26.7	42.6	53.4	57.3	55.8	48.7	34.3	22.9	14.4
Avg. Low (ºF)	-2.4	-2.6	-0.2	11.7	29.8	39.7	45.3	44.2	36.6	22.7	10.3	-0.5
Avg. Precipitation (inches)	0.9	0.7	0.6	0.7	0.7	1.1	2.2	3.2	2.4	1.5	1.1	0.9
Avg. Snowfall (inches)	10.3	9.3	7.6	6.8	2.0	0.2	0	0	0.4	4.6	10.9	10.8

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.22.7.2 Topography

Topography in the vicinity of Nome is relatively flat, becoming steeper to the north. The upper Anvil Mountain site is on a topographic high point at an elevation of about 1,100 ft MSL. Anvil Mountain is part of a series of hills and ridges oriented predominantly north-south and located north of the south coastal plain of the Seward Peninsula. Anvil Mountain's WACS antennas are the prominent feature of the area's skyline.

The primary topographical features of the Nome area are beaches, coastal plains, high hills, and water courses. The Nome site lies at the base of a bluff along the Snake River in the coastal plain area, which extends from Cape Nome to the hills west of the Cripple River. Land surrounding the facility is typically less than 100 ft MSL. The property consists of level ground dissected by several earth dikes.

H.22.7.3 Geology and Soils

The Anvil Mountain area was subject to alpine glaciation during the Pleistocene Epoch. Paleozoic to Tertiary metamorphic and igneous rocks are folded into broad anticlines and synclines. Most rocks of the Seward Peninsula are of sedimentary origin and are highly metamorphosed, consisting primarily of limestone overlain by schistose rocks. The area is generally characterized by soils of the Histic Pergelic Cryaquepts-Pergelic Cryorthents association. These soils consist of silt loam to very gravelly silt loam covered by a thin layer of organic soil. The site is underlain by a thin layer of silty topsoil covering schist rock, limestone, or broken and loose metamorphic mica-quartz. Slopes at the site vary from flat to 25% with some rock outcrops occurring (Reiger et al. 1979).

The coastal lowlands geology of the Nome area consists of unconsolidated Quaternary deposits of glacial, glaciofluvial, and alluvial deposits over metamorphosed quartz and calcareous schists. The Nome area geology is dominated by structural faulting, thrusting, and thermal intrusions, which have contributed to thermal and dynamic metamorphic structures in the area. These processes have produced rich deposits of placer gold on the Seward Peninsula and in the immediate vicinity of the Nome site (Hart Crowser, Inc. 1997c).

Soils in the vicinity of the lower Anvil Mountain site and the POL site are poorly drained silts overlain with thick mats of organic material. The region is underlain by continuous permafrost at shallow depths. Soils are perennially frozen near the base of the organic mat. The area has many thaw lakes and drained thaw lake scars. Peat ridges, frost mounds, and frost boils are common. A common surface soil type of the Nome area and in the vicinity of the Nome POL site is coarse rubble along small streams and old beach lines from extensive mining in the area (Hart Crowser, Inc. 1997c).

H.22.8 Hydrology

Anvil Mountain site does not exhibit well defined drainage patterns; however, potential drainages from Anvil Mountain lead to tributary systems of two rivers, the Snake River and Nome River. Major named drainages of Anvil Mountain are Little Specimen Gulch and Cooper Gulch, which lead to the Snake River drainage, and Grass Gulch and Wet Gulch, which lead to the Nome River drainage. Anvil Creek is about 1½ miles west, and Bear Creek is about ¾ of a mile east of the Anvil Mountain site. Anvil and Bear creeks are tributaries of the Snake River. Dexter Creek is about 1 mile northeast of the summit of Anvil Mountain and discharges into the Nome River.

Moderately thick (90-120 ft deep) to relatively thin permafrost occurs in the area (Hart Crowser, Inc. 1997a), and the site is underlain with a 3-5 foot thick layer of permafrost. There is no evidence of a groundwater table at the site (USACE 1997). The primary drinking water supply for the city of Nome and Perkinsville is Moonlight Springs, an artesian spring about 1½ miles southwest of the summit of Anvil Mountain.

The primary surface water feature near the Nome sites is the Snake River, which discharges into Norton Sound near the sites. The Nome River is the second major surface water feature occurring in the vicinity of the site, and it discharges into Norton Sound about 4 miles east of Nome. Surface water in the area generally contains low amounts of dissolved solids, probably due to relatively low rates of annual stream runoff, low relief in the area, and the lack of glaciers. The site's several earthen dikes designed for spill abatement have created three small, shallow depressions, which hold ponded water during periods of high precipitation. These ponds are the only surface water features on the site (Hart Crowser, Inc. 1997c).

Groundwater in the area is available in small amounts in permafrost thaw-bulbs beneath channels of larger streams. Regional permafrost is generally prohibitive of productive groundwater sources (Hart Crowser, Inc. 1997c).

H.22.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Anvil Mountain sites and the Nome Field POL site. Attachment 11 contains lists of vascular plants (Table H-101) and birds (Table H-104) known to occur or potentially occurring on or in the vicinity of the sites. ESA-listed species that may occur at or in the vicinity of the three sites are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.22.9.1 Ecoregion Classification

The upper and lower Anvil Mountain sites and the Nome Field POL site are located in the Seward Peninsula ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.22.9.2 Vegetation/Habitat

A general vegetation map of the upper Anvil Mountain site has not been prepared. Vegetation within and around the upper Anvil Mountain site is characterized as moist sedge/willow tundra. Moist tundra usually completely covers the ground and can be productive during the growing season. The tundra varies from an almost continuous and uniformly developed cotton grass tussock growth to stands devoid of tussocks where dwarf shrubs dominate. The soil is commonly saturated, and mosses and lichens grow in channels between tussocks. High brush often occurs as a type that may be interspersed with reindeer lichens, low heath-type shrubs, or patches of tundra. Alders tend to occupy wetter sites; birch prefer more mesic areas; and tundra patches occur within the driest, most wind-exposed locations (Selkregg 1984). The site is dominated by

arctic/alpine species such as *Carex microchaeta, Empetrum nigrum, Dryas octopetala*, *Salix reticulata*, and *S. planifolia* p*ulchra*. Gravel pads and roadsides are naturally revegetating to shrubby willows, dominated by *S. alexensis* and *S. planifolia pulchra* (611 ASG 2001c).

A general vegetation map of the lower Anvil Mountain site and Nome Field POL site has not been prepared. Both sites were previously developed and disturbed with storage tanks, buildings, gravel roads, and infrastructure dominating the sites. Much of the previously cleared areas of the lower Anvil Mountain site and Nome Field POL site have revegetated to a cover of shrubby willows, dominated by *Salix alexensis*, *S. planifolia pulchra*, and *S. glauca*. More open areas, such as the footprint of buildings or fuel tank bases, have revegetated with an herbaceous cover of grasses, such as *Poa* sp., *Festuca* sp., and *Trisetum spicatum*. Small segments of the bluff and hillslope on the site were never cleared and retain natural tundra and riparian vegetation. The three shallow ponded depressions harbor patches of open mud and shallow water and are partially vegetated with wetland species, such as *Eriophorum angustifolium*, *Juncus arcticus*, *Equisetum arvense*, and several species of *Carex* (611 ASG 2001c).

H.22.9.3 Wetlands

The current mapping of wetlands at the Anvil Mountain and Nome Field POL sites is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

The upper Anvil Mountain site does not contain any wetlands. For the purposes of this discussion, the lower Anvil Mountain site and Nome Field POL site will be combined (Nome sites) as they are immediately adjacent. Of the approximate 37-acre Nome sites, 2 acres (or 6%) are considered estuarine and marine wetlands and freshwater emergent wetlands per the NWI mapping (Table H-100 and Figure H-138).

Table H-100. Former Anvil Mountain and Nome Field POL Sites Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Estuarine and Marine	1.4	3.8%	0	0
Freshwater Emergent	0.8	2.1%	0	0
Freshwater Forested/Shrub	0	0	9.7	26.1%
Wetlands Total	**2.2**	**5.9%**	**9.7**	**26.1%**
Upland	34.9	94.1%	27.4	73.9%
Site Total	**37.1**		**37.1**	

Notes: *See Figure H-138. †See Figure H-139.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

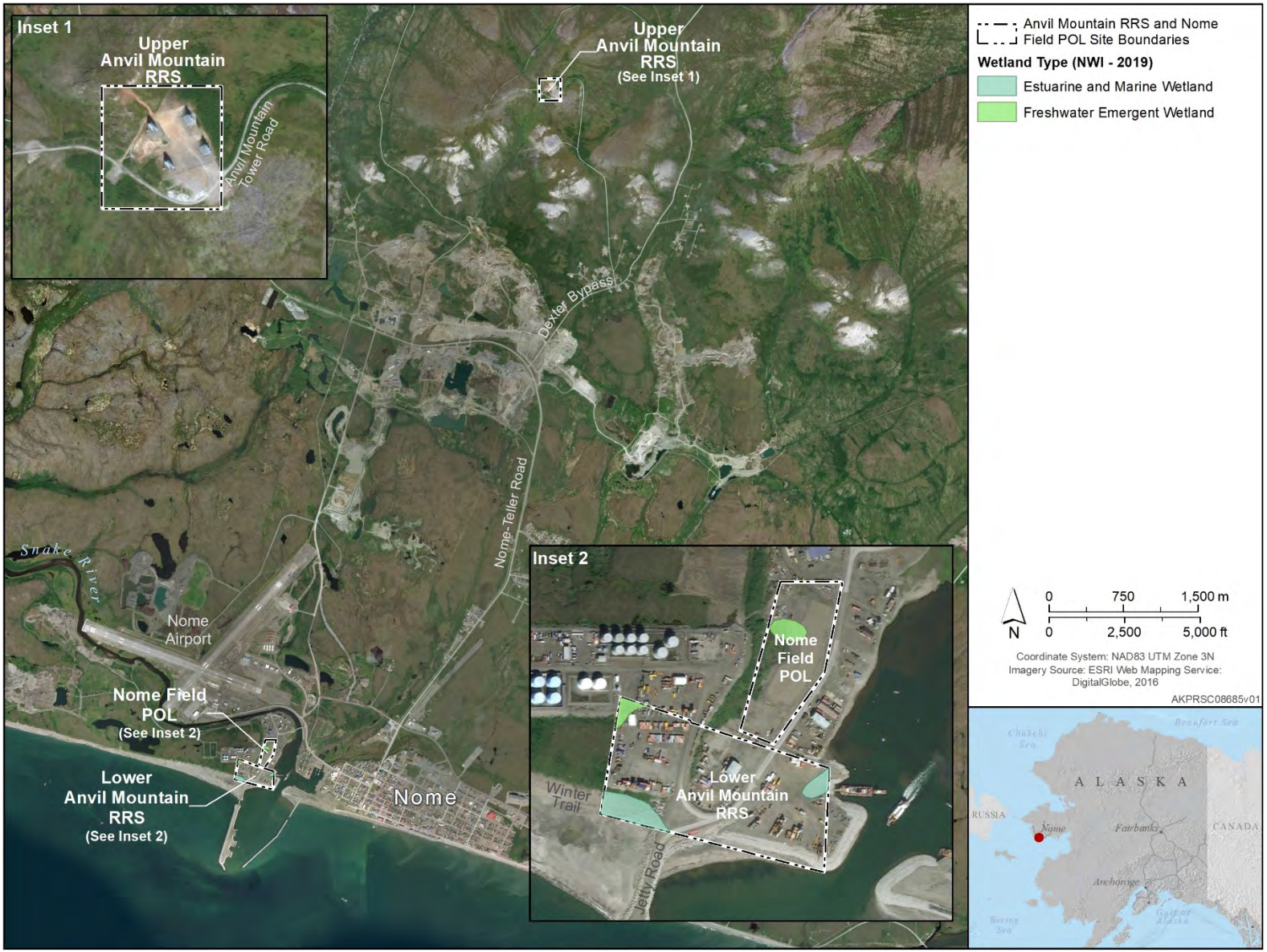

Figure H-138. Former Anvil Mountain and Nome Field POL Sites Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

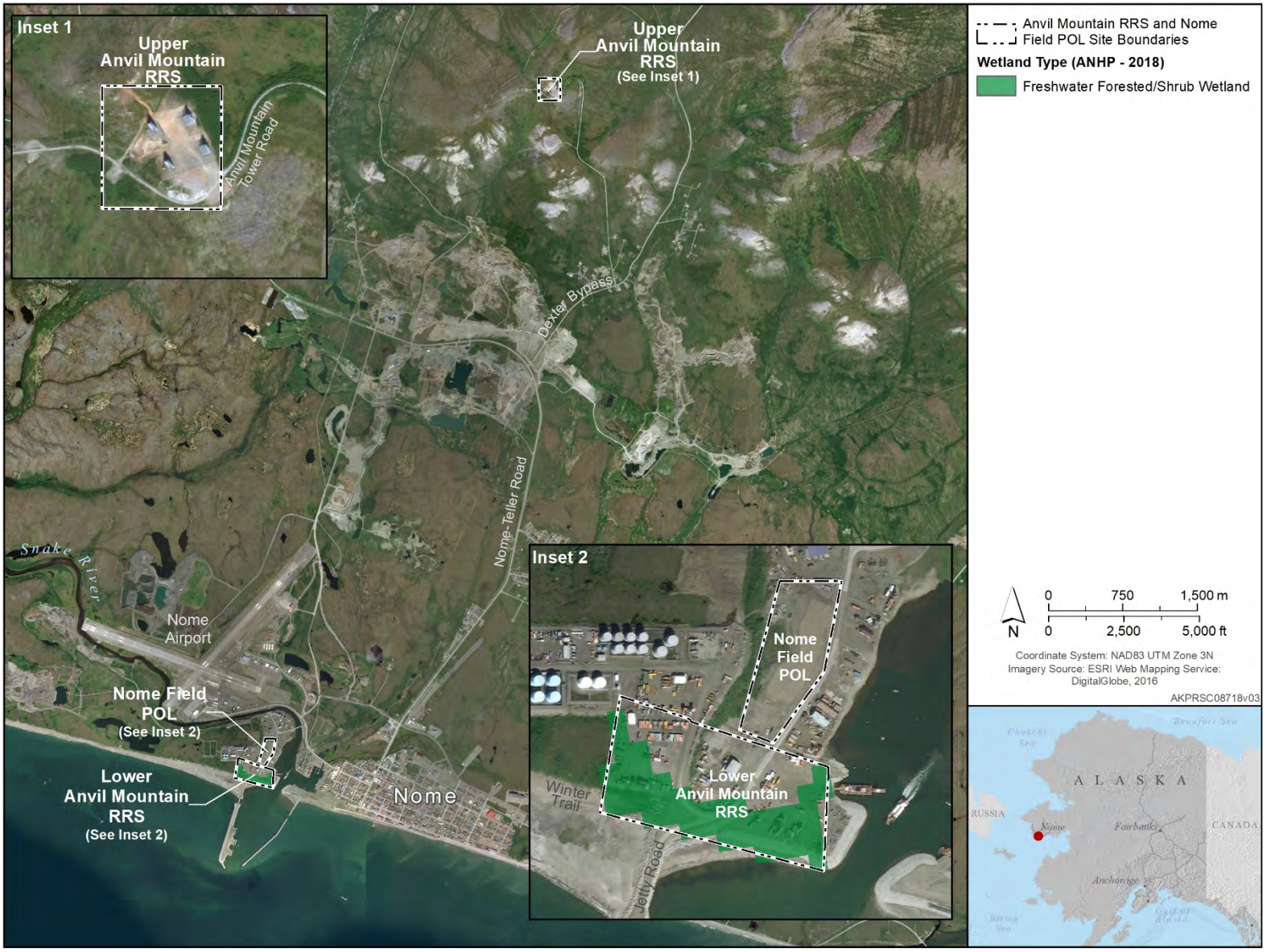

Figure H-139. Former Anvil Mountain and Nome Field POL Sites Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.22.9.4 Fish and Wildlife

H.22.9.4.1 Fish

A variety of fish inhabit the Snake River and coastal waters near the lower Anvil Mountain site including all five species of Pacific salmon (chinook, sockeye, coho, chum, and pink), Pacific cod, Arctic char, and halibut, Arctic grayling, rainbow trout, Dolly Varden, whitefish, and northern pike (CH2M Hill 1994a; Johnson and Blossom 2019b).

H.22.9.4.2 Mammals

A total of 22 terrestrial mammals potentially occurin or around the Anvil Mountain site (Table H-103). A commercial reindeer herd is managed in the Anvil Mountain area, and their range surrounds the site.

H.22.9.4.3 Birds

The moist tundra and brush environment within and adjacent to the upper Anvil Mountain site provides nesting and foraging habitat for a wide variety of bird species including American pipit, fox sparrow, golden-crowned sparrow, savannah sparrow, and Lapland longspur (Table H-104). Breeding birds on the lower Anvil Mountain and Nome Field POL sites include common redpoll, yellow warbler, semipalmated plover, and white-crowned, savannah, and fox sparrows.

H.22.9.5 ESA-listed Species

No ESA-listed species have been reported within the boundaries of the lower and upper Anvil Mountain sites or Nome Field POL site.

Steller's and Spectacled Eiders. Both species may occur in the offshore waters of Norton Sound during spring and fall migration.

Polar Bear. The lower Anvil Mountain site and the Nome Field POL site are located on the coast and Nome is within the range of the polar bear. Therefore, there is the potential, although considered very low, for polar bears to occur in the vicinity of these sites. In addition, the offshore waters of Norton Sound have been designated polar bear sea ice critical habitat (see INRMP Figures 18, 19, and 20).

H.22.10 Other Natural Resources Information

H.22.10.1 Subsistence

Approximately 95% of residents of Nome in 1995 used at least one subsistence resource, and 65% used at least six different wild resources. Harvest estimates are exclusively for birds and eggs. A large portion of the bird and egg harvest consisted of migratory birds, upland birds, and seabird and loon eggs. Fish harvest includes salmon, Dolly Varden, grayling, and whitefish. Nome residents harvest such marine mammals as bearded, ringed, and spotted seals. In general, Nome residents use an area that consists of Norton Sound, west to Bering Strait, and all watersheds draining the southern portion of the Seward Peninsula between Golovin Bay and Port Clarence (Braund and Associates 2004).

H.22.10.2 Outdoor Recreation

Outdoor recreation opportunities available at the Anvil Mountain site include small and big game hunting and nonconsumptive activities, such as ATV riding along gravel roads and bird watching. The limited hunting that occurs in the area primarily consists of subsistence harvest of animals and the collection of vegetation for greens and berries by local residents. Outdoor recreation opportunities available at the Nome sites are limited due to the small acreage and the industrial nature of the area surrounding the site.

ATTACHMENT 11: NATURAL RESOURCES OF THE ANVIL MOUNTAIN, GRANITE MOUNTAIN, NOME FIELD POL, AND NORTH RIVER SITES

Table H-101. Vascular Plant Species Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
SHRUBS						
American green alder	*Alnus crispa*	X	X	X	X	GM, NR
Sitka alder	*Alnus sinuata*	X	X			
Thinleaf alder	*Alnus tennuifolia*			X	X	
Bog-rosemary	*Andromeda polifolia*	X	X	X	X	GM
Alpine bearberry	*Arctostaphylos alpina*	X	X	X	X	
Red-fruit bearberry	*Arctostaphylos rubra*	X	X	X	X	GM, NR
Kinikinik	*Arctostaphylos uva-ursi*			X	X	
Alaska sagebrush	*Artemisia alaskana*			X	X	
Dwarf Arctic birch	*Betula nana*	X	X	X	X	AM, GM, NR
Paper birch	*Betula papyrifera*				X	NR
Four-angled cassiope	*Cassiope tetragona*	X	X	X	X	AM, GM
Leatherleaf	*Chamaecyparis calyculata*	X	X	X	X	
Bunchberry	*Cornus canadensis*	X	X	X	X	NR
Red-osier dogwood	*Cornus stolonifera*			X	X	
Diapensia	*Diapensia lapponica*	X	X	X	X	AM, GM
Entire-leaf mountain avens	*Dryas integrifolia*	X	X			
White mountain avens	*Dryas octopetala*	X	X	X		NM, AM, GM
Crowberry	*Empetrum nigrum*	X	X	X	X	NM, AM, GM
Common juniper	*Juniperus communis*			X	X	
Tamarack	*Larix laricina*			X	X	
Narrowleaf Labrador tea	*Ledum palustre decumbens*	X	X	X	X	AM, GM, NR
Labrador tea	*Ledum palustris groenlandicum*			X	X	
Twin-flower	*Linnaea borealis*	X	X	X	X	
Alpine-azalea	*Loiseleuria procumbens*	X	X	X	X	AM, GM, NR
Sweet gale	*Myrica gale*			X	X	
White spruce	*Picea glauca*	X	X	X	X	NR
Black spruce	*Picea mariana*			X	X	NR
Balsam poplar	*Populus balsamifera*	X		X	X	NM, GM, NR
Quaking aspen	*Populus tremuloides*			X	X	NR
Shrubby cinquefoil	*Potentilla fruiticosa*	X	X	X	X	
Kamchatka rhododendron	*Rhododendron camtshaticum*		X			AM
Lapland rosebay	*Rhodedendron lapponicum*	X	X			
Currant	*Ribes* sp.	X	X	X	X	
American red currant	*Ribes triste*	X	X	X	X	NR
Prickly rose	*Rosa acicularis*	X	X	X	X	
Nagoonberry	*Rubus arcticus*	X	X	X	X	NM, GM, NR
Cloudberry	*Rubus chamaemorus*	X	X	X	X	GM, NR
American red raspberry	*Rubus idaeus* var. *strigosus*			X	X	
Feltleaf willow	*Salix alaxensis*	X	X	X	X	All
Littletree willow	*Salix arbusculoides*	X	X	X	X	NR
Arctic willow	*Salix arctica*	X	X		X	NR
Barren-ground willow	*Salix brachycarpa*	X	X			
Chamisso willow	*Salix chamissonis*	X	X	X		AM, GM
Alaska bog willow	*Salix fuscescens*	X	X	X		NM, GM
Grayleaf willow	*Salix glauca*	X	X	X	X	NM, AM, NR

Table H-101. Vascular Plant Species Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Halberd willow	*Salix hastata*	X	X	X	X	
Sandbar willow	*Salix interior*			X	X	
Richardson willow	*Salix lanata richardsonii*	X	X	X	X	
Oval-leafed willow	*Salix ovalifolia*	X	X			NM
Skeleton leaf willow	*Salix phlebophylla*	X	X	X	X	GM, NR
Diamond-leaf willow	*Salix planifolia pulchra*	X	X	X	X	All
Polar willow	*Salix polaris*			X		GM
Netleaf willow	*Salix reticulata*	X	X	X		NM, AM, GM
Least willow	*Salix rotundifolia*	X	X	X		AM, GM
Green Mountain ash	*Sorbus scopulina*			X	X	
Beauverd spirea	*Spiraea beauverdiana*	X	X	X	X	GM, NR
Trisetum	*Trisetum spicatum*	X		X	X	NM, GM, NR
Bog blueberry	*Vaccinium uliginosum*	X	X	X	X	All
Low-bush cranberry	*Vaccinium vitis-idaea*	X	X	X	X	All
Highland cranberry	*Viburnum edule*			X	X	
HERBACEOUS						
Baneberry	*Acatea rubra*			X	X	
Common yarrow	*Achillea millefoilum*	X				NM
Siberian yarrow	*Achillea sibirica*			X	X	
Monkshood	*Aconitium delphinifolium*	X	X	X	X	GM
Musk root	*Adoxa moschatellina*			X	X	GM
Wild chives	*Allium schoenoprasum*	X	X	X	X	
Round leaf orchid	*Amerorchis rotundifolia*	X	X	X	X	
Bog rosemary	*Andromeda polifolia*			X	X	
Rock jasmine	*Androsace chamaejasme*	X	X			AM
Northern jasmine	*Androsace septentrionalis*	X	X			
Drummond's anemone	*Anemone drummondii*	X	X	X	X	
Narcissus-flower anemone	*Anemone narcissiflora*	X	X	X	X	AM, GM, NR
Northern anemone	*Anemone parviflora*	X	X	X	X	AM
Yellow anemone	*Anemone richardsonii*	X	X	X	X	GM
Anemone	*Anemone* sp.			X	X	
Wild celery	*Angelica lucida*	X	X	X	X	AM
Pussytoes	*Antennaria friesiana*	X	X	X	X	
Cats paws	*Antennaria monocephala*		X	X		AM, GM
Lyre-leaf rockcress	*Arabis lyrata*				X	NR
Pendent grass	*Arctophila fulva*	X	X	X	X	
Bearberry	*Arctostaphylos rubra*		X			AM
Frigid arnica	*Arnica frigida*	X	X	X	X	
Lessing's arnica	*Arnica lessingii*	X	X	X	X	AM, GM, NR
Arctic wormwood	*Artemisia arctica*	X	X	X	X	AM, GM, NR
Northern wormwood	*Artemisia borealis*	X	X	X	X	
Yellow ball wormwood	*Artemisia senjavinensis*	X	X			
Common wormwood	*Artemisia tilesii*	X	X	X	X	NM, AM, NR
Pussytoes	*Artennaria friesiana*			X		GM
Siberian aster	*Aster sibiricus*	X	X	X	X	NR
Alpine milkvetch	*Astragalus alpinus*	X	X	X	X	NR
Milkvetch	*Astragalus eucosmus*				X	NR
Hairy Arctic milkvetch	*Astragalus umbellatus*	X	X			
Wintercress	*Barbarea orthoceras*	X	X		X	NR
Beckmannia	*Beckmannia erucaeformis*	X	X	X	X	

Table H-101. Vascular Plant Species Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Broomrape	*Boschniakia rossica*	X	X	X	X	
Moonwort	*Botrychium lunaria*	X	X	X	X	
Alaska boykinia	*Boykinia richardsonii*		X	X	X	AM
Bluejoint grass	*Calamagrostis canadensis*	X	X	X	X	NM, GM, NR
Reed bent grass	*Calamagrostis* sp.	X	X	X	X	
Wild calla lily	*Calla palustris*			X	X	
Marsh marigold	*Caltha palustris*	X	X	X	X	NR
Bluebell	*Campanula lasiocarpa*	X	X	X	X	
Bittercress	*Cardamine bellidifolia*			X		GM
Bittercress	*Cardamine digitata*	X	X	X	X	
Cuckoo flower	*Cardamine pratensis*	X	X	X	X	GM, NR
Sedge	*Carex aquatilis*	X	X	X	X	GM, NR
Sedge	*Carex atherodes*			X	X	
Sedge	*Carex bigelowii*	X	X	X	X	GM, NR
Sedge	*Carex lyngbyaei*	X	X			
Sedge	*Carex nespophila*		X	X	X	AM, GM, NR
Sedge	*Carex* sp.	X	X	X	X	NM, AM
Elegant paintbrush	*Castilleja elegans*	X	X			
Paintbrush	*Castilleja hyperborea*			X		GM
Paintbrush	*Castilleja* sp.	X	X	X	X	
Chickweed	*Cerastium beeringianum*	X	X	X	X	NR
Strawberry blight	*Chenopodium capitatum*			X	X	
Arctic daisy	*Chrysanthemum arcticum*	X	X			
Entire-leaved chrysanthemum	*Chrysanthemum integrifolium*	X	X			
Mackenzie water hemlock	*Cicuta mackenzienana*			X	X	
Alaska spring beauty	*Claytonia sarmentosa*	X	X	X	X	
Spring beauty	*Claytonia tuberosa*			X		GM
Coral root	*Corallorrhiza trifida*	X	X	X	X	
Northern lady's slipper	*Cypripedium passerinum*	X	X	X	X	
Arctic larkspur	*Delphinium glaucum*			X	X	
Deschampsia	*Deschampsia brevifolia*			X	X	
Frigid shooting star	*Dodecatheon frigidum*	X	X	X	X	AM
Douglasia	*Douglasia gormanii*			X	X	
Mustard	*Draba* sp.		X			AM
Draba	*Draba pseudopilosa*			X	X	
Arctic avens	*Dryas integrifolia*	X	X	X	X	
Wood fern	*Dryopteris dilatata*				X	NR
Lyme grass	*Elymus arenarius mollis*	X			X	NM, NR
Fireweed	*Epilobium angustifolium*	X	X	X	X	NM, AM, GM
Dwarf fireweed	*Epilobium latifolium*	X	X	X	X	All
Common horsetail	*Equisetum arvense*					All
Horsetail	*Equisetum fluviatile*				X	NR
Horsetail	*Equisetum pratense*				X	NR
Horsetail	*Equisetum scirpoides*		X			AM
Horsetail	*Equisetum silvaticum*				X	NR
Horsetail	*Equisetum* sp.	X	X	X	X	
Blue fleabane	*Erigreon acris*			X	X	
Fleabane	*Erigeron humilis*	X	X			
Arctic fleabane	*Erigeron hyperboreus*	X	X			
Tall cotton grass	*Eriophorum angustifolium*	X		X	X	NM, GM, NR

Table H-101. Vascular Plant Species Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Russet cotton grass	*Eriophorum russeolum*			X		GM
Arctic cotton grass	*Eriophorum scheuchzeri*	X	X	X	X	
Sheathed cotton grass	*Eriophorum vaginatum*	X	X	X	X	GM, NR
Arctic forget-me-not	*Eritichum aretioides*	X	X	X	X	
Edward's eutrema	*Eutrema edwardsii*			X		GM
Fescue grass	*Festuca aitaica*		X	X		AM, GM
Fescue grass	*Festuca brevissima*			X		GM
Red fescue	*Festuca rubra*				X	NR
Fescue grass	*Festuca* sp.	X	X	X	X	NM, AM
Northern bedstraw	*Galium boreale*	X	X	X	X	AM, NR
Bedstraw	*Galium trifidium*			X	X	
Whitish gentian	*Gentiana algida*	X	X			
Glaucous gentian	*Gentiana glauca*	X	X	X	X	GM
White geranium	*Geranium erianthum*			X	X	
Glacier avens	*Geum glaciale*		X			AM
Ross avens	*Geum rossii*		X			AM
Alpine eskimo potato	*Hedysarum hedysaroides*	X	X			
Cow parsnip	*Heracleum lanatum*	X	X			
Alpine holy grass	*Hierochloe alpina*		X	X	X	AM, GM, NR
Squirreltail grass	*Hordeum jubatum*	X				NM
Wild iris	*Iris setosa*	X	X	X	X	
Arctic rush	*Juncus arcticus*	X		X	X	NM
Rush	*Juncus castaneus*			X		GM
Glaucous weaselsnout	*Lagotis glauca*	X	X			AM
Vetchling	*Lathyrus palustris*	X	X	X	X	
Alpine milk vetch	*Lathyrus maritimus*	X			X	NM, NR
Bladder pod	*Lesquerella arctica*	X	X			
Alp lily	*Lloydia serotina*	X	X	X	X	
Alpine azalea	*Loiseleuria procumbens*			X	X	
Arctic lupine	*Lupinus arcticus*	X	X	X	X	
Wood rush	*Luzula arcuata*			X		GM
Wood rush	*Luzula confusa*				X	NR
Alpine club moss	*Lycopodium alpinum*			X	X	
Club moss	*Lycopodium annotinum*				X	NR
Bladder campion	*Melandrium apetalum*	X	X	X	X	GM
Bogbean	*Menyanthes trifoliata*	X	X	X	X	
Chiming bells	*Mertensia paniculata*	X	X	X	X	GM
Wild snapdragon	*Mimulus guttatus*			X	X	
Arctic sandwort	*Minuartia arctica*			X	X	GM, NR
Sandwort	*Minuartia obtusiloba*		X			AM
Sandwort	*Minuartia rubella*		X			AM
Shy maiden	*Moneses uniflora*			X	X	
Alpine forget-me-not	*Myosotis alpestris*	X	X			
Yellow pond lily	*Nuphar polysepalum*			X	X	
Oxytrope	*Oxytropis artica* var. *barnebyana*	X	X			
Maydell's oxytrope	*Oxytropis maydelliana*	X	X	X		GM
Blackish oxytrope	*Oxytropis nigrescens*	X	X	X	X	AM, GM
Arctic poppy	*Papaver hultenii*	X	X			
Northern grass of Parnassus	*Parnassia palustris*	X	X	X	X	
Grass of Parnassus	*Parnassia* sp.	X				NM

Table H-101. Vascular Plant Species Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Parrya	*Parrya nudicaulis*	X	X	X	X	AM
Capitate lousewort	*Pedicularis capitata*	X	X	X		AM, GM
Wooly lousewort	*Pedicularis kanei*		X	X		AM, GM
Arctic lousewort	*Pedicularis landsdorfii*				X	NR
Oeder's lousewort	*Pedicularis oederi*	X	X	X	X	
Fernweed	*Pedicularis sudetica*	X	X			
Bumblebee flower	*Pedicularis verticillata*	X	X	X	X	
Frigid coltsfoot	*Petasites frigidus*	X		X	X	NM, GM, NR
Butterwort	*Pinguicila vulgaris*	X	X			
Bog orchid	*Platanthera convallariaefolia*					
Small northern bog orchid	*Platanthera obtusata*	X	X	X	X	
Arctic blue grass	*Poa arctica*			X		GM
Kentucky blue grass	*Poa pratensis*			X	X	
Blue grass	*Poa* sp.	X	X	X	X	NM, AM, NR
Tall Jacob's ladder	*Polemonium acutiflorum*	X	X	X	X	NM, GM, NR
Jacob's ladder	*Polemonium pulcherrimum*	X	X			
Bistort	*Polygonum bistorta*	X	X	X	X	AM, GM
Alpine meadow bistort	*Polygonum viviparum*	X	X	X	X	
Two-flowered cinquefoil	*Potentilla biflora*	X	X			
Silverweed	*Potentilla egedii*			X	X	
Arctic cinquefoil	*Potentilla hyparctica*			X		GM
Marsh fivefinger	*Potentilla palustris*	X	X	X	X	GM, NR
One-flowered cinquefoil	*Potentilla uniflora*	X	X			AM
Northern primrose	*Primula borealis*	X	X			AM
Wedge-leafed primrose	*Primula cuneifolia*	X	X			
Pink pyrola	*Pyrola asarifolia*	X	X	X	X	
Wintergreen	*Pyrola chlorantha*				X	NR
Large-flowered wintergreen	*Pyrola grandiflora*	X	X	X	X	NM, AM, GM
Wintergreen	*Pyrola secunda*				X	NR
Pasqueflower	*Pulsatilla patens*			X	X	
Buttercup	*Ranunculus* sp.	X	X	X	X	
Buttercup	*Ranunculus suiphureus*			X		GM
Arctic dock	*Rumex arcticus*	X	X	X	X	GM
Dock	*Rumex fenestratus*				X	NR
Dock	*Rumex graminifolius*	X	X	X	X	
Burnet	*Sanguisorba officinalis*	X	X	X	X	
Narrow-leafed saussurea	*Saussurea viscida*	X	X			
Spotted saxifrage	*Saxifraga bronchialis*	X	X	X		GM
Bulblet saxifrage	*Saxifraga cernua*	X	X	X		GM
Rusty saxifrage	*Saxifraga hieracifolia*	X	X	X		GM
Yellow marsh saxifrage	*Saxifraga hirculus*	X	X	X	X	
Cordate-leaved saxifage	*Saxifraga punctata*	X	X	X		GM
Snow saxifrage	*Saxifraga nivalis*		X			AM
Purple mountain saxifrage	*Saxifraga oppositifolia*		X			AM
Brook saxifrage	*Saxifrage rivularis*			X		GM
Spiked saxifrage	*Saxifraga spicata*			X	X	
Roseroot	*Sedum rosea*	X	X	X	X	AM, GM, NR
Marsh fleawort	*Senecio congestus*	X	X	X	X	
Arctic senecio	*Senecio atropurpureus frigidus*			X		GM
Black-tipped groundsel	*Senecio lugens*	X	X	X	X	

Table H-101. Vascular Plant Species Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Seabeach scenecio	*Senecio pseudo-arnica*	X	X			
Ragwort	*Senecio* sp.			X	X	
Buffaloberry	*Shepherdia canadensis*	X	X			
Moss campion	*Silene acaulis*	X	X	X	X	AM
Smelowskia	*Smelowskia calycina*	X	X			
Goldenrod	*Solidago multiradiata*	X	X	X	X	AM
Bur-reed	*Sparganium angustifolim*	X	X	X	X	
Ladies' tresses	*Spiranthes romanzoffiana*			X	X	
Chickweed	*Stellaria edwardsii*			X		GM
Chickweed	*Stellaria* sp.				X	NR
Dandelion	*Taraxacum ceratophorum*			X		GM
Dandelion	*Taraxacum officinale*				X	NR
Dandelion	*Taraxacum* sp.	X	X	X	X	
False asphodel	*Tofieldia coccinea*		X		X	AM, NR
Star flower	*Trientalis europea*			X	X	NR
Arrow grass	*Triglochin maritimum*	X	X			
Bladderwort	*Utricularia intermedia*	X	X	X	X	
Capitate valerian	*Valeriana capitata*	X	X	X	X	GM, NR
Mountain heliotrope	*Valeriana sitchensis*			X	X	
Two-flowered violet	*Viola biflora*			X	X	
Death camass	*Zygadenus elegans*	X	X	X	X	AM

Sources: Hulten 1968; Viereck and Little 1972; White, 1974; DeLapp, 1987; Pratt 1991; 611 ASG 2000a.

Table H-102. Fish Species Potentially Occurring on or near the Nome Field POL, Anvil Mountain, Granite Mountain, and North River Sites

Common Name	Scientific Name	Nome Field	Anvil Mountain	Granite Mountain	North River
Alaska blackfish	*Dallia pectoralis*				X
Arctic char	*Salvelinus alpinus*	X	X		X
Arctic flounder	*Liopsetta glacialis*	X	X		
Arctic grayling	*Thymallus arcticus*	X	X	X	X
Burbot	*Lota lota*	X	X		X
Chinook salmon	*Oncorhynchus tshawytscha*	X	X		X
Chum salmon	*Oncorhynchus keta*	X	X		X
Coho salmon	*Oncorhynchus kisutch*	X	X		X
Dolly varden	*Salvelinus malma*	X	X		X
Longnose sucker	*Catostomus catostomus*				X
Ninespine stickleback	*Pungitus pungitus*	X	X		
Northern pike	*Esox lucius*	X	X	X	X
Pacific herring	*Clupea pallasi*	X	X		X
Pacific tomcod	*Microgadus proximus*	X	X		X
Pink salmon	*Oncorhynchus gorbuscha*	X	X		X
Polar cod	*Boreogadus saida*	X	X		
Rainbow smelt	*Osmerus mordax*	X	X		X
Sheefish	*Stenodus leucichtys*			X	X
Sockeye salmon	*Oncorhynchus nerka*	X	X		X
Whitefish	*Coregonus* sp.	X	X		X

Sources: Flock and Hubbard 1979; Morrow 1980; Craig 1984; Minerals Management Service 1987a; USFWS 1988; Robbins et al. 1991; USACE 1991; CH2M Hill 1994c, d; ICF Technology, Inc. 1996d; 611 ASG 1995b, 1999b, c, 2000a, b; Johnson and Blossom 2019a.

Table H-103. Mammal Species Potentially Occurring on or near the Nome Field POL, Anvil Mountain, Granite Mountain, and North River Sites

Common Name (ESA Status)	Scientific Name	Nome Field	Anvil Mountain	Granite Mountain	North River
TERRESTRIAL					
Alaskan hare	*Lepus othus*	X	X	X	X
American mink	*Neovison vison*	X	X	X	X
Arctic fox	*Alopex lagopus*	X	X	X	X
Arctic ground squirrel	*Spermophilus parryii*	X	X*	X*	X
Brown bear	*Ursus arctos*	X	X	X†	X
Canadian lynx	*Lynx canadensis*	X	X	X	X
Caribou	*Rangifer tarandus*	X	X	X*	X
Cinereus shrew	*Sorex cinereus*			X	X
Common muskrat	*Ondatra zibethicus*	X	X	X	X
Ermine	*Mustela erminea*	X	X	X	X
Least weasel	*Mustela nivalis*	X	X	X	X
Meadow vole	*Microtus pennsylvanicus*	X	X	X	X
Moose	*Alces americanus*	X	X	X	X
Nearctic brown lemming	*Lemmus trimucronatus*	X	X	X	X
Nearctic collared lemming	*Dicrostonyx groenlandicus*	X	X	X	X
North American river otter	*Lontra canadensis*	X	X	X	X
Northern red-backed vole	*Clethrionmys rutilus*	X	X	X	X
Red fox	*Vulpes vulpes*	X	X	X	X
Root vole	*Microtus oeconomus*	X	X	X	X

Table H-103. Mammal Species Potentially Occurring on or near the Nome Field POL, Anvil Mountain, Granite Mountain, and North River Sites

Common Name (ESA Status)	Scientific Name	Nome Field	Anvil Mountain	Granite Mountain	North River
Singing vole	*Microtus miurus*	X	X	X	X
Snowshoe hare	*Lepus americanus*	X	X	X	X
Tundra shrew	*Sorex tundrensis*			X	X
Wolf	*Canis lupus*	X	X	X†	X
Wolverine	*Gulo gulo*	X	X	X	X
MARINE†					
Arctic ringed seal (T)	*Phoca hispida hispida*	X			
Bearded seal (T)	*Erignathus barbatus*	X			
Beluga	*Delphinapterus leucas*	X			
Bowhead (E)	*Balaena mysticetus*	X			
Common minke whale	*Balaenoptera acutorostrata*	X			
Fin whale (E)	*Balaenoptera physalus*	X			
Gray whale	*Eschrichtius robustus*	X			
Harbor porpoise	*Phocoena phocoena*	X			
Humpback whale (E)	*Megaptera novaeangliae*	X			
Killer whale	*Orcinus orca*	X			
North Pacific right whale (E)	*Eubalaena japonica*	X			
Pacific walrus	*Odobenus rosmarus divergens*	X			
Polar bear (T)	*Ursus maritimus*	X*			
Ribbon seal	*Histriophoca fasciata*	X			
Spotted seal	*Phoca largha*	X			
Steller sea lion (T)	*Eumetopias jubatus*	X			

Notes: * = observed; † = tracks, den site, bones, or skull observed. †All marine mammals are listed under the MMPA.
Sources: USFWS undated (b); Hart Crowser 1987; Minerals Management Service 1987b; Wynne 1993; Day et al. 1995; EMCON Alaska, Inc. 1996a; ICF Technology, Inc. 1996a; DOWL/Ogden Joint Venture 1998; 611 ASG 1995c, 1999b, c, 2000a, b, c; Frost et al., 2007.

Table H-104. Bird Species Observed or Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Alder flycatcher	*Empidonax alnorum*			X	X	NR*
Aleutian tern	*Onychoprion aleuticus*	X	X		X	
American dipper	*Cinclus mexicanus*	X	X		X	
American golden-plover	*Pluvialis dominica*	X	X	X	X	GM*
American kestrel	*Falco sparverius*	X	X	X	X	
American pipit	*Anthus rubescens*	X	X	X	X	AM*, GM*
American robin	*Turdus migratorius*	X	X	X	X	All
American tree sparrow	*Spizelloides arborea*	X	X	X	X	NR*
American wigeon	*Mareca americana*	X	X		X	
Arctic loon	*Gavia arctica*	X	X			
Arctic tern	*Sterna paradisaea*	X	X		X	NF
Arctic warbler	*Phylloscopus borealis*	X	X	X	X	
Baird's sandpiper	*Calidris bairdii*	X	X			
Bald eagle	*Haliaeetus leucocephalus*				X	
Bank swallow	*Riparia riparia*	X	X	X	X	
Barn swallow	*Hirundo rustica*	X	X	X	X	
Barrow's goldeneye	*Bucephala islandica*	X				
Bar-tailed godwit	*Limosa lapponica*	X	X	X	X	GM
Belted kingfisher	*Megaceryle alcyon*				X	

Table H-104. Bird Species Observed or Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Black guillemot	*Cepphus grylle*	X	X			
Black scoter	*Melanitta americana*	X	X		X	
Black turnstone	*Arenaria melanocephala*	X	X	X	X	
Black-bellied plover	*Pluvialis squatarola*	X	X	X	X	
Black-capped chickadee	*Poecile atricapillus*	X	X	X	X	
Black-legged kittiwake	*Rissa tridactyle*	X	X			
Blackpoll warbler	*Setophaga striata*			X	X	
Bluethroat	*Cyanecula svecica*	X	X	X	X	
Bohemian waxwing	*Bombycilla garrulus*				X	
Bonaparte's gull	*Chroicocephalus philadelphia*	X	X		X	
Boreal chickadee	*Poecile hudsonica*				X	
Boreal owl	*Aegolius funereus*				X	
Brant	*Branta bernicla*	X	X		X	
Bristle-thighed curlew	*Numenius tahitiensis*	X	X		X	
Buff-breasted sandpiper	*Calidris subruficollis*	X	X			
Bufflehead	*Bucephala albeola*	X	X		X	
Canada goose	*Branta canadensis*	X	X		X	
Canada jay	*Perisoreus canadensis*	X	X	X	X	NR
Canvasback	*Aythya valisineria*	X	X		X	
Cliff swallow	*Petrochelidon pyrrhonota*	X	X	X	X	
Common eider	*Somateria mollissima*	X	X		X	
Common goldeneye	*Bucephala clangula*	X	X		X	
Common loon	*Gavia immer*	X	X		X	
Common merganser	*Mergus merganser*	X	X		X	
Common murre	*Uria aalge*	X	X			
Common raven	*Corvus corax*	X	X	X	X	AM, GM, NR
Common redpoll	*Acanthis flammea*	X	X	X	X	All
Crested auklet	*Aethia cristatella*	X	X			
Dark-eyed junco	*Junco hyemalis*	X	X		X	NR*
Dunlin	*Calidris alpina*	X	X	X	X	
Eastern yellow wagtail	*Motacilla tschutschensis*	X	X	X	X	NF*
Emperor goose	*Anser canagicus*	X	X		X	
Eurasian wigeon	*Mareca penelope*	X	X		X	
Fox sparrow	*Passerella iliaca*	X	X	X	X	All*
Glaucous gull	*Larus hyperboreus*	X	X		X	NF
Glaucous-winged gull	*Larus glaucescens*	X	X		X	
Golden eagle	*Aquila chrysaetos*	X	X	X	X	
Golden-crowned sparrow	*Zonotrichia atricapilla*	X	X	X	X	AM*, GM*
Gray-cheeked thrush	*Catharus minimus*	X	X	X	X	
Gray-crowned rosy-finch	*Leucosticte arctoa*			X	X	
Great horned owl	*Bubo virginianus*				X	
Great knot	*Calidris tenuirostris*	X	X			
Greater scaup	*Aythya marila*	X	X		X	
Greater white-fronted goose	*Anser albiforns*	X	X		X	
Greater yellowlegs	*Tringa melanoleuca*	X	X		X	
Green sandpiper	*Tringa ochropus*	X	X			
Green-winged teal	*Anas crecca*	X	X	X	X	NF, GM
Gyrfalcon	*Falco rusticolus*	X	X	X	X	
Harelquin duck	*Histrionicus histrionicus*	X	X		X	
Hermit thrush	*Catharus guttatus*	X	X			

Table H-104. Bird Species Observed or Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Herring gull	*Larus argentatus*	X	X		X	
Hoary redpoll	*Acanthis hornemanni*	X	X	X	X	NF
Horned grebe	*Podiceps auritus*	X	X		X	
Horned lark	*Eremophila alpestris*	X	X	X	X	GM
Horned puffin	*Fratercula corniculata*	X	X			
Hudsonian godwit	*Limosa haemastica*	X	X	X	X	
Ivory gull	*Pagophila eburnea*	X	X		X	
King eider	*Somateria spectabilis*	X	X		X	
Kittlitz's murrelet	*Brachyramphus brevirostris*	X	X			
Lapland longspur	*Calcarius lapponicus*	X	X	X	X	AM*, GM*
Least auklet	*Aethia pusilla*	X	X			
Least sandpiper	*Calidris minutilla*	X	X		X	
Lesser scaup	*Aythya affinis*	X	X		X	
Lesser yellowlegs	*Tringa flavipes*	X	X		X	
Lincoln's sparrow	*Melospiza lincolnii*	X			X	
Little stint	*Calidris minuta*	X	X			
Long-billed dowitcher	*Limnodromus scolopaceus*	X	X	X	X	
Long-tailed duck	*Clangula hyemalis*	X	X		X	
Long-tailed jaeger	*Stercorarius longicaudus*	X	X	X	X	NF, GM
Long-toed Stint	*Calidris subminuta*	X	X			
Mallard	*Anas platyrhynchos*	X	X		X	
Marbled murrelet	*Brachyramphus marmoratus*	X	X			
McKay's bunting	*Plectrophenax hyperboreus*	X	X			
Merlin	*Falco columbarius*				X	
Mew gull	*Larus canus*	X	X		X	NF
Northern fulmar	*Fulmarus glacialis*	X				
Northern goshawk	*Accipiter gentilis*			X	X	NR
Northern harrier	*Circus hudsonius*	X	X	X	X	GM
Northern hawk owl	*Surnia ulula*				X	
Northern pintail	*Anas acuta*	X	X		X	
Northern shoveler	*Spatula clypeata*	X	X		X	
Northern shrike	*Lanius borealis*	X	X	X	X	
Northern waterthrush	*Parkesia noveboraxensis*	X	X		X	
Northern wheatear	*Oenanthe oenanthe*	X	X	X	X	GM*
Olive-sided flycatcher	*Contopus cooperi*				X	NR*
Orange-crowned warbler	*Oreothlypis celata*			X	X	NR*
Osprey	*Pandion haliaetus*	X	X		X	
Pacific golden-plover	*Pluvialis fulva*	X	X	X	X	
Pacific loon	*Gavia pacifica*	X	X	X	X	
Parakeet auklet	*Cyclorrhynchus psittacula*	X	X			
Parasitic jeager	*Stercorarius parasisticus*	X	X	X	X	
Pectoral sandpiper	*Calidris melanotos*	X	X	X	X	
Pelagic cormorant	*Phalacrocorax pelagicus*	X	X			
Peregrine falcon	*Falco peregrinus*	X	X	X	X	
Pigeon guillemot	*Cepphus columba*	X	X			
Pine grosbeak	*Pinicola enucleator*				X	
Pomarine jaeger	*Stercorarius pomarinus*	X	X	X	X	
Red knot	*Calidris canutus*	X	X	X	X	
Red phalarope	*Phalaropus fulicarius*	X	X	X	X	
Red-breasted merganser	*Mergus serrator*	X	X		X	

Table H-104. Bird Species Observed or Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
Redhead	*Aythya americana*	X	X		X	
Red-necked grebe	*Podiceps grisegena*	X	X		X	
Red-necked phalarope	*Phalaropus lobatus*	X	X	X	X	
Red-necked stint	*Calidris ruticollis*	X	X			
Red-tailed hawk	*Buteo jamaicenis*				X	
Red-throated loon	*Gavia stellata*	X	X	X	X	
Red-throated pipit	*Anthus cervinus*	X	X	X	X	
Ring-necked duck	*Aythya collaris*	X				
Rock ptarmigan	*Lagopus muta*	X	X	X	X	
Rock sandpiper	*Calidris ptilocnemis*	X	X			
Ross' gull	*Rhodostethia rosea*	X	X			
Rough-legged hawk	*Buteo lagopus*		X	X	X	
Ruby-crowned kinglet	*Regulus calendula*	X	X	X	X	NR*
Ruddy turnstone	*Arenaria interpres*	X	X	X	X	
Rusty blackbird	*Euphagus carolinus*	X	X	X	X	
Sabine's gull	*Xema sabini*	X	X		X	
Sandhill crane	*Antigone canadensis*	X	X	X	X	
Savannah sparrow	*Passerculus sandwichensis*	X	X	X	X	All*
Say's phoebe	*Sayornis saya*			X	X	
Semipalmated plover	*Charadrius semipalmatus*	X	X	X	X	NF*
Semipalmated sandpiper	*Calidris pusilla*	X	X	X	X	NF
Sharp-shined hawk	*Accipiter striatus*				X	
Short-eared owl	*Asio flammeus*	X	X	X	X	GM
Siberian rubythroat	*Calliope calliope*	X	X			
Slaty-backed gull	*Larus schistisagus*	X	X			
Snow bunting	*Plectrophenax nivalis*	X	X	X	X	GM*
Snow goose	*Anser caerulescens*	X	X		X	
Snowy owl	*Bubo scandiacus*	X	X	X	X	
Spectacled eider	*Somateria fischeri*	X	X	X	X	
Spotted sandpiper	*Actitis macularius*	X	X		X	
Spruce grouse	*Falcipennis canadensis*				X	
Steller's eider	*Polysticta stelleri*	X	X	X	X	
Surf scoter	*Melanitta perspicillata*	X	X		X	
Surfbird	*Calidris virgata*	X	X			
Swainson's thrush	*Catharus ustulatus*			X	X	NR*
Temmick's stint	*Calidris temminckii*	X	X			
Terek sandpiper	*Xenus cinereus*	X	X			
Thayer's gull	*Larus thayeri*	X	X			
Thick-billed murre	*Uria lomvia*	X	X			
Tree swallow	*Tachycineta bicolor*	X	X	X	X	NF
Trumpeter swan	*Cygnus buccinator*				X	
Tufted puffin	*Fratercula cirrhata*	X	X			
Tundra swan	*Cygnus columbianus*	X	X		X	
Varied thrush	*Ixoreus naevius*	X	X	X	X	NR*
Violet-green swallow	*Tachycineta thalassina*	X	X	X	X	
Wandering tattler	*Heteroscelus incanus*	X	X		X	
Western sandpiper	*Calidris mauri*	X	X	X	X	NF
Whimbrel	*Numenius phaeopus*	X	X	X	X	
White wagtail	*Motacilla alba*	X	X			
White-crowned sparrow	*Zonotrichia leucophrys*	X	X	X	X	NF*, GM*, NR*

Table H-104. Bird Species Observed or Potentially Occurring on or near the Nome Field POL (NF), Anvil Mountain (AM), Granite Mountain (GM), and North River (NR) Sites

Common Name	Scientific Name	NF	AM	GM	NR	Observed
White-winged crossbill	*Loxia leucoptera*				X	
White-winged Scoter	*Melanitta deglandi*	X	X		X	
Willow ptarmigan	*Lagopus lagopus*	X	X	X	X	GM
Wilson's snipe	*Gallinago delicata*	X	X	X	X	AM, GM*, NR
Wilson's warbler	*Cardellina pusilla*	X	X	X	X	GM*, NR*
Wood sandpiper	*Tringa glareola*	X	X			
Yellow warbler	*Setophaga petechia*	X	X	X	X	NF*, GM*, NR*
Yellow-billed loon	*Gavia adamsii*	X	X			
Yellow-rumped warbler	*Setophaga coronata*			X	X	NR*

Note: *breeding behavior and/or nest observed.
Sources: Robbins et al. 1983; Harris 1996; Armstrong 1998; Skinner 1999; 611 ASG 2000a; Pardieck et al. 2018.

H.23 BEAR CREEK RRS (INACTIVE)

H.23.1 Location and Area

The approx. 100-acre former Bear Creek RRS is in central Alaska just north of the Yukon River, about 7 miles northeast of Tanana and 130 air miles west of Fairbanks (Figure H-140 and Figure H-141). The former RRS can be reached from Tanana via an approx. 8-mile dirt road.

Figure H-140. Ground-level View of the Former Bear Creek RRS Site

H.23.2 Installation History

Construction of facilities at Bear Creek occurred in 1956 and 1957. The site is 1 of the 31 original WACS sites. It was initially called the Bear Creek Communications Station, then renamed Bear Creek AFS in 1958, and in 1961 became the Bear Creek RRS. The Bear Creek WACS operated as a combined tropospheric scatter/TD-2 microwave station, which relayed radio information to and from Indian Mountain, Kalakaket Creek, and Pedro Dome WACS sites. Bear Creek was active from 1958 to 1979. Site facilities included a dormitory/equipment/annex building complex, a primary and temporary vehicle maintenance building, four WACS antennas, a water storage tank, an airfield, 20 additional miscellaneous facilities, 2 POL storage tank areas, and several former disposal areas. All facilities were demolished and disposed of during Clean Sweep activities in 1996 (Reynolds 1988; Denfield 1994; 611 ASG 1998b).

H.23.3 Military Mission

The former Bear Creek RRS is now closed; see Section H.23.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is currently scheduled for 2020.

H.23.4 Surrounding Communities

Located at the confluence of the Tanana and Yukon rivers, the City of Tanana is the closest community to the Bear Creek site. The estimated 2018 population of Tanana is 204 consisting of approx. 80% Alaska Native. Traditional ways of life persist, with subsistence, potlatches, dances, and foot races a part of the culture. Two-thirds of the full-time jobs are with the city, school district, or native council. Fire fighting, trapping, construction work, and commercial fishing are important seasonal cash sources. Tanana is accessible only by air and river transportation.

Figure H-141. Overview of the Former Bear Creek RRS

H.23.5 Regional Land Use

The lands surrounding the Bear Creek site are primarily Alaska Native Allotments and Native Lands, with some sections of BLM and state lands (BLM 2019a).

H.23.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Bear Creek site. The Nowitna NWR is approx. 30 miles west of Tanana.

H.23.7 Physical Environment

H.23.7.1 Climate

The Bear Creek site has a cold, continental climate typical of the Alaska interior with large temperature differences between winter and summer. From May through September the average high temperatures are in the mid-50s to the low 70s °F (Table H-105). Winter low temperatures from November through March are typically below 0 °F. Average annual precipitation is 12 inches, with 47 inches of snowfall. The river is ice-free from mid-May through mid-October.

Table H-105. Monthly Climatic Averages for Tanana, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	-3.0	4.9	18.7	38.0	57.5	69.7	70.9	64.4	51.6	29.6	8.8	-0.3
Avg. Low (ºF)	-18.3	-14.0	-6.1	14.5	33.7	45.7	48.7	44.1	33.5	15.7	-5.1	-15.3
Avg. Precipitation (inches)	0.5	0.5	0.4	0.4	0.6	1.4	2.0	2.6	1.6	0.9	0.6	0.6
Avg. Snowfall (inches)	6.5	6.2	6.5	2.6	0.3	0	0	0	0.7	6.6	7.7	10.0

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.23.7.2 Topography

The Bear Creek site is within the unglaciated Yukon-Tanana Upland Physiographic Province. Located about 1 mile south of the Bear Creek site, the major structural feature of the area is the Kaltag Fault, which generally controls the location of the Yukon River. The site is on a heavily forested ridge at an elevation of 1,650 ft MSL. The topography of the site slopes gently towards the west and southwest (USAF 1998).

H.23.7.3 Geology and Soils

Bedrock beneath the site is primarily composed of an Early Paleozoic and Precambrian metamorphic complex of quartz-mica schist, quartzite, phyllite, and slate beds. Other materials associated with this complex include minor amounts of gray schist; medium to dark gray, shaley limestone; tufaceous siltstone; fine-grained and conglomeratic graywache sandstone with stretched or sheared pebbles and slate fragments; and white quartz pods, lenses, and irregular veinlets. Due to the proximity of the Bear Creek site to the Kaltag Fault, the bedrock is believed to be highly fractured (Hazardous Materials Technical Center 1989; 611 ASG 1998a).

Soils at the Bear Creek site belong to the Typic Cryachrepts and Histic Pergelic Cryaquepts association. This association includes silty to sandy loam, which grade into gravelly and stony material in areas where permafrost is absent. Permafrost, where found, is reported at depths of 10-20 inches below ground surface. Soils are generally less than 40 inches thick in the area (Hazardous Materials Technical Center 1989).

H.23.8 Hydrology

The Bear Creek site is on the top of a ridge, and is devoid of surface water features. Drainages of Mission, NC, and Bear creeks occur near the site to the east, south, and west, respectively. Runoff from the site

potentially contributes to these creeks, which discharge into the Yukon River. The depth to groundwater is unknown.

H.23.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Bear Creek site. Attachment 9 contains lists of vascular plants (Table H-84), fish (Table H-85), mammals (Table H-86), and birds (Table H-87) known to occur or potentially occurring in the Bear Creek area. ESA-listed species that may occur at or in the vicinity of the Bear Creek site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.23.9.1 Ecoregion Classification

The Bear Creek site is located in the Ray Mountains ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.23.9.2 Vegetation/Habitat

A general vegetation map of the Bear Creek site has not been prepared. Forested areas on the Bear Creek site are dominated by black spruce with the co-dominant trees/shrubs being willows and alders. Very few birch are present, and those present are only tree/shrub sized. Ground cover is generally sub-alpine with many areas dominated by fruticose lichens and an abundance of mosses, crowberry, bog blueberry, lowbush cranberry, dwarf Arctic birch, and alpine azalea. Some areas of boreal forest ground cover can be found under thick alder stands. *Festuca* and *Poa* species, along with weedy volunteers, are growing on much of the area where the facilities once stood (611 ASG 2001b).

H.23.9.3 Wetlands

The current mapping of wetlands at the Bear Creek site is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Of the approximate 100-acre Bear Creek site, 25 acres (or 25%) are considered wetlands per the NWI mapping (Table H-106 and Figure H-142). Freshwater forested/shrub wetlands make up the majority of the wetlands and occur along the access road to the site.

Table H-106. Former Bear Creek RRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*(1)		2018 ANHP†(2)	
	Area (acres)	Proportion	Area (acres)	Proportion
Freshwater Forested/Shrub	24.0	24.3%	0.9	0.9%
Riverine	0.5	0.5%	0.4	0.4%
Wetlands Total	**24.5**	**24.8%**	**1.3**	**1.3%**
Upland	74.4	75.2%	97.6	98.7%
Site Total	**98.9**		**98.9**	

Notes: *See Figure H-142. †See Figure H-143.
Sources: (1)USFWS 2019d. (2)Flagstad et al. 2018.

Figure H-142. Former Bear Creek RRS Wetlands (2019 NWI)
(Source: USFWS 2019d. [2]Flagstad et al. 2018

Figure H-143. Former Bear Creek RRS Wetlands (2018 ANHP)
(Source: Flagstad et al. 2018)

H.23.9.4 Fish and Wildlife

H.23.9.4.1 Fish

Mission Creek to the southeast of the site and other creeks in the area support chinook salmon.Fish species that occur in the Yukon River include chinook, coho, sockeye, and chum salmon; inconnu/sheefish; several species of whitefish; Arctic grayling; northern pike; burbot; longnose sucker; lake chub; Alaska blackfish; slimy sculpin; and Arctic lamprey (Johnson and Blossom 2019c) (Table H-85).

H.23.9.4.2 Mammals

Mammals observed in the Tanana area include meadow jumping mouse, voles, shrews, hoary marmot, Arctic ground squirrel, black and brown bear, moose, lynx, marten, wolf, and river otter (Table H-86).

H.23.9.4.3 Birds

A large number of bird species are found in the general area surrounding the Bear Creek site. Some more common species include Canada goose, American wigeon, spotted sandpiper, Wilson's snipe, alder flycatcher, bank swallow, black-capped chickadee, ruby-crowned kinglet, American robin, Swainson's thrush, varied thrush, orange-crowned warbler, yellow warbler, slate-colored junco, fox sparrow, and common redpoll (Sauer et al. 1997) (Table H-87).

H.23.9.5 ESA-listed Species

No ESA-listed candidate species have been reported within the boundaries of the Bear Creek site.

H.23.10 Other Natural Resources Information

H.23.10.1 Subsistence

Subsistence resource harvesting is critical to the continued existence of Tanana. The cultural preference is for traditional foods, and the expense of shipping in prepared foods is prohibitive. Social organization in Tanana revolves around kin-based subsistence harvest groups that organize for seasonal fish camps, moose, bear, and caribou hunts. The importance of subsistence to Tanana residents is reflected in the high participation rates of households that use (100%), harvest (92%), try to harvest (93%), and receive (98%) subsistence resources. Four species of fish (chum, chinook, and coho salmon and whitefish) account for approximately 86% of Tanana's annual subsistence harvest in terms of edible pounds. Tanana residents use areas along the Tanana, Yukon, and Nowitna rivers and their tributaries and sloughs for hunting and fishing. In addition, lakes and wetlands along these rivers are heavily used. Hunters looking for birds and moose often use the road from Tanana to the Bear Creek facility (Braund and Associates 2004).

H.23.10.2 Outdoor Recreation

Outdoor recreation opportunities available at Bear Creek site include small and big game hunting, gathering of vegetation and berries, and nonconsumptive activities, such as ATV riding along gravel roads and bird watching. The limited hunting that occurs in the area primarily consists of subsistence harvest of animals and collection of vegetation for greens and berries by residents of Tanana.

H.24 BEAVER CREEK RRS (INACTIVE)

H.24.1 Location and Area

The 33-acre Beaver Creek site is located along Alaskan Route 2 (or ALCAN Highway) about 3 miles north of the community of Northway Junction, 10 miles northeast of the community of Northway, 45 miles southeast of Tok, and 240 air miles southeast of Fairbanks (Figure H-144). The site lies on a hilltop overlooking the confluence of the Chisana and Nabesna rivers. Access to the Beaver Creek site is via a gravel road from Route 2.

H.24.2 Installation History

Site construction was completed in 1957. The facility was first called the Tanana Radio Relay Annex, in 1956 became the Beaver Creek Communications Station, was renamed Beaver Creek AFS in 1958, and in 1961 became the Beaver Creek RRS. The site consisted of a steel frame building, a radio tower, two diesel underground storage tanks, a parking lot, and fencing surrounding the facility. The USAF began leasing the Beaver Creek site to Alascom in 1984 and Alascom continues to operate a communications facility at the site. Original facilities remain at the site except for one 20,000-gallon underground storage tank that was removed in 1990 (611 ASG 1997). Two sites have undergone remedial investigations and feasibility studies for fuel and heavy metals contamination; no further remedial actions are planned.

H.24.3 Military Mission

The former Beaver Creek RRS is now closed; see Section H.24.2, Installation History.

H.24.4 Surrounding Communities

Northway consists of three dispersed settlements: Northway Junction (3 miles south of the former RRS), Northway (7 miles southeast), and the Native settlement of Northway Village (6 miles south-southeast). The 2018 estimated populations are 51 for Northway Junction, 69 for Northway, and 89 for Northway Village, each consisting of 75-80% Alaska Native, primarily Athabascan. Most wage employment is with facilities or services for the Northway Airport, including an FAA Flight Service Station and U.S. Customs office. A motel, cafe, bar, pool hall, grocery store, and electric utility provide some employment. Firefighting, construction, and trapping also provide income (State of Alaska 2018, 2019.)

H.24.5 Regional Land Use

Lands surrounding the Beaver Creek site are primarily Alaska Native Allotments and Native Lands with state lands to the north and east, and NWR lands to the south (BLM 2019a).

H.24.6 Local and Regional Natural Areas

The northern boundary of the Tetlin NWR is south of Highway 2 and the Beaver Creek site and is a landscape made up of forests, wetlands, tundra, lakes, mountains, and glacial rivers bounded by the Alaska Range. The refuge extends south about 40 miles and to the Alaska/Canada border to the east. The Tetlin NWR is one of only two refuges in Alaska that is accessible by road.

Figure H-144. Overview of the Former Beaver Creek RRS

H.24.7 Physical Environment

H.24.7.1 Climate

The Beaver Creek site lies in the Continental climate zone, with long, cold winters and relatively warm summers. The average low temperature in January is -27 °F; the average high during July is 70 °F (Table H-107). Average precipitation is 10 inches per year; snowfall averages 37 inches annually.

Table H-107. Monthly Climatic Averages for Northway Airport, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	-9.9	3.4	22.5	42.0	56.9	67.0	69.5	64.9	52.5	29.6	5.4	-6.4
Avg. Low (ºF)	-26.6	-19.2	-8.9	15.2	32.9	44.4	48.0	42.9	31.4	13.3	-10.5	-22.3
Avg. Precipitation (inches)	0.3	0.2	0.2	0.2	0.9	2.0	2.6	1.5	1.0	0.5	0.3	0.3
Avg. Snowfall (inches)	5.4	4.9	3.4	2.2	0.8	0	0	0.2	1.0	6.8	6.5	6.0

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.24.7.2 Topography

The Beaver Creek site is located on a hillside at about 2,500 ft MSL. The area east and north of the site is mountainous with elevations reaching about 3,000 to 4,000 ft MSL. The area west and south of the site is a broad valley of the Chisana and Nabesna rivers.

H.24.7.3 Geology and Soils

The Beaver Creek site is underlain by bedrock primarily of the Paleozoic and Precambrian age and is comprised of schist, quartzite, and gneiss. Intrusive Cretaceous granitica are present in uplands. River basins consist of deep unconsolidated Quaternary deposits with surficial deposits of fluvial sand and gravel, silts, and peat. Discontinuous permafrost is present in the area to depths of up to 150 ft (611 ASG 1997).

H.24.8 Hydrology

Major surface water features in the area of the Beaver Creek site include two north flowing glacial rivers: the Chisana and Nebesna, which converge and form the Tanana River (Figure H-144). This area also has extensive lake and marsh complexes in a broad river valley to the east and south of the site. Beaver Creek is a small tributary of the Chisana River and flows westerly about 0.5 mile northwest of the Beaver Creek site. No other surface water features occur near the site. Drainage from the site likely enters Beaver Creek or flows directly into the Chisana River.

H.24.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Beaver Creek site. Attachment 9 contains lists of vascular plants (Table H-84), fish (Table H-85), mammals (Table H-86), and birds (Table H-87) known to occur or potentially occurring in the Beaver Creek area. ESA-listed species that may occur at or in the vicinity of the Beaver Creek site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.24.9.1 Ecoregion Classification

The Beaver Creek site is located in the Yukon-Tanana Uplands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.24.9.2 Vegetation/Habitat

A general vegetation map of the Beaver Creek site has not been prepared. There are four distinct terrestrial plant communities in the vicinity of the Beaver Creek site: upland spruce-hardwood forest, lowland spruce-hardwood forest, low brush-muskeg bog, and alpine tundra and barren ground. The site is in an upland spruce-hardwood forest, characterized by a fairly dense forest of white spruce, paper birch, quaking aspen, and balsam poplar with some large Bebb's willow and Scouler willow in relatively open understory. Undergrowth typically consists of mosses, grasses, and shrubs. Downslope and along the site access road, large patches of quaking aspen and some white spruce occur. Cleared or disturbed areas are revegetating to alder, grayleaf willow, Bebb's willow, and forbs with some small white spruce, quaking aspen, and balsam poplar (611 ASG 1997).

H.24.9.3 Wetlands

The current mapping of wetlands at the Beaver Creek site is based on 2018 ANHP data (Flagstad et al. 2018). Of the approximate 33-acre Beaver Creek site, less than an acre is considered wetlands per the ANHP mapping and that area is located along the access road (Table H-108 and Figure H-145).

Table H-108. Former Beaver Creek RRS Wetland Types Based on 2018 ANHP Data*

Wetland Type	Area (acres)	Proportion
Freshwater Emergent	0.4	1.2%
Upland	32.3	98.8%
Site Total	**32.7**	

Note: *See Figure H-145.
Source: Flagstad et al. 2018.

H.24.9.4 Fish and Wildlife

H.24.9.4.1 Fish

Potential fish populations in creeks and lakes in the area are unknown. However, fish species that occur in the Tanana River include Arctic grayling, northern pike, burbot, whitefish, longnose sucker, lake chub, Alaska blackfish, slimy sculpin, and Arctic lamprey, and chinook, sockeye, coho, and chum salmon (Johnson and Blossom 2019c) (Table H-85).

H.24.9.4.2 Mammals

A total of 23 mammal species have the potential to occur on or in the vicinity of the Beaver Creek site including black and brown bear, moose, caribou, wolf, snowshoe hare, red fox, lynx, American mink, marten, beaver, porcupine, muskrat, red squirrel, shrews, and voles (Table H-86).

Figure H-145. Former Beaver Creek RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.24.9.4.3 Birds

This upper Tanana River valley has been called the "Tetlin Passage" because it serves as a major migratory route for birds traveling to and from Canada, the lower 48, and both Central and South America. The area is the flyway for sandhill cranes and is a critical nesting area for trumpeter swans (USFWS 2019h). Species commonly observed on or near the Beaver Creek site include alder flycatcher, golden-crowned sparrow, American robin, Swainson's thrush, yellow-rumped warbler, dark-eyed junco, pine siskin, northern flicker, spruce grouse, common raven, Canada jay, and numerous species of waterfowl. Raptors common to the area include osprey, bald and golden eagles, merlin, northern goshawk, and red-tailed hawk (Table H-87).

Important Bird Areas (IBAs)

The Beaver Creek site is located within the Upper Tanana River Valley IBA (Figure H-47). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The IBA covers 6.1 million acres of the Upper Tanana Valley which widely known as an important migration corridor for birds that travel to and from Alaska and western Siberia to breed each year. Hundreds of thousands of migratory brds including swans, geese, ducks, cranes, and raptors pass through the valley each spring and fall. More than 75% of the entire mid-continental population of lesser Sandhill cranes pass through the proposed site annually in addition to thousands of swans (Audubon Alaska 2014).

H.24.9.5 ESA-listed Species

No ESA-listed candidate species have been reported within the boundaries of the Beaver Creek site.

H.24.10 Other Natural Resources Information

H.24.10.1 Subsistence

Subsistence activities provide most food sources, and residents harvest moose, rabbit, ptarmigan, ducks, geese, whitefish, and berries. Some residents travel to the Copper River for salmon. Northway residents fish in lakes, rivers and sloughs in the Northway Flats, low-lying areas near lower reaches of the Nabesna and Chisana rivers. Moose hunting occurs along water routes near the Tanana, Nabesna, Chisana, and Tetlin rivers and along road-accessible areas near the Alaska Highway, Taylor Highway, Tok Cutoff, and Nabesna Road. Caribou hunting occurs in hills north of Northway, the Taylor Highway corridor, and portions of the Nutzotin Mountains. Trapping areas include the Nabesna and Chisana rivers, over most of the Northway Flats, in hills north of Northway and east to the Canadian border and along the Taylor Highway (Braund and Associates 2004).

H.24.10.2 Outdoor Recreation

The primary use of the site is use of the access road to gain access to areas further east of the site. The surrounding area is likely used primarily by residents of Northway Junction and Northway for hunting, fishing, trapping, and gathering. Although, the Tetlin NWR is one of only two refuges in Alaska that is accessible by road, and thus, is used by visitors for wildlife viewing, hunting, fishing, and camping.

H.25 BETHEL RRS (INACTIVE)

H.25.1 Location and Area

The 14-acre former Bethel RRS site is in southwestern Alaska about 1.5 miles west of the Bethel Airport, 4 miles west of Bethel, and 400 miles west of Anchorage (Figure H-146 and Figure H-147).

Figure H-146. Ground-level View of the Former Bethel RRS

H.25.2 Installation History

The Bethel AC&W site was activated as a GCI installation in 1958 as part of the Bethel Airfield. Bethel's WACS tropospheric antennas were adjacent to the AC&W site. The WACS portion of the installation consisted of six tropospheric antennas, two above-ground fuel storage tanks, a pump house, a 204,750-gallon tank, an equipment and power building, a facility support building, and a vehicle maintenance building. The installation was a 3-way link between Aniak, Cape Newenham, and Cape Romanzof. In 1963, the Bethel AC&W site was deactivated and by December 1964 all equipment had been removed and the site was re-designated as the Bethel RRS. The RRS was deactivated in 1987 and demolished in 1989 and 1990. One tropospheric antenna was left in place at the request of the City of Bethel for use as a long-range visual reference point for pilots and snow-machine operators (Figure H-146) (Reynolds 1988; Argonne National Laboratory and CEMML 2013).

H.25.3 Military Mission

The former Bethel RRS is now closed; see Section H.25.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is currently scheduled for 2020.

Figure H-147. Overview of the Former Bethel RRS

H.25.4 Surrounding Communities

Bethel was first established by Yupik Eskimos who called the village "Mumtrekhlogamute", meaning "Smokehouse People". Bethel has a population of 6,135 (2018 estimate) consisting of about 60% Alaska Native Yupik Eskimo. Bethel serves as the regional trading, transportation, and distribution center for 56 villages in the Yukon-Kuskokwim Delta. Bethel maintains a medium-draft port for ocean-going vessels, as well as a cargo dock, petro port, small boat harbor, float plane beach, and seawall. Food, fuel, transportation, medical care, and other services for the region are provided in Bethel. Approximately 50% of the jobs in Bethel are federal and state government positions, and commercial fishing is an important source of income (State of Alaska 2018, 2019).

H.25.5 Regional Land Use

Surrounding lands are primarily Alaska Native Allotments or Native Lands that are used for recreation or subsistence purposes (BLM 2019a).

H.25.6 Local and Regional Natural Areas

Although the Bethel site lies within the 19-million acre Yukon Delta NWR, the lands immediately adjacent to the site are not managed by the USFWS/NWR.

H.25.7 Physical Environment

H.25.7.1 Climate

Bethel falls within the western transitional climate zone, characterized by long, cold winters and shorter, warm summers. High humidity, considerable cloudiness, frequent fog, and multiple periods of light rain and snow showers are typical. Average summer high temperatures only reach the mid-60s °F, and average winter temperatures are below freezing from November through March (Table H-109). The wettest season is generally from July through September, with precipitation averaging 17 inches a year, and snowfall 56 inches per year.

Table H-109. Monthly Climatic Averages for Bethel Airport, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	12.0	15.4	20.9	33.1	49.6	59.9	62.6	59.7	52.1	35.8	23.4	14.1
Avg. Low (ºF)	-0.8	1.4	4.9	17.2	32.6	43.1	48.0	46.6	38.6	24.4	11.3	1.2
Avg. Precipitation (inches)	0.8	0.7	0.7	0.7	0.9	1.5	2.3	3.3	2.5	1.5	1.3	1.1
Avg. Snowfall (inches)	7.9	7.3	8.5	5.4	1.8	0.1	0	0	0.3	4.1	10.0	10.3

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.25.7.2 Topography

Topography in the vicinity of the Bethel site is typical of glacial moraine topography, being relatively flat to gently rolling and includes wetlands and many small lakes and ponds. The site is on a topographic high point at an elevation of about 170 ft MSL. Bethel's tropospheric antenna is a prominent feature of the area's skyline.

H.25.7.3 Geology and Soils

The Bethel area is underlain by Quaternary silt deposits of the Yukon-Kuskokwim Delta, which consist of light- to dark-gray silt and sandy silt containing abundant permafrost. Organic muck occurs locally near the top of these deposits, which become sandier with depth and locally contain pebbles and wood fragments. Organic material, including wood chips and bark, suggest that these are freshwater estuarine deposits. These deposits apparently thicken westward and at Bethel have a minimum thickness of 450 ft.

Silt deposits may include eolian and marine members in some areas. Silt underlies much of the Yukon-Kuskokwim Delta, where it forms a wide plain at an altitude of 10-150 ft msl (Dynamac Corporation 1989a).

The Kuskokwim River, about 3.6 miles east of the site, exhibits Pleistocene deposits of floodplain and low terrace alluvium. These deposits consist mainly of mud, silt, sand, gravel, boulders, and considerable organic matter. The alluvium ranges from 230 to 360 ft in thickness and is related to glacial advances from the nearby Alaska Range. In Illinoian time considerable deposition of alluvium occurred, which were later eroded and dissected by streams and rivers in Sangamon time. In Wisconsinan time deposits of fluvial origin were predominant in this area (Dynamac Corporation 1989a).

The Bethel site is underlain by the Kuskokwim-Kwethluk Complex. The complex is intertwined such that mapping them separately is not feasible. Kwethluk soils occur in small areas from 3 to 10 acres on low knolls, convex slopes bordering drainage ways, and areas adjacent to drained thaw lakes. Kuskokwim soils are found on level areas between slopes and knolls of Kwethluk soils. The two soils can be identified by their differences in slope, vegetation, drainage, and texture. Kuskokwim soils have a thick surface mat and a large proportion of sedges and sphagnum moss; the water table is generally near the surface; and the texture is silty in the upper part. Kwethluk soils have a sandy texture throughout and have a thin mat with polytrichum moss and low growing shrubs and forbs. The water table is several feet deep by mid-summer (Dynamac Corporation 1989a).

H.25.8 Hydrology

The major surface water feature in the Bethel area is the Kuskokwim River (Figure H-147). The site is not within the Kuskokwim River floodplain. Land surrounding the site includes wetlands, small lakes and ponds, streams, and bogs. There are two unnamed small creeks that flow north of the site into small unnamed ponds (Dynamac Corporation 1989a).

Groundwater in the Bethel area is obtained from the floodplain and low-terrace alluvium deposits of the Kuskokwim River in permafrost-free areas close to the river and from deep sands beneath the permafrost. At the nearby Bethel Bureau of Indian Affairs administrative site water well, permafrost was reported to extend from near the surface to a depth of 603 ft. In wells that penetrate the permafrost, the groundwater is under considerable hydrostatic pressure. It rises in wells near Bethel to a static water level about equal to that of the Kuskokwim River. Water below the permafrost is potable, and most water supplied to the population of Bethel is pumped from a location near the center of town (EMCON Alaska, Inc. 1996a).

The local distribution of permafrost in the Bethel area is determined largely by surface insulation and subsurface drainage. Permafrost lies at most shallow depths in areas mantled with peat, organic silt, or a dense mat of living vegetation, and it lies at greatest depths beneath bare soil. Permafrost is absent or lies at great depths beneath lakes and ponds. Permafrost has a significant impact on both surface and groundwater flow in the area (11th Civil Engineering Operations Squadron, Operating Engineers 1992).

H.25.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Bethel site. Attachment 12 contains lists of vascular plants (Table H-119) and birds (Table H-114) known to occur or potentially occurring in the Bethel area. ESA-listed species that may occur at or in the vicinity of the Bethel site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.25.9.1 Ecoregion Classification

The Bethel site is located in the Yukon-Kuskokwim ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.25.9.2 Vegetation/Habitat

A general vegetation map of the Bethel site has not been prepared. Vegetation in the immediate area of the Bethel site is primarily cottongrass tussock tundra with shrubby willows and alders growing along drainages. Common habitats of the area include a variety of scrub, peatland, heath meadow, marsh, and bogs. The periphery of the site is heavily vegetated with shrub/scrub species dominated by alders. Outside of the shrub/scrub band of vegetation is primarily subarctic tundra dominated by sedge grasses (611 ASG 2001d).

H.25.9.3 Wetlands

The current mapping of wetlands at the Bethel site is based on 2018 ANHP data (Flagstad et al. 2018). Of the approximate 14-acre Bethel site, 1 acre is considered wetlands per the ANHP mapping (Table H-110 and Figure H-148).

Table H-110. Former Bethel RRS Wetland Types Based on 2018 ANHP Data*

Wetland Type	Area (acres)	Proportion
Freshwater Emergent	0.9	6.3%
Riverine	0.2	1.4%
Wetlands Total	**1.1**	**7.7%**
Upland	13.2	92.3%
Site Total	**14.3**	

Note: *See Figure H-148.
Source: Flagstad et al. 2018.

H.25.9.4 Fish and Wildlife

H.25.9.4.1 Fish

A variety of fish inhabit the Kuskokwim River, its tributaries, and numerous lakes in the Bethel area. Common freshwater fish include Arctic grayling and rainbow trout. All five species of Pacific salmon migrate up the Kuskokwim River.

H.25.9.4.2 Mammals

Terrestrial mammals inhabiting the Bethel area include Arctic and dusky shrews; Alaskan hare; brown and collared lemmings; ermine; Arctic and red foxes; beaver; American mink; muskrat; and wolverine. Larger species include brown and black bears, caribou, and moose (11th Civil Engineering Operations Squadron, Operating Engineers 1992; EMCON Alaska, Inc. 1996a).

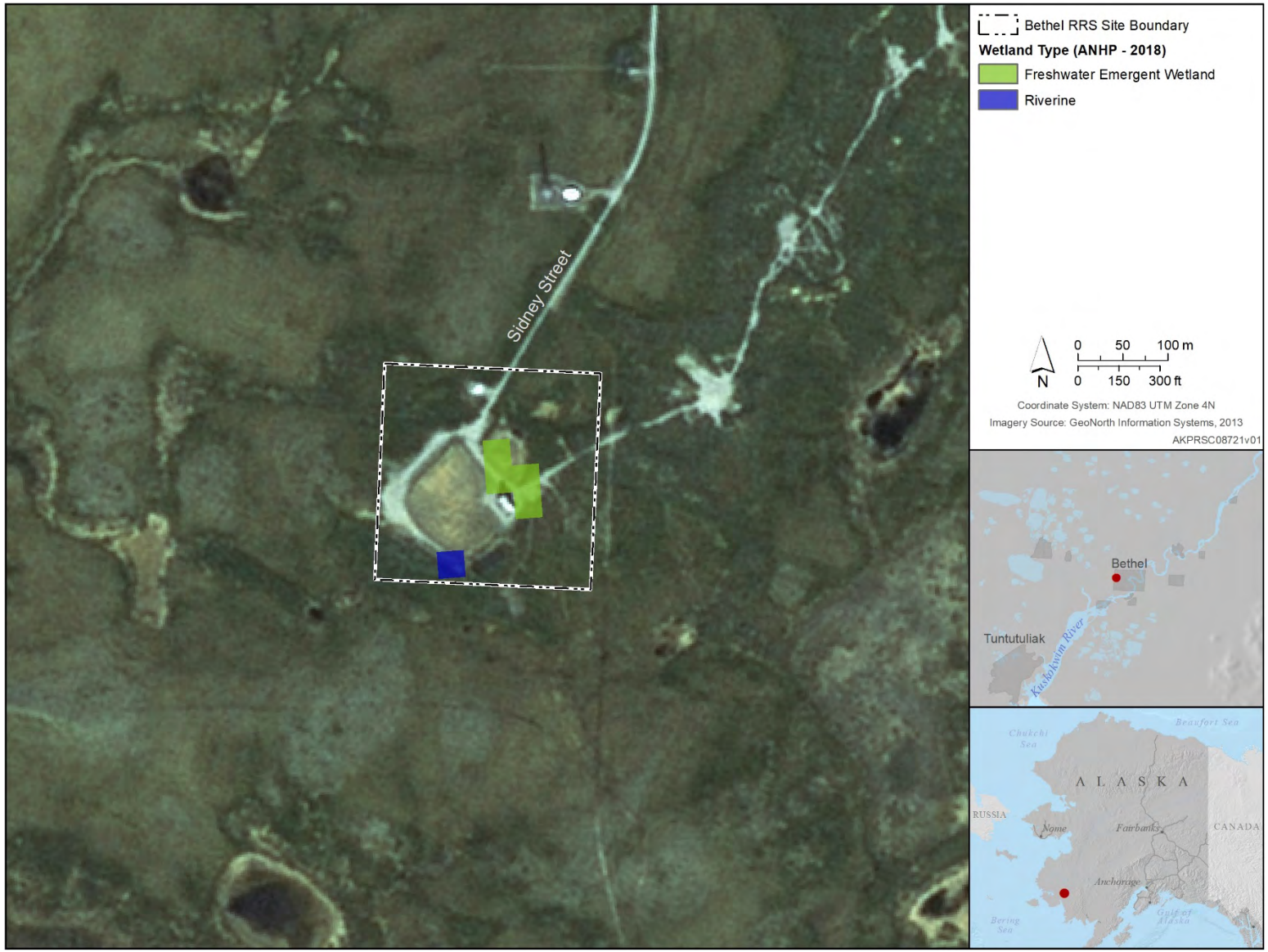

Figure H-148. Former Bethel RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.25.9.4.3 Birds

Numerous species of waterfowl and shorebirds use the area surrounding the site for resting and feeding during migration, and many species nest in the area. Waterfowl and shorebirds common to the area include red-throated, Pacific, and common loons; greater white-fronted and Canada geese; mallard; American wigeon; canvasback; greater and lesser yellowlegs; spotted, western, least, and pectoral sandpipers; and red-necked phalarope. Many passerine species summer and nest in the area, including several species of warblers, sparrows, and swallows. Permanent residents of the area include northern goshawk, willow ptarmigan, Canada jay, black-billed magpie, black-capped chickadee, snow bunting, and common and hoary redpolls.

H.25.9.5 ESA-listed Species

No ESA-listed candidate species have been reported within the boundaries of the Bethel site.

H.25.10 Other Natural Resources Information

H.25.10.1 Subsistence

Subsistence activities contribute substantially to the diet and livelihood of Bethel residents. Subsistence resources include five species of Pacific salmon, several species of whitefish, burbot, pike, blackfish, sheefish, smelt, Dolly Varden, grayling, and trout, moose, caribou, black and brown bear, three species of seals, muskox, hare, porcupine, beaver, muskrat, American mink, marten, river otter, fox, lynx, ptarmigan, waterfowl, eggs, berries and other plants. No quantitative studies and/or systematic subsistence surveys have been conducted for Bethel, and no use area for Bethel is depicted in the available literature (Braund and Associates 2004).

H.25.10.2 Outdoor Recreation

Outdoor recreation opportunities available at Bethel site include small and big game hunting, berry picking, and nonconsumptive activities, such as ATV riding along gravel roads, bird watching, and hiking.

ATTACHMENT 12: NATURAL RESOURCES OF THE BETHEL, BIG MOUNTAIN, AND NAKNEK RECREATION ANNEXES SITES

Table H-111. Vascular Plant Species Observed or Potentially Occurring on or near the Bethel (B), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
TREES AND SHRUBS						
American green alder	*Alnus crispa*		X	X	X	BM
Sitka alder	*Alnus sinuata*		X	X	X	BM
Thinleaf alder	*Alnus tennuifolia*		X	X	X	
Alder	*Alnus* sp.	X	X	X	X	B, RC, LC
Pacific serviceberry	*Amelanchier florida*		X	X	X	
Bog rosemary	*Andromeda polifolia*		X	X	X	BM
Alpine bearberry	*Arctostaphylos alpina*		X	X	X	
Red-fruit bearberry	*Arctostaphylos rubra*	X				B
Bearberry	*Arctostaphylos uva-ursi*		X	X	X	
Alaska paper birch	*Betula papyrifera* var. *humilis*		X	X	X	
Kenai birch	*Betula papyrifera* var. *kenaica*		X	X	X	RC, LC
Dwarf Arctic birch	*Betula nana*	X				
Alaska cassiope	*Cassiope lycopodiodes*		X	X	X	
Starry cassiope	*Cassiope stelleriana*		X	X	X	
Leatherleaf	*Chamaecyparis calyculata*		X	X	X	
Bunchberry	*Cornus canadensis*		X	X	X	
Lapland cornel	*Cornus suecica*	X	X	X	X	B, BM
Diapensia	*Diapensia lapponica*		X	X	X	
Entire-leaf mountain avens	*Dryas integrifolia*		X	X	X	
Mountain avens	*Dryas octopetala*		X	X	X	BM
Crowberry	*Empetrum nigrum*	X	X	X	X	
Narrowleaf Labador tea	*Ledum decumbens*	X	X	X	X	B
Twin-flower	*Linnaea borealis*		X	X	X	
Alpine azalea	*Loiseleuria procumbens*		X	X	X	
Luetkea	*Luetkea pectinata*		X	X	X	
Sweet gale	*Myrica gale*		X	X	X	
Aleutian mountain heath	*Phyllodoce aleutica*		X	X	X	
White spruce	*Picea glauca*		X	X	X	LC, BM
Black spruce	*Picea mariana*		X	X	X	LC, BM
Balsam poplar	*Populus balsamifera*		X	X	X	NI, BM
Kamchatka rhododendron	*Rhododendron camtschaticum*		X	X	X	
Skunk currant	*Ribes glandulosm*		X	X	X	
Swamp gooseberry	*Ribes lacustre*		X	X	X	
American red currant	*Ribes triste*		X	X	X	
Prickly rose	*Rosa acicularis*		X	X	X	
Noogan-berry	*Rubus arcticus*	X	X	X	X	B
Cloudberry	*Rubus chamaemorus*	X	X	X	X	B, LC
Feltleaf willow	*Salix alaxensis*		X	X	X	RC, BM
Littetree willow	*Salix arbusculoides*		X	X	X	
Arctic willow	*Salix arctica*	X	X	X	X	B, BM
Undergreen willow	*Salix commutata*		X	X	X	
Alaska bog willow	*Salix fuscescens*		X	X	X	
Grayleaf willow	*Salix glauca*		X	X	X	
Low blueberry willow	*Salix myrtillifolia*		X	X	X	

Table H-111. Vascular Plant Species Observed or Potentially Occurring on or near the Bethel (B), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
Skeletonleaf willow	*Salix phlebophylla*		X	X	X	
Netleaf willow	*Salix reticulata*		X	X	X	
Least willow	*Salix rotundifolia*		X	X	X	
Scouler willow	*Salix scouleriana*		X	X	X	
Willow	*Salix* sp.	X	X	X	X	B, BM
Sprouting willow	*Salix stolonifera*		X	X	X	
Pacific red-elder	*Sambucus callicarpa*		X	X	X	
Green Mountain ash	*Sorbus scopulina*		X	X	X	
Sitka Mountain ash	*Sorbus sitchensis*		X	X	X	
Beauverd spirea	*Spiraea beauverdiana*		X	X	X	BM
Dwarf blueberry	*Vaccinium caespitosum*		X	X	X	BM
Bog blueberry	*Vaccinium uliginosum*	X	X	X	X	RC
Low-bush cranberry	*Vaccinium vitis-idaea*	X	X	X	X	B, LC
Highland cranberry	*Viburnum edule*		X	X	X	
HERBACEOUS						
Baneberry	*Acatea rubra*		X	X	X	
Northern yarrow	*Achillea borealis*		X	X	X	RC
Siberian yarrow	*Achillea sibirica*	X	X	X	X	B, BM
Monkshood	*Aconitium delphinifolium*	X	X	X	X	
Wild chives	*Allium schoenoprasum*		X	X	X	
Northern jasmine	*Androsace sepientrionalis*		X	X	X	
Pasque flower	*Anemone drummondii*		X	X	X	
Narcissus-flower anemone	*Anemone narcissiflora*		X	X	X	
Yellow anemone	*Anemone richardsonii*		X	X	X	BM
Wild celery	*Angelica lucida*	X	X	X	X	B
Cats paws	*Antennaria monocephala*		X	X	X	
Pussytoes	*Antennaria* sp.		X	X	X	BM
Lyre-leaf rockcress	*Arabis lyrata*		X	X	X	RC
Rose-purple orchis	*Archis aristata*		X	X	X	
Pendent grass	*Arctophila fulva*		X	X	X	
Frigid arnica	*Arnica frigida*		X	X	X	BM
Lessing's arnica	*Arnica lessingii*		X	X	X	
Arctic wormwood	*Artemisia arctica*		X	X	X	
Northern wormwood	*Artemisia borealis*		X	X	X	
Purple wormwood	*Artemisia globularia*		X	X	X	
Common wormwood	*Artemisia tilesii*	X	X	X	X	B
Goatsbeard	*Aruncus sylvester*		X	X	X	
Siberian aster	*Aster sibiricus*		X	X	X	
Wintercress	*Barbarea orthoceras*		X	X	X	
Broomrape	*Boschniakia rossica*		X	X	X	BM
Moonwort	*Botrychium boreale*		X	X	X	
Moonwort	*Botrychium lunaria*		X	X	X	
Bluejoint grass	*Calamagrostis canadensis*		X	X	X	RC, LC
Reed bent grass	*Calamagrostis* sp.		X	X	X	
Marsh marigold	*Caltha palustris*		X	X	X	
Bluebell	*Campanula lasiocarpa*	X	X	X	X	B, BM
Cuckoo flower	*Cardamine pratensis*		X	X	X	
Sedge	*Carex aquatilis*		X	X	X	
Sedge	*Carex bigelowii*		X	X	X	

Table H-111. Vascular Plant Species Observed or Potentially Occurring on or near the Bethel (B), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
Sedge	*Carex lyngbyaei*		X	X	X	
Sedge	*Carex nesophila*	X	X	X	X	B, BM
Sedge	*Carex* sp.	X	X	X	X	B, LC, BM
Paintbrush	*Castilleja* sp.		X	X	X	
Coastal paintbrush	*Castilleja unalaschensis*		X	X	X	
Bering Sea chickweed	*Cerastium beeringianum*		X	X	X	
Chickweed	*Cerastium fischerianum*	X	X	X	X	B
Arctic daisy	*Chrysanthemum arcticum*		X	X	X	
Mackenzie water hemlock	*Cicuta mackenzieana*		X	X	X	
Lichen	*Cladonia* sp.	X				B
Spring beauty	*Claytonia chamissoi*		X	X	X	
Alaska spring beauty	*Claytonia sarmentosa*		X	X	X	BM
Coral root	*Corallorrhiza trifida*		X	X	X	
Pink lady's slipper	*Cypripedium guttatum*		X	X	X	
Hair moss	*Dicranum* sp.	X				
Long leaved sundew	*Drosera angelica*		X	X	X	
Yellow dryas	*Dryas drummondii*		X	X	X	
Eight petaled dryas	*Dryas octopetala*		X	X	X	
Fireweed	*Epilobium angustifolium*	X	X	X	X	B, RC, BM
Dwarf fireweed	*Epilobium latifolium*		X	X	X	BM
Horsetail	*Equisetum arvense*		X	X	X	RC
Horsetail	*Equisteum* sp.	X	X	X	X	B, BM
Bue fleabane	*Erigeron acris*		X	X	X	
Fleabane	*Erigeron humilis*		X	X	X	
Cotton grass	*Eriophorum gracile*	X	X	X	X	B, LC, BM
Arctic cotton grass	*Eriophorum scheuchzeri*		X	X	X	
Cotton grass	*Eriophorum* sp.	X				B
Fescue grass	*Festuca* sp.		X	X	X	
Chocolate lily	*Fritillaria camschatcensis*		X	X	X	
Northern bedstraw	*Galium boreale*		X	X	X	RC
White gentian	*Gentiana algida*		X	X	X	BM
Wild geranium	*Geranium erianthum*		X	X	X	RC
Ross avens	*Geum rossii*		X	X	X	
Wild sweet pea	*Hedysarum mackenzii*		X	X	X	RC
Cow parsnip	*Heracleum lanatum*		X	X	X	RC, BM
Wild iris	*Iris setosa*		X	X	X	
Lagotis	*Lagotis glauca*		X	X	X	BM
Vetching	*Lathyrus palustris*		X	X	X	
Labrador tea	*Ledum palustre groenlandicum*		X	X	X	RC, BM
Duckweed	*Lemna* sp.	X				
Leutkea	*Leutkea pectinata*		X	X	X	
Alp lily	*Lloydia serotina*		X	X	X	BM
Alpine azalea	*Loiseleuria procumbens*		X	X	X	BM
Arctic lupine	*Lupinus arcticus*		X	X	X	LC, BM
Nootka lupine	*Lupinus nootkatensis*		X	X	X	
Alpine club moss	*Lycopodium alpinum*		X	X	X	LC
Club moss	*Lycopodium* sp.	X	X	X	X	BM
Bladder campion	*Melandrium apetalum*		X	X	X	
Bogbean	*Menyanthes trifoliata*		X	X	X	

Table H-111. Vascular Plant Species Observed or Potentially Occurring on or near the Bethel (B), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
Monkey flower	*Mimulus guttatus*		X	X	X	
Arctic sandwort	*Minuartia arctica*		X	X	X	RC, BM
Grove sandwort	*Moehringia lateriflora*		X	X	X	RC
Alpine forget-me-not	*Myosotis alpestris*		X	X	X	
Yellow pond lily	*Nuphar polysepalum*	X	X	X	X	
White pond lily	*Nuphar tetragona*	X				
Bog cranberry	*Oxycoccus microcarpus*	X	X	X	X	B
Maybell's oxytrope	*Oxytropis maydelliana*		X	X	X	BM
Blackish oxytrope	*Oxytropis nigrescens*		X	X	X	BM
Arctic poppy	*Papaver lapponicum*		X	X	X	
Grass of parnassus	*Parnassia palustris*		X	X	X	
Parrya	*Parrya nudicaulis*		X	X	X	
Capitate lousewort	*Pedicularis capitata*		X	X	X	
Wooly lousewort	*Pedicularis kanei*		X	X	X	BM
Labrador lousewort	*Pedicularis labradorica*	X				B
Arctic lousewort	*Pedicularis landsdorfii*	X				B
Oeder's lousewort	*Pedicularis oederi*		X	X	X	
Lousewort	*Pedicularis* sp.	X				
Bumble bee flower	*Pedicularis verticillata*		X	X	X	
Northern coltsfoot	*Petasites hyperboreus*		X	X	X	B, LC
Aleutian heather	*Phyllodoce aleutica*		X	X	X	
Bog violet	*Pinguicula vulgaris*	X	X	X	X	B
Small north bog orchid	*Platanthera obtrusata*		X	X	X	
Blue grass	*Poa* sp.		X	X	X	
Tall Jacob's ladder	*Polemonium acutiflorum*		X	X	X	BM
Northern Jacob's ladder	*Polemonium boreale*	X				B
Pink plumes	*Polygonum bistorta*		X	X	X	BM
Alpine meadow bistort	*Polygonum viviparum*		X	X	X	
Pondweed	*Potamogeton* sp.	X				
Pacific silver weed	*Potentilla egedii*		X	X	X	
Tundra rose	*Potentilla fruticosa*		X	X	X	BM
Marsh fivefinger	*Potentilla palustris*		X	X	X	LC
Pixie eyes	*Primula cuneifolia*		X	X	X	
Pink pyrola	*Pyrola asarifolia*		X	X	X	
Western buttercup	*Ranunculus occidentalis*		X	X	X	RC, BM
Roseroot	*Rhodiola rosea*		X	X	X	
Sheep sorrel	*Rumex acetosella*		X	X	X	
Arctic dock	*Rumex arcticus*	X	X	X	X	B, BM
Dock	*Rumex beringensis*		X	X	X	
Dock	*Rumex graminifolius*		X	X	X	
Brook saxifrage	*Saxifraga punctata*		X	X	X	
Spotted saxifrage	*Saxifraga bronchialis*		X	X	X	
Yellow marsh saxifrage	*Saxifraga hirculis*		X	X	X	
Thyme-leaved saxifrage	*Saxifraga serpyllifolia*		X	X	X	
Rosewort	*Sedum rosea*		X	X	X	BM
Mastodon flower	*Senecio congestus*		X	X	X	
Black-tipped groundsel	*Senecio lugens*		X	X	X	
Ragwort	*Senecio* sp.		X	X	X	
Sibbaldia procumbens	*Sibbaldia procumbens*		X	X	X	BM

Table H-111. Vascular Plant Species Observed or Potentially Occurring on or near the Bethel (B), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
Moss campion	*Silene acaulis*		X	X	X	BM
Goldenrod	*Solidago multiradiata*		X	X	X	BM
Bur-reed	*Sparganium augustifolium*	X	X	X	X	
Sphagnum moss	*Sphagnum* sp.		X	X	X	BM
Alaska spirea	*Spiraea beauverdiana*	X				B
Ladies' tresses	*Spiranthes romanzoffiana*		X	X	X	
Dandelion	*Taraxacum* sp.		X	X	X	LC
Star flower	*Trientalis europaea*	X	X	X	X	B, LC, BM
Arrow grass	*Trilochin maritimum*		X	X	X	
Mountain helotrope	*Valeriana capitata*		X	X	X	
False hellebore	*Veratrum viride*		X	X	X	BM
American brook lime	*Veronica americana*		X	X	X	
Two-flowered violet	*Viola biflora*		X	X	X	
Violet	*Viola epipsila*	X				
Alaska violet	*Viola langsdorffii*		X	X	X	
Great spurred violet	*Viola selkirkii*		X	X	X	

Sources: Hulten 1968; Viereck and Little 1972; White 1974; EMCON Alaska, Inc. 1996a; 611 ASG 1999b.

Table H-112. Fish Species Potentially Occurring on or near the Bethel, Naknek Recreation Annexes, and Big Mountain Sites

Common Name	Scientific Name	Bethel	Naknek Recreation Annexes	Big Mountain
Alaska blackfish	*Dallia pectoralis*	X	X	X
Arctic char	*Salvelinus alpinus*	X	X	X
Arctic grayling	*Thymallus arcticus*	X	X	X
Arctic lamprey	*Lethenteron camtschaticum*	X	X	X
Burbot	*Lota lota*	X	X	X
Capelin	*Mallotus villosus*			
Chinook salmon	*Oncorhynchus tshawytscha*	X	X	X
Chum salmon	*Oncorhynchus keta*	X	X	X
Coastrange sculpin	*Cottus aleuticus*	X	X	X
Coho salmon	*Oncorhynchus kisutch*	X	X	X
Dolly varden	*Salvelinus malma*	X	X	X
Green sturgeon	*Acipenser medirostris*	X	X	
Humpback whitefish	*Coregonus pidschian*	X	X	
Lake trout	*Salvelinus namaycush*	X	X	X
Least cisco	*Coregonus sardinella*	X	X	
Longnose sucker	*Catostomus catostomus*		X	X
Ninespine stickleback	*Pungitus pungitus*	X	X	X
Northern pike	*Esox lucius*	X	X	X
Pacific lamprey	*Entosphenus tridentatus*			X
Pink salmon	*Oncorhynchus gorbuscha*	X	X	X
Pond smelt	*Hypomesus olidus*	X	X	X
Pygmy whitefish	*Prosopium coulterii*	X	X	
Rainbow smelt	*Osmerus mordax*	X	X	
Rainbow trout	*Oncorhynchus mykiss*	X	X	X
Rainbow trout	*Oncorhynchus mykiss*	X	X	X
Round whitefish	*Prosopium cylindraceum*	X	X	X

Table H-112. Fish Species Potentially Occurring on or near the Bethel, Naknek Recreation Annexes, and Big Mountain Sites

Common Name	Scientific Name	Bethel	Naknek Recreation Annexes	Big Mountain
Slimy sculpin	*Cottus cognatus*	X	X	X
Sockeye salmon	*Oncorhynchus nerka*	X	X	X
Starry flounder	*Platichthys stellatus*	X	X	
Three-spined stickleback	*Gasterosteus aculeatus*	X	X	X
Whitefish	*Coregonus* sp.	X		

Sources: Flock and Hubbard 1979; Morrow 1980; Craig 1984; Minerals Management Service 1987a; USFWS 1988; Robbins et al. 1991; USACE 1991; CH2M Hill 1994c, d; ICF Technology, Inc. 1996d; 611 ASG 1995b, 1999b, c, 2000a, b; Johnson and Blossom 2019a.

Table H-113. Mammal Species Potentially Occurring on or near the Bethel, Naknek Recreation Annexes, and Big Mountain Sites

Common Name (ESA Status)	Scientific Name	Bethel	Naknek Recreation Annexes	Big Mountain
Alaskan hare	*Lepus othus*	X	X	
American beaver	*Castor canadensis*	X	X	X†
American marten	*Martes americana*			X
American mink	*Neovison vison*	X	X	X
American pygmy shrew	*Sorex hoyi*			X
Arctic fox	*Alopex lagopus*	X	X	X
Arctic ground squirrel	*Spermophilus parryii*	X	X	X*
Arctic shrew	*Sorex arcticus*	X		X
Black bear	*Ursus americanus*	X		
Brown bear	*Ursus arctos*	X	X	X†
Canadian lynx	*Lynx canadensis*	X	X	
Caribou	*Rangifer tarandus*	X	X	X†
Cinereus shrew	*Sorex cinereus*	X	X	X
Common muskrat	*Ondatra zibethicus*	X†	X	X
Coyote	*Canis latrans*		X	
Ermine	*Mustela erminea*	X	X	X
Hoary marmot	*Marmota caligata*			X
Least weasel	*Mustela nivalis*	X	X	X
Little brown myotis	*Myotis lucifugus*		X	X
Meadow jumping mouse	*Zapus hudsonius*	X	X	X
Meadow vole	*Microtus pennsylvanicus*	X	X	X
Moose	*Alces americanus*	X	X	X†
Muskox	*Ovibos moschaturs*	X		
Nearctic brown lemming	*Lemmus trimucronatus*	X	X	X
North American porcupine	*Erethizon dorsata*	X	X	X
North American river otter	*Lontra canadensis*	X	X	X
Northern bog lemming	*Synaptomys borealis*	X	X	X
Northern flying squirrel	*Glaucomys sabrinus*			X
Northern red-backed vole	*Clethrionmys rutilus*	X	X	X
Palearctic collared lemming	*Dicrostonyx torquatus*	X	X	X
Red fox	*Vulpes vulpes*	X†	X*	X*
Red squirrel	*Tamiasciurus hudsonicus*		X	X
Root vole	*Microtus oeconomus*	X	X	X
Singing vole	*Microtus miurus*			X
Snowshoe hare	*Lepus americanus*	X†	X	X*

Table H-113. Mammal Species Potentially Occurring on or near the Bethel, Naknek Recreation Annexes, and Big Mountain Sites

Common Name (ESA Status)	Scientific Name	Bethel	Naknek Recreation Annexes	Big Mountain
Vagrant shrew	*Sorex vagrans*	X	X	X
Wolf	*Canis lupus*	X	X	X†
Wolverine	*Gulo gulo*	X	X	X

Notes: * = observed; † = tracks, den site, bones, or skull observed. †All marine mammals are listed under the MMPA.

Sources: USFWS undated (b); Hart Crowser 1987; Minerals Management Service 1987b; Wynne 1993; Day et al. 1995; EMCON Alaska, Inc. 1996a; ICF Technology, Inc. 1996a; DOWL/Ogden Joint Venture 1998; 611 ASG 1995c, 1999b, c, 2000a, b, c; Frost et al., 2007.

Table H-114. Bird Species Observed or Potentially Occurring on or near the Bethel (Be), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
Alder flycatcher	*Empidonax alnorum*	X	X	X	X	B*
Aleutian cackling goose	*Branta hutchinsii leucopareia*		X	X	X	
Aleutian tern	*Onychoprion aleuticus*	X	X	X	X	
American dipper	*Cinclus mexicanus*		X	X	X	
American golden-plover	*Pluvialis dominica*	X	X	X	X	
American kestrel	*Falco sparverius*		X	X	X	
American pipit	*Anthus rubescens*		X	X	X	
American robin	*Turdus migratorius*	X	X	X	X	B*, LC, BM
American three-toed woodpecker	*Picoides dorsalis*		X	X	X	
American tree sparrow	*Spizelloides arborea*	X	X	X	X	B*
American wigeon	*Mareca americana*	X	X	X	X	
Arctic loon	*Gavia arctica*	X				
Arctic tern	*Sterna paradisaea*	X	X	X	X	LC
Arctic warbler	*Phylloscopus borealis*	X				
Baird's sandpiper	*Calidris bairdii*		X	X	X	
Bald eagle	*Haliaeetus leucocephalus*	X	X	X	X	RC, BM
Bank swallow	*Riparia riparia*	X	X	X	X	
Barrow's goldeneye	*Bucephala islandica*		X	X	X	
Bar-tailed godwit	*Limosa lapponica*	X	X	X	X	
Belted kingfisher	*Megaceryle alcyon*	X	X	X	X	
Black scoter	*Melanitta americana*	X	X	X	X	LC
Black turnstone	*Arenaria melanocephala*	X	X	X	X	
Black-bellied plover	*Pluvialis squatarola*	X	X	X	X	
Black-billed magpie	*Pica hudsonia*	X	X	X	X	NI
Black-capped chickadee	*Poecile atricapilla*	X	X	X	X	
Black-legged kittiwake	*Rissa tridactyle*		X	X	X	
Blackpoll warbler	*Setophaga striata*	X	X	X	X	RC, LC
Bohemian waxwing	*Bombycilla garrulus*		X	X	X	
Bonaparte's gull	*Chroicocephalus philadelphia*	X	X	X	X	BM
Boreal chickadee	*Poecile hudsonica*	X	X	X	X	
Boreal owl	*Aegolius funereus*		X	X	X	
Brant	*Branta bernicla*	X	X	X	X	
Bristle-thighed curlew	*Numenius tahitiensis*		X	X	X	
Brown creeper	*Certhia americana*		X	X	X	
Bufflehead	*Bucephala albeola*	X	X	X	X	
Canada goose	*Branta canadensis*	X	X	X	X	

Table H-114. Bird Species Observed or Potentially Occurring on or near the Bethel (Be), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
Canada jay	*Perisoreus canadensis*	X	X	X	X	
Canvasback	*Aythya valisineria*	X	X	X	X	
Chipping sparrow	*Spizella passerina*		X	X	X	
Cliff swallow	*Petrochelidon pyrrhonota*	X	X	X	X	B
Common eider	*Somateria mollissima*		X	X	X	
Common goldeneye	*Bucephala clangula*	X	X	X	X	BM
Common loon	*Gavia immer*	X	X	X	X	
Common merganser	*Mergus merganser*	X	X	X	X	
Common murre	*Uria aalge*		X	X	X	
Common raven	*Corvus corax*	X	X	X	X	B
Common redpoll	*Acanthis flammea*	X	X	X	X	All
Dark-eyed junco	*Junco hyemalis*	X	X	X	X	B*
Double-crested cormorant	*Phalacrocorax auritus*		X	X	X	
Downy woodpecker	*Dryobates pubescens*	X	X	X	X	
Dunlin	*Calidris alpina*	X	X	X	X	
Eastern yellow wagtail	*Motacilla tschutschensis*	X	X	X	X	
Emperor goose	*Anser canagicus*	X	X	X	X	
Eurasian wigeon	*Mareca penelope*		X	X	X	
Fork-tailed storm-petrel	*Hydrobates furcatus*		X	X	X	
Fox sparrow	*Passerella iliaca*	X	X	X	X	B*, RC, BM
Gadwall	*Mareca strepera*		X	X	X	
Glaucous gull	*Larus hyperboreus*	X	X	X	X	RC, BM
Glaucous-winged gull	*Larus glaucescens*	X	X	X	X	
Golden eagle	*Aquila chrysaetos*		X	X	X	
Golden-crowned kinglet	*Regulus satrapa*		X	X	X	
Golden-crowned sparrow	*Zonotrichia atricapilla*	X	X	X	X	BM
Gray-cheeked thrush	*Catharus minimus*	X	X	X	X	
Gray-crowned rosy-finch	*Leucosticte tephrocotis*		X	X	X	
Great horned owl	*Bubo virginianus*	X	X	X	X	
Greater scaup	*Aythya marila*	X	X	X	X	
Greater white-fronted goose	*Anser albiforns*	X	X	X	X	
Greater yellowlegs	*Tringa melanoleuca*	X	X	X	X	BM
Green-winged teal	*Anas crecca*	X	X	X	X	
Gyrfalcon	*Falco rusticolus*	X	X	X	X	
Hairy woodpecker	*Dryobates villosus*		X	X	X	
Harlequin duck	*Histrioncus histrioncus*		X	X	X	
Hermit thrush	*Catharus guttatus*	X	X	X	X	
Herring gull	*Larus argentatus*		X	X	X	
Hoary redpoll	*Acanthis hornemanni*	X	X	X	X	
Hooded merganser	*Lophodytes cucullatus*		X	X	X	
Horned grebe	*Podiceps auritus*		X	X	X	
Hudsonian godwit	*Limosa haemastica*	X	X	X	X	
Ivory gull	*Pagophila eburnea*		X	X	X	
King eider	*Somateria spectabilis*		X	X	X	
Kittlitz's murrelet	*Brachyramphus brevirostris*		X	X	X	
Lapland longspur	*Calcarius lapponicus*	X	X	X	X	B
Leach's storm-petrel	*Hydrobates leucorhous*		X	X	X	
Least auklet	*Aethia pusilla*		X	X	X	
Least sandpiper	*Calidris minutilla*	X	X	X	X	

Table H-114. Bird Species Observed or Potentially Occurring on or near the Bethel (Be), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
Lesser scaup	*Aythya affinis*	X				
Lesser yellowlegs	*Tringa flavipes*	X				
Lincoln's sparrow	*Melospiza lincolnii*	X	X	X	X	
Long-billed dowitcher	*Limnodromus scolopaceus*	X	X	X	X	
Long-tailed duck	*Clangula hyemalis*	X	X	X	X	
Long-tailed jaeger	*Stercorarius longicaudus*	X	X	X	X	B
Mallard	*Anas platyrhynchos*	X	X	X	X	
Marbled godwit	*Limosa fedoa*		X	X	X	
Marbled murrelet	*Brachyramphus marmoratus*		X	X	X	
McKay's bunting	*Plectrophenax hyperboreus*	X	X	X	X	
Merlin	*Falco columbarius*	X	X	X	X	
Mew gull	*Larus canus*	X	X	X	X	RC, LC
Mottled petrel	*Pterodroma inexpectata*		X	X	X	
Northern goshawk	*Accipiter gentilis*	X	X	X	X	
Northern harrier	*Circus hudsonius*	X	X	X	X	
Northern hawk owl	*Surnia ulula*		X	X	X	
Northern pintail	*Anas acuta*	X	X	X	X	B, LC, BM
Northern shoveler	*Spatula clypeata*	X	X	X	X	
Northern shrike	*Lanius borealis*	X	X	X	X	
Northern waterthrush	*Parkesia noveboracensis*	X	X	X	X	
Northern wheatear	*Oenanthe oenanthe*		X	X	X	
Olive-sided flycatcher	*Contopus cooperi*		X	X	X	
Orange-crowned warbler	*Oreothlypis celata*	X	X	X	X	RC
Osprey	*Pandion haliaetus*	X	X	X	X	
Pacific golden-plover	*Pluvialis fulva*	X				B*
Pacific loon	*Gavia pacifica*	X	X	X	X	LC
Parasitic jaeger	*Stercorarius parasisticus*	X	X	X	X	
Pectoral sandpiper	*Calidris melanotos*	X	X	X	X	
Pelagic cormorant	*Phalacrocorax pelagicus*		X	X	X	
Peregrine falcon	*Falco peregrinus*		X	X	X	
Pine grosbeak	*Pinicola enucleator*	X	X	X	X	
Pomarine jaeger	*Stercorarius pomarinus*		X	X	X	
Red crossbill	*Loxia curvirostra*		X	X	X	
Red phalarope	*Phalaropus fulicarius*	X	X	X	X	B
Red-breasted merganser	*Mergus serrator*	X	X	X	X	
Red-breasted nuthatch	*Sitta canadensis*		X	X	X	
Red-faced cormorant	*Phalacrocorax urile*		X	X	X	
Redhead	*Aythya americana*		X	X	X	
Red-necked grebe	*Podiceps grisegena*	X	X	X	X	
Red-necked phalarope	*Phalaropus lobatus*	X	X	X	X	
Red-throated loon	*Gavia stellata*	X	X	X	X	
Ring-necked duck	*Aythya collaris*		X	X	X	
Rock dove	*Columba livia*		X	X	X	
Rock ptarmigan	*Lagopus muta*		X	X	X	
Rock sandpiper	*Calidris ptilocnemis*	X	X	X	X	
Rough-legged hawk	*Buteo lagopus*	X	X	X	X	
Ruby-crowned kinglet	*Regulus calendula*	X	X	X	X	
Ruddy turnstone	*Arenaria interpres*	X	X	X	X	
Ruffed grouse	*Bonasa umbellus*	X				

Table H-114. Bird Species Observed or Potentially Occurring on or near the Bethel (Be), Naknek Recreation Annex 1-Rapids Camp (RC), Recreation Annex 2-Lake Camp (LC), and Big Mountain (BM) Sites

Common Name	Scientific Name	B	RC	LC	BM	Observed
Rusty blackbird	*Euphagus carolinus*	X	X	X	X	BM
Sabine's gull	*Xema sabini*	X	X	X	X	
Sanderling	*Calidris alba*		X	X	X	
Sandhill crane	*Antigone canadensis*	X	X	X	X	
Savannah sparrow	*Passerculus sandwichensis*	X	X	X	X	B*, LC, BM
Semipalmated plover	*Charadrius semipalmatus*	X	X	X	X	
Semipalmated sandpiper	*Calidris pusilla*		X	X	X	
Sharp-shinned hawk	*Accipter striatus*		X	X	X	
Sharp-tailed sandpiper	*Calidris acuminata*		X	X	X	
Short-billed dowitcher	*Limnodromus griseus*	X	X	X	X	
Short-eared owl	*Asio flammeus*	X	X	X	X	
Short-tailed shearwater	*Ardenna tenuirostris*		X	X	X	
Snow bunting	*Plectrophenax nivalis*	X	X	X	X	BM
Snow goose	*Anser caerulescens*		X	X	X	
Snowy owl	*Bubo scandiacus*		X	X	X	
Solitary sandpiper	*Tringa solitaria*	X	X	X	X	
Song sparrow	*Melospiza melodia*	X	X	X	X	
Sooty shearwater	*Ardenna griseus*		X	X	X	
Spotted sandpiper	*Actitis macularius*	X	X	X	X	
Spruce grouse	*Falcipennis canadensis*		X	X	X	
Surf scoter	*Melanitta perspicillata*		X	X	X	
Surfbird	*Calidris virgata*		X	X	X	
Swainson's thrush	*Catharus ustalatus*		X	X	X	
Thick-billed Murre	*Uria lomvia*		X	X	X	
Tree swallow	*Tachycineta bicolor*	X	X	X	X	B, RC, LC
Tufted duck	*Aythya fuligula*		X	X	X	
Tundra swan	*Cygnus columbianus*	X	X	X	X	
Varied thrush	*Ixoreus naevius*	X	X	X	X	B*
Violet-green swallow	*Tachycineta thalassina*		X	X	X	
Wandering tattler	*Heteroscelus incanus*		X	X	X	
Western sandpiper	*Calidris mauri*	X	X	X	X	
Whimbrel	*Numenius phaeopus*	X	X	X	X	
Whiskered auklet	*Aethia pygmaea*		X	X	X	
White-crowned sparrow	*Zonotrichia leuophrys*	X	X	X	X	B*, BM
White-winged crossbill	*Loxia leucoptera*		X	X	X	
White-winged scoter	*Melanitta deglandi*		X	X	X	
Whooper swan	*Cygnus cygnus*		X	X	X	
Willow ptarmigan	*Lagopus lagopus*	X	X	X	X	
Wilson's snipe	*Gallinago delicata*	X	X	X	X	B, BM
Wilson's warbler	*Cardellina pusilla*	X	X	X	X	B*, RC, LC
Winter wren	*Troglodytes hiemalis*		X	X	X	
Yellow warbler	*Setophaga petechia*	X	X	X	X	B*
Yellow-rumped warbler	*Setophaga coronata*	X	X	X	X	

Note: *Breeding behavior and/or nests observed.

Sources: Anonymous, undated (a, b); MacGowan, 1994; EMCON Alaska, Inc. 1996a; Moore 1996; Ruhl and Moore 1996; Ruhl 1997; Armstrong, 1998; 611 ASG 1999b.

H.26 BIG MOUNTAIN RRS (INACTIVE)

H.26.1 Location and Area

The former Big Mountain RRS site is at the northern end of the Alaska Peninsula on the south shore of Iliamna Lake, about 225 miles southwest of Anchorage. The 446-acre site consisted of a barge landing on Iliamna Lake and an Upper Camp and Lower Camp connected by an access road (Figure H-149and Figure H-150).

Figure H-149. Aerial View of the Former Big Mountain RRS, Upper Camp

H.26.2 Installation History

The Big Mountain site was one of 31 WACS sites and operated as a tropospheric scatter station from 1957 to 1979. It was initially known as the Big Mountain Communications Station, renamed Elmendorf/Iliamna RRS Annex, then Big Mountain AFS in 1958, and in 1961 became Big Mountain RRS. As a WACS it linked Diamond Ridge, King Salmon, and Sparrevohn (Reynolds 1988). Big Mountain was upgraded in the 1960s with Alaska Telephone Switching Station capabilities, and operated as one of four hubs for the entire telephone network. Big Mountain was operated by RCA Alaska Communications, beginning in 1967, as part of a transfer of government-owned communication facilities to private operators.

The facility was permanently deactivated in 1979. Deactivated facilities of Upper Camp included four tropospheric antennas, two dish antennas, a dormitory building, a equipment and power building, a water storage tank, two fuel storage tanks, and a temporary vehicle storage building. Deactivated facilities of Lower Camp included a small storage building, a fuel storage tank, the gravel airstrip that is inactive and not maintained, and a former landfill area (DOWL/Ogden Joint Venture 1998). Demolition and remediation of the Big Mountain site under the Clean Sweep program occurred during 2004 and 2005, and further remediation of the site occurred in 2011-2012 (ADEC 2014).

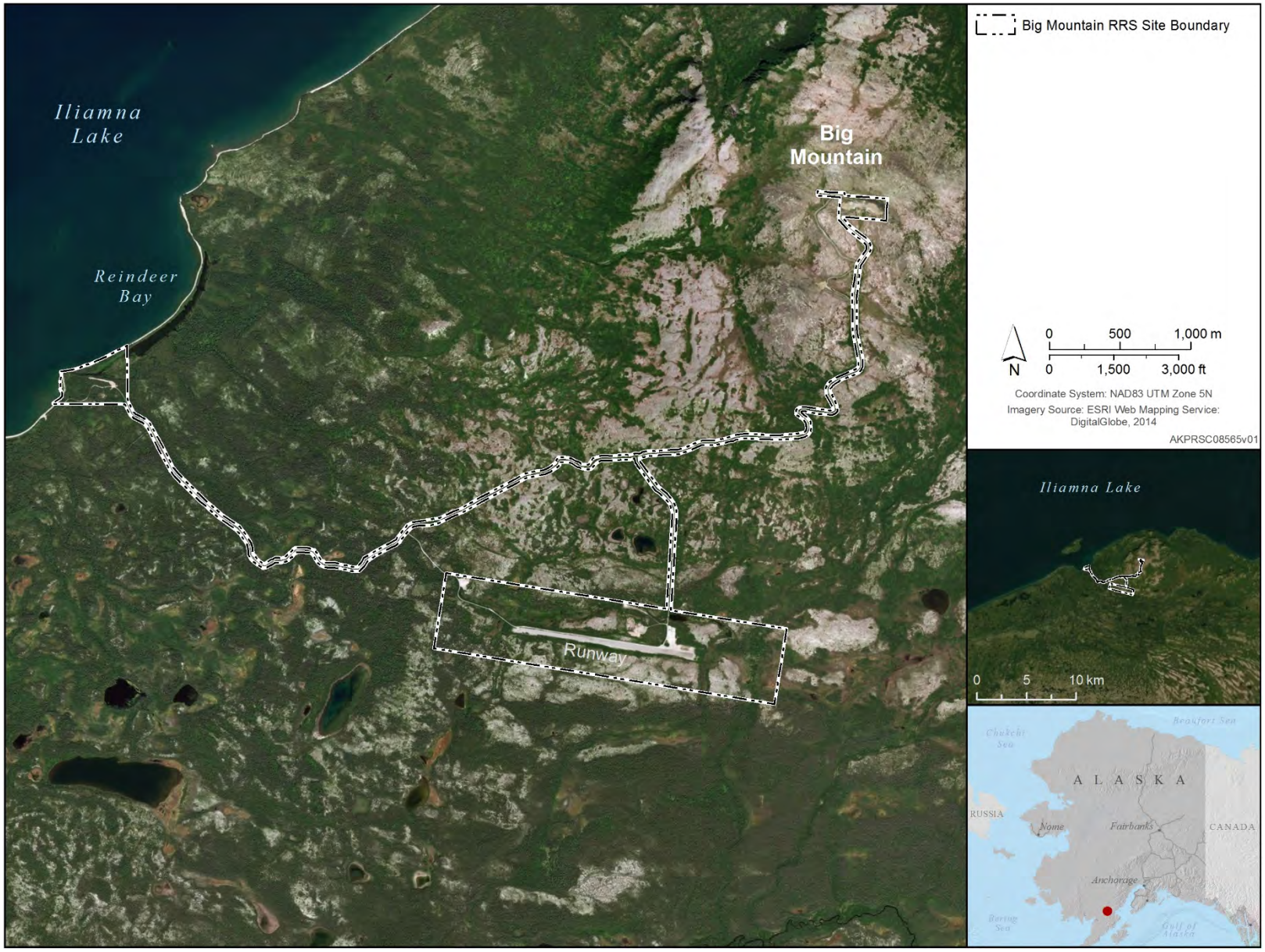

Figure H-150. Overview of the Former Big Mountain RRS

H.26.3 Military Mission

The former Big Mountain RRS is now closed; see Section H.26.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is currently scheduled for 2022.

H.26.4 Surrounding Communities

The Big Mountain site is in a remote area on the south shore of Iliamna Lake about 17 miles west of Kokhanok. Kokhanok is a fishing village with a 2018 estimated population of 168 consisting of 92% Alaska Native, primarily Alutiiq and Yup'ik. There is a state-owned gravel airstrip and a seaplane base at the village. The school is the largest employer in Kokhanok. People heavily rely on subsistence activities; many families have a summer fish camp near the Gibraltar River. Salmon, trout, grayling, moose, bear, rabbit, porcupine, and seal are utilized. Subsistence activities are a focal point of the culture and lifestyle (State of Alaska 2018, 2019).

H.26.5 Regional Land Use

The surrounding lands consist of state and local government lands. Subsistence and commercial fishing, as well as sport fishing and hunting, are the primary regional land uses.

H.26.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the the Big Mountain site.

H.26.7 Physical Environment

H.26.7.1 Climate

The Big Mountain site and the Iliamna Lake region have a continental climate typical of the Interior Basin of Alaska with long, cold winters and shorter, warm summers. Wind storms and ice fog are common during winter. Average summer high temperatures are in the upper 50s and low 60s °F; winter low temperatures average 10 to 20 °F. Precipitation averages 26 inches annually, with 60 inches of snow (Table H-115).

Table H-115. Monthly Climatic Averages for Iliamna Airport, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	22.6	25.5	29.5	39.2	50.6	59.0	62.5	61.0	54.1	40.8	29.9	23.1
Avg. Low (ºF)	9.9	11.7	14.4	24.9	35.3	43.2	48.3	48.1	41.7	29.3	18.4	10.5
Avg. Precipitation (inches)	1.3	1.1	1.1	1.0	1.2	1.5	2.7	4.6	4.4	3.1	2.0	1.5
Avg. Snowfall (inches)	10.8	9.5	9.8	5.3	1.0	0	0	0	0	2.5	8.5	11.8

Note: Iliamna Airport, 28 miles north-northeast of the Big Mountain site, is the closest meteorological station.
Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.26.7.2 Topography

The immediate area around the Big Mountain site is characterized by knob and kettle topography (SAIC 1993b). The region is dominated by the Alaska Peninsula Aleutian Mountain Range to the east and the relatively flat kettle-type terrain to the west. Upper Camp is on the peak of Big Mountain at 2,160 ft MSL. Lower Camp, including the airstrip and barge landing on Iliamna Lake, lies at 50 ft MSL. The Lower Camp and airstrip are on an east-west orientation below the southern slope of Big Mountain.

H.26.7.3 Geology and Soils

Virtually all geologic history in the Big Mountain area is centered on volcanic activity. Most bedrock in the area is composed of volcanic rock of Tertiary age, and glacial debris mantles much of the area. Most

rocks are informally classified as basalt, andesite, tuff, and volcanic rubble. Unconsolidated deposits consist of sandy, cobbley gravels. Cobbles and gravels are predominantly composed of well-rounded granitic rocks with some angular and subangular volcanic rocks. Sands in the area are rich in quartz with variable occurrences of silt (DOWL/Ogden Joint Venture 1998).

Soils at the Big Mountain site are classified as Typic Cryandepts, which are commonly associated with very gravelly, hilly to steep-rough mountainous land. Soils are shallow, well-drained volcanic ash over very gravelly glacial till on valley sides and rounded hills. Soils consist of 10-20 inches of dark brown loamy volcanic ash over dark brown, very gravelly loam under a mat of litter and roots. Soils are strongly acid. Generally, there is little or no soil cover on mountain peaks and ridges (DOWL/Ogden Joint Venture 1998).

H.26.8 Hydrology

Iliamna Lake is the largest body of surface water in the area. Regional drainage tends to flow towards the lake or north-northwest in the area surrounding the site. Big Mountain is a topographic high point and is predominantly rocky and devoid of surface water bodies. A radial drainage pattern is apparent on Big Mountain, and the area surrounding the site can be classified as multibasinal. This drainage pattern is heavily influenced by glacial deposition and discontinuous permafrost, giving it the characteristically hummocky, knob and kettle topography. Water from Upper Camp follows one of several unnamed intermittent streams. Water draining from the northern, northwestern, and northeastern sides of the mountain enters these unnamed streams and empties directly into Iliamna Lake. Water from the western and southern sides of the mountain drains into the Belinda Creek drainage basin, flowing down tributaries into Belinda Creek, which empties into Iliamna Lake (SAIC 1993b).

Ground water in the vicinity of the site most likely occurs within joints and fractures of underlying volcanic rocks, within the matrix of more permeable deposits, and along bedding planes of these deposits. Depth to ground water is unpredictable. Ground water discharge at topographic lowpoints, including seeps, marshes, and shallow ponds, suggests a near surface shallow aquifer under unconfined conditions. Discontinuous permafrost in the area may impede downward and lateral movement of ground water and may also act as a confining layer. It appears ground water gradients mirror surface water flow, draining radially from the Upper Camp area and in a western and southwestern direction from Lower Camp and the airstrip area (DOWL/Ogden Joint Venture 1998).

H.26.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Big Mountain site. Attachment 12 contains lists of vascular plants (Table H-111), fish (Table H-112), mammals (Table H-113), and birds (Table H-114) known to occur or potentially occurring in the Big Mountain area. ESA-listed species that may occur at or in the vicinity of the Big Mountain site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.26.9.1 Ecoregion Classification

The Big Mountain site is located in the Alaska Peninsula ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.26.9.2 Vegetation/Habitat

A general vegetation map of the Big Mountain site has not been prepared. The Upper Camp area is above tree line and is generally barren in windswept areas. The area surrounding Upper Camp is vegetated with

tundra, including, dryas, grasses, sedges, bryophytes, lichens, and fireweed. Dwarf scrub species, such as mountain avens, heaths, forbs, grasses, and sedges, are common on well-drained slopes and comprise the dominant communities. On lower slopes and along stream banks and drainages, taller scrub communities occur and are dominated by Sitka alder, feltleaf willow, and other willows. Mixed alder and willow communities dominate Lower Camp and around the airstrip (611 ASG 2001d).

H.26.9.3 Wetlands

The current mapping of wetlands at the Big Mountain site is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note: For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.*]

Upper Camp does not contain any wetlands. Several large ponds occur at the base of the mountain close to the access road. A small stream flows just north of the airstrip, and historically several beaver dams built along this stream have created ponds and a marsh area immediately adjacent to the Lower Camp area (DOWL/Ogden Joint Venture 1998). Of the approximate 446-acre Big Mountain site, 14 acres (or 3%) are considered wetlands associated with riverine and lake/pond areas per the NWI mapping (Table H-116 and Figure H-151).

Table H-116. Former Big Mountain RRS Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*[(1)]		2018 ANHP†[(2)]	
	Area (acres)	Proportion	Area (acres)	Proportion
Riverine	6.0	1.3%	4.2	0.9%
Lake	5.6	1.3%	0.7	0.2%
Pond	2.4	0.5%	0	0
Freshwater Emergent	0	0	44.9	10.1%
Freshwater Forested/Shrub	0	0	8.0	1.8%
Wetlands Total	**14.0**	**3.1%**	**57.8**	**13.0%**
Upland	432.3	96.9%	388.5	87.0%
Site Total	**446.3**		**446.3**	

Notes: *See Figure H-151. †See Figure H-152.
Sources: [(1)]USFWS 2019d. [(2)]Flagstad et al. 2018.

H.26.9.4 Fish and Wildlife

H.26.9.4.1 Fish and Amphibians

The network of rivers, streams, and lakes of the Big Mountain area produce some of the world's finest sport fishing and is the largest producer of sockeye salmon in the world. Small intermittent streams that drain into Iliamna Lake may contain such small fish as sculpin, trout in early life stages, and first-year northern pike (DOWL/Ogden Joint Venture 1998). North of the airstrip is an unnamed stream that flows west into Iliamna Lake and supports Arctic char. Iliamna Lake supports chum, coho, chinook, pink and sockeye salmon, Arctic char, Dolly Varden, and whitefish (Johnson and Blossom 2019a) (Table H-94). Wood frogs (*Lithobates sylvaticus*) were observed in small ponds along the access road to Upper Camp during a 1999 site visit (611 ASG 2001c).

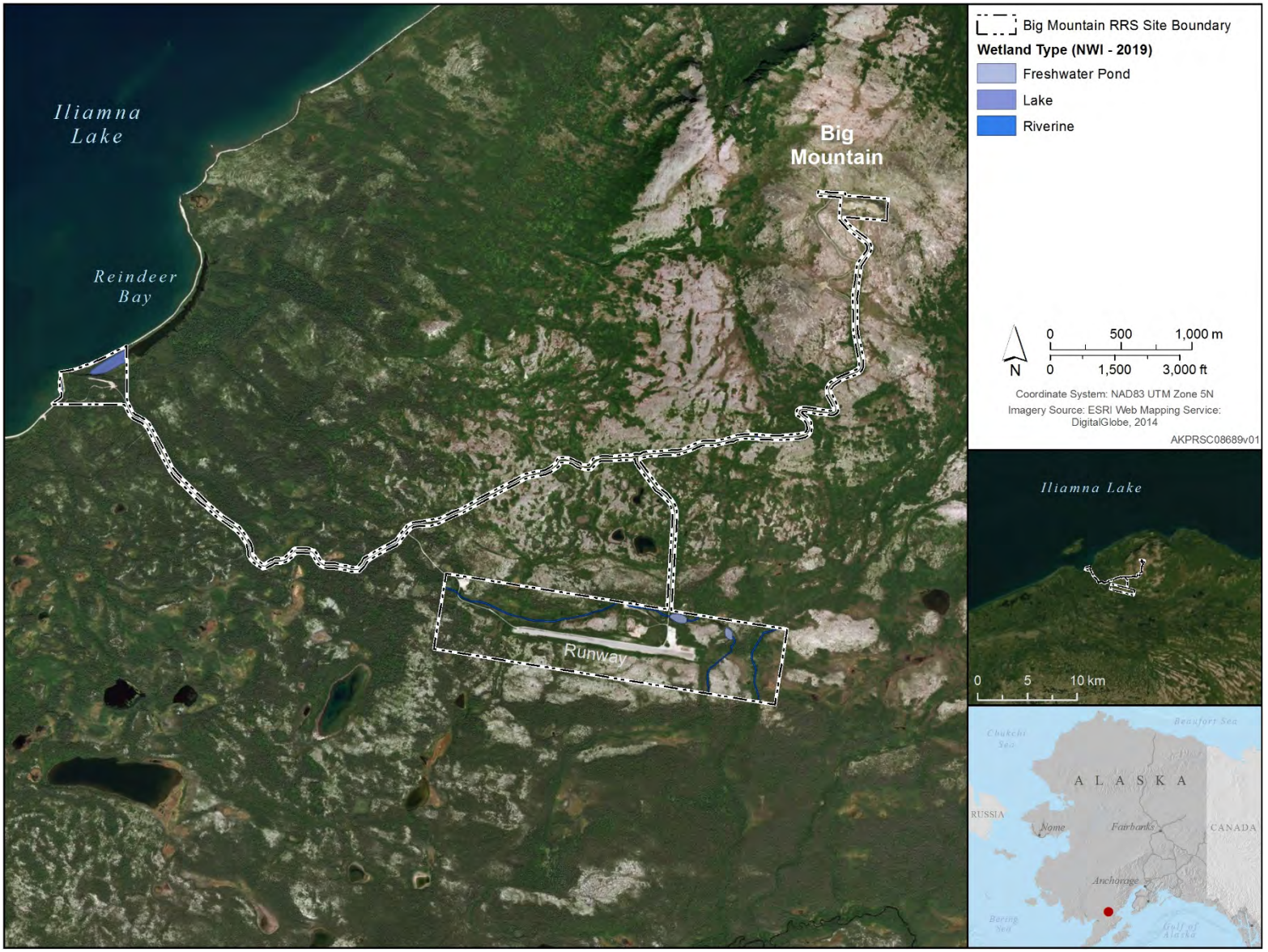

Figure H-151. Former Big Mountain RRS Wetlands (2019 NWI)
(*Source*: USFWS 2019d)

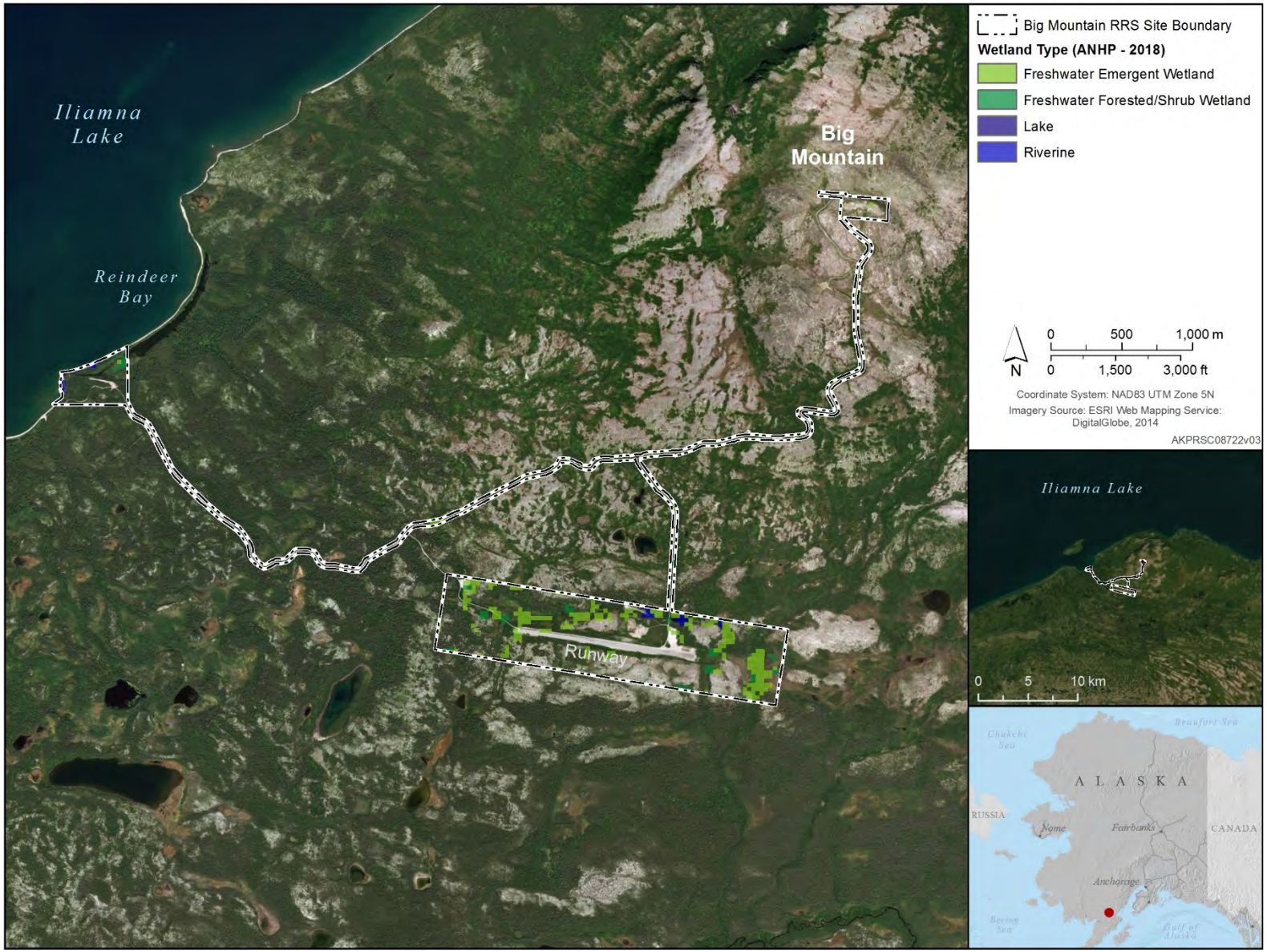

Figure H-152. Former Big Mountain RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.26.9.4.2 Mammals

A total of 33 mammal species have been observed or potentially occur at the Big Mountain site (Table H-95). Large terrestrial mammals in the area include brown bear, caribou, and moose. The Arctic and red fox, wolf, wolverine, and several species of small mammals occur in the area (DOWL/Ogden Joint Venture 1998). The most common small mammal observed during a 1999 site visit was the Arctic ground squirrel (611 ASG 2001c).

H.26.9.4.3 Birds

In general, birds common to the interior or southwestern Alaska are expected to be found in the Big Mountain region and 171 species have been recorded or potentially occur in the Iliamna Lake area (Table H-114). Numerous waterfowl and shorebirds use Iliamna Lake for feeding and resting during migration. Passerine species common to the area include golden-crowned sparrow, Wilson's warbler, orange-crowned warbler, snow bunting, hermit thrush, Canada jay, and common raven. Common game birds in the area include spruce grouse and willow and rock ptarmigan. Bird species commonly observed at Big Mountain include American robin, savannah sparrow, golden-crowned sparrow, white-crowned sparrow, snow bunting, and common redpoll.

H.26.9.5 ESA-listed Species

No ESA-listed candidate species have been reported within the boundaries of the Big Mountain site.

H.26.10 Other Natural Resources Information

H.26.10.1 Subsistence

As stated previously, Kokhanok is the nearest community to the Big Mountain site. Residents of Kokhanok rely heavily on subsistence resources including salmon, trout, grayling, moose, bear, hare, porcupine and seal. The Kokhanok subsistence area encompasses all of Iliamna Lake and extends from Kvichak River in the west to Kamishak Bay in the east and from Naknek Lake in the south to the Tazmina Lakes in the north. The communities of Kokhanok, Iliamna, Newhalen, and Pedro Bay have similar annual rounds of seasonal subsistence activities (Braund and Associates 2004).

H.26.10.2 Outdoor Recreation

Outdoor recreational activities are limited due to the isolated location of the Big Mountain site. As the airfield at the Big Mountain site is no longer maintained, access to the area is limited to water craft via Reindeer Bay on Iliamna Lake and ATV or snowmobile by land.

H.27 DRIFTWOOD BAY RRS (INACTIVE)

H.27.1 Location and Area

The 453-acre Driftwood Bay site is located on the north shore of Unalaska Island in the Aleutian Islands of southwestern Alaska. The site is about 15 miles northwest of Unalaska/Dutch Harbor and 800 miles southwest of Anchorage (Figure H-153). The installation consisted of two separate parcels connected by a dirt access road: Upper Camp supported the radar facilities and is on a hillside about 2 miles west of Lower Camp which provided overall support and an airstrip. The site is within the Alaska Maritime NWR.

H.27.2 Installation History

The Driftwood Bay site was initially developed as a DEW Line station with WACS facilities and became operational in 1961. The original WACS site consisted of Upper Camp and Lower Camp. Upper Camp contained two tropospheric antennas; two receiver antennas; a composite building with dormitories, office space, storage, a vehicle maintenance shop, and equipment for standby power generation; two underground fuel storage tanks; and a water tank. About 2 miles east of the WACS site was Lower Camp with a maintenance building, four above-ground fuel storage tanks, and the airstrip, which has a general north-south orientation. A water supply pump house, an ammunition storage shed, and a fuel pipeline were along an access road that connected Upper Camp and Lower Camp. In 1969 the site was redesignated as an RRS and was then deactivated in 1977. All buildings and structures, with the exception of concrete building foundations and portions of the fuel pipeline, were demolished or removed in 1991. A 3,500-ft dirt runway is still present at the Lower Camp portion of the facility. As part of the demolition in 1991, a permitted landfill was developed to contain building debris and asbestos (611 CES 2011a).

H.27.3 Military Mission

The former Driftwood Bay RRS is now closed; see Section H.27.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is currently scheduled for 2020.

H.27.4 Surrounding Communities

The city of Unalaska/Dutch Harbor is about 15 miles southeast of the Driftwood Bay site. The 2018 estimated population was 4,333 consisting of 43% Asian, 32% white, 6% African American, and 4% Alaska Native. Daily scheduled flights serve the community at the state-owned 3,900-ft long paved runway; a seaplane base is also available. The state ferry operates bi-monthly from Kodiak between April and October. Unalaska's economy is based on commercial fishing, fish processing, and fleet services, such as fuel, repairs, maintenance, trade, and transportation. The community enjoys a strategic position as the center of a rich fishing area and is used for transferring cargo between Pacific Rim trading partners. Dutch Harbor provides a protected port for fishing vessels (State of Alaska 2018, 2019).

H.27.5 Regional Land Use

As the site is within the Alaska Maritime NWR, current regional land use is in accordance with NWR policies and the refuge Comprehensive Conservation Plan (USFWS 1988).

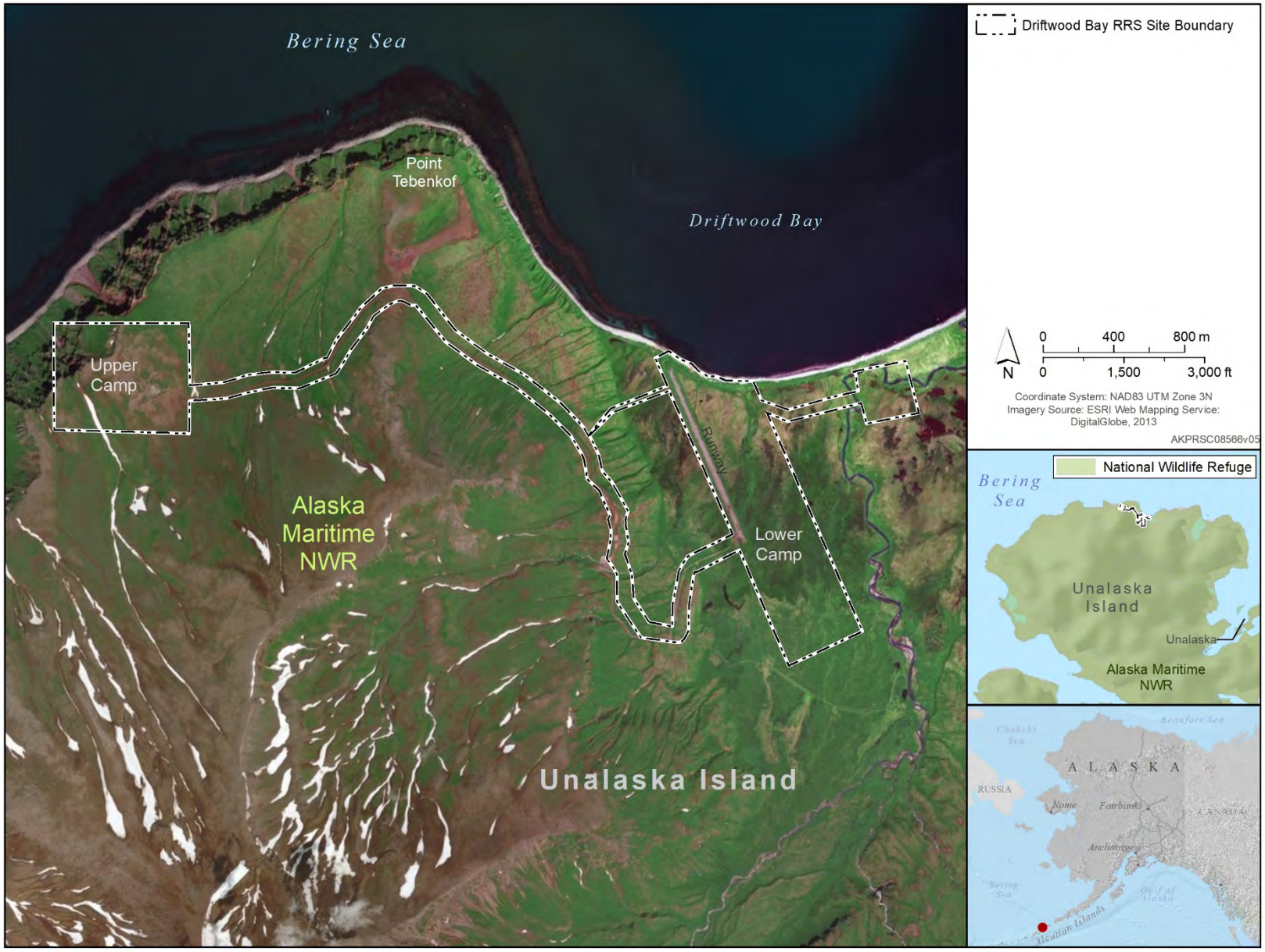

Figure H-153. Overview of the Former Driftwood Bay RRS

H.27.6 Local and Regional Natural Areas

The Driftwood Bay site is within the Alaska Maritime NWR. The Alaska Maritime NWR was established to conserve marine mammals, seabirds and other migratory birds, and the marine resources upon which they rely. The Refuge's 3.4 million acres is spread along most of the 47,300 miles of Alaska's coastline and includes the spectacular volcanic islands of the Aleutian chain, the seabird cliffs of the remote Pribilofs, and icebound lands washed by the Chukchi Sea, providing essential habitat for some 40 million seabirds, representing more than 30 species. Activities focus on long-term ecosystem monitoring, marine resources research, and invasive species management (USFWS 1988).

H.27.7 Physical Environment

H.27.7.1 Climate

The Driftwood Bay site has a cold maritime climate characterized by high humidity, considerable cloudiness, frequent fog, and light rain or snow. Winter low temperatures average in the high 20s and low 30s °F; average summer highs are in the mid- to upper 50s °F (Table H-117). Average annual precipitation is 61 inches. Annual snow accumulation is over 92 inches.

Table H-117. Monthly Climatic Averages for Dutch Harbor Airport, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	36.7	37.4	38.5	40.8	46.0	51.5	56.8	58.8	53.9	47.3	42.5	39.0
Avg. Low (ºF)	28.0	27.8	28.2	31.4	36.7	41.8	45.9	47.6	43.5	37.3	32.1	30.3
Avg. Precipitation (inches)	7.1	6.2	5.2	3.4	4.0	2.5	2.2	2.8	5.5	7.1	6.7	7.9
Avg. Snowfall (inches)	23.8	19.6	16.8	6.8	0.2	0	0	0	0	0.5	7.1	17.4

Note: Dutch Harbor Airport, 15 miles southeast of the Driftwood Bay site, is the closest meteorological station.
Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.27.7.2 Topography

Upper Camp is on a hillside at about 1,275 ft MSL. The most prominent feature on Unalaska Island is the 6,680-ft high active Makushin Volcano, which is about 6 miles southeast of the site. Lower Camp is close to sea level and occupies a gently undulating valley floor.

H.27.7.3 Geology and Soils

Unalaska Island is primarily of volcanic origin from activities of the Makushin Volcano. Oldest deposits are from the Tertiary period consisting of altered and andesitic intrusive and extrusive rocks and sedimentary rocks of similar origin. Granodiorite batholiths and exposed igneous masses are also present. Much of the island is discontinuously veneered by a mantle of volcanic ash, cinders, till, humus, and soil. The latest Makushin Volcano smoke and ash activity occurred in the early 1950s (CH2M Hill 1994b).

Upper Camp is predominantly Makushin volcanics that consist of basalt and andesite lava, argoclastic and minor sedimentary rocks, which are overlain by till of assorted material derived from disintegration of rock and mixtures of ground moraine and layers of ash, lapilli, and cinders. The low-lying ground at Lower Camp is composed of Makushin volcanics and Eider Point basalt of the Tertiary and Quaternary periods, overlain by unconsolidated, recent surficial alluvial, beach, and eolian deposits (CH2M Hill 1994b).

H.27.8 Hydrology

Surface water from Upper Camp generally flows north, via sheetflow and small streamlets, entering the Bering Sea. Water in the Lower Camp area flows into two unnamed creeks, which discharge into Driftwood Bay. These creeks are year-round drainage features fed by snowmelt and subsurface waters. East of the

airstrip is about 0.75 square mile of wet tundra and small shallow ponds. The ponds total about 10 acres (CH2M Hill 1994b).

Only small amounts of water are contained in the unconsolidated material, and the water table is generally found in bedrock. Groundwater recharges the unnamed creeks. The depth to groundwater at the site is unknown. The site is free of permafrost (CH2M Hill 1994b).

H.27.9 Biotic Environment

INRMP Section 2.3 (Biotic Environment) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Driftwood Bay site. Attachment 13 contains lists of vascular plants (Table H-119), fish (Table H-120), mammals (Table H-121), and birds (Table H-122) known to occur or potentially occurring in the vicinity of the site. ESA-listed species that may occur at or in the vicinity of the site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.27.9.1 Ecoregion Classification

The former Driftwood Bay site is located in the Aleutian Islands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.27.9.2 Vegetation/Habitat

A general vegetation map of the Driftwood Bay site has not been prepared. Vegetation at the Driftwood Bay site consists of species associated with alpine, moist, and wet tundra. Alpine tundra is found at higher elevations and is associated with well drained soils, such as the upper site. Various grasses, such as fescue and bentgrass, and lichens and forbs, such as aster, cinquefoil, and lupine, colonize barren areas exposed to wind. Sheltered areas support alpine azalea, bearberry, cranberry, moss campion, and mountain avens. Crowberries, coltsfoot, and yarrow are found occasionally in select areas. Moist tundra is the predominant habitat type at the Driftwood Bay site. The moist tundra community consists of a well developed mat of mosses with sedges, tufted grasses, and forbs growing in the base mat. Crowberries, blueberries, bistort, lousewort, monkshood, violets, ferns, and wormwood are also found in these communities. Beach areas are dominated by ryegrass, which is mixed with fescues, bluegrasses, and seabeach senecio. On dunes and higher beach sands, cow parsnips, angelica, and cinquefoil may also be found. There are no trees on the site, and the few shrubs consist of willows. Fireweed can be found scattered over drier areas (Selkregg 1984).

H.27.9.3 Wetlands

Of the approximate 453-acre Driftwood Bay site, 15 acres (or 3%) are considered wetlands associated with riverine and lake/pond areas per the 2018 ANHP mapping (Table H-118 and Figure H-154).

Table H-118. Former Driftwood Bay RRS Wetland Types Based on 2018 ANHP Data

Wetland Type	Area (acres)	Proportion
Freshwater Emergent	14.7	3.2%
Riverine	0.4	0.1%
Wetlands Total	**15.1**	**3.3%**
Upland	437.6	96.7%
Site Total	**452.7**	

Notes: See Figure H-154.
Source: Flagstad et al. 2018.

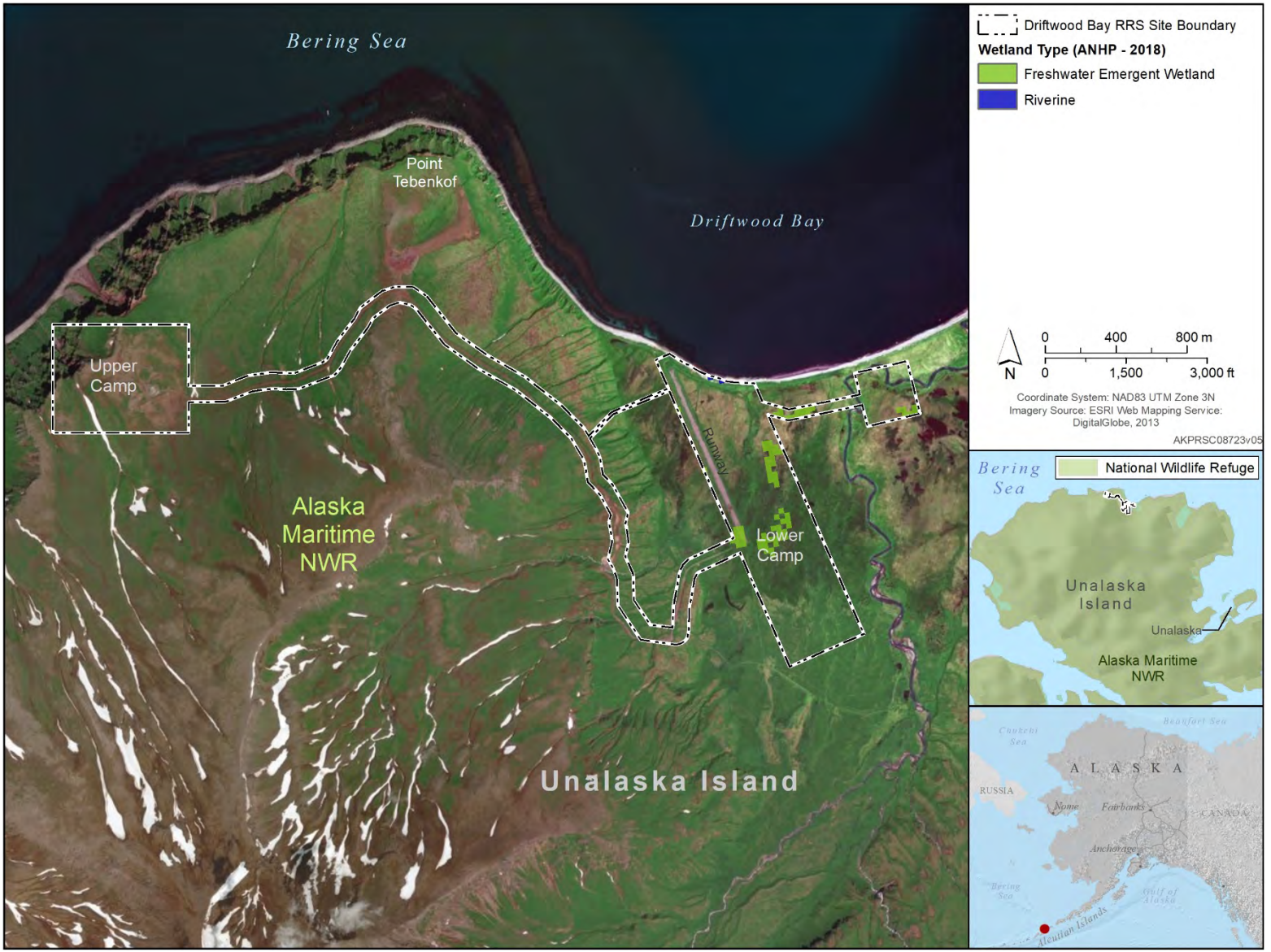

Figure H-154. Former Driftwood Bay RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.27.9.4 Fish and Wildlife

H.27.9.4.1 Fish

There are two anadromous streams to the east of the airstrip, and both support spawning populations of coho and pink salmon (Johnson and Blossom 2019a). Fry and smolt of various species are present in the creeks year-round. Coastal habitats in the Driftwood Bay area provide feeding grounds for Pacific herring (CH2M Hill 1994b).

H.27.9.4.2 Mammals

Terrestrial Mammals

Terrestrial mammals inhabiting Unalaska Island include red fox, Arctic fox, Arctic ground squirrel, collared lemming, and root vole (Table H-121).

Marine Mammals

Two species of dolphin and porpoise, eight species of whale, three species of seal, Steller sea lion, and northern sea otter occur in the Driftwood Bay area (Table H-121). Marine mammals are discussed in detail in Section H.27.9.5 (ESA- and MMPA-listed Species).

H.27.9.4.3 Birds

Pelagic species commonly found in the Unalaska region (Driftwood Bay) include fulmars, cormorants, gulls, kittiwakes, auklets, and puffins birds (Table H-122). Pelagic cormorant, marbled murrelet, and tufted puffin are known to nest on Unalaska Island. Black oystercatcher and rock sandpiper are permanent residents. Turnstones, sandpipers, and phalaropes are common migratory shorebirds. Numerous waterfowl species are found along the eastern Aleutian Islands including Emperor goose, Canada goose, scaup, goldeneye, bufflehead, long-tailed duck, green-winged teal, grebes, common eider, and brant. Bald eagle and common raven are common and gyrfalcon and snowy owls may be seen on occasion (CH2M Hill 1994b).

H.27.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Nine ESA-listed species potentially occur in the vicinity of the former Driftwood Bay RRS: threatened spectacled and Steller's eiders, endangered short-tailed albatross, threatened northern sea otter, endangered Steller sea lion, and endangered humpback, North Pacific right, blue, and fin whales (Table H-121 and Table H-122 and INRMP Table 6). The sea otter, Steller sea lion, and whale species are also listed under the MMPA.

Short-tailed Albatross and Spectacled and Steller's Eiders. All three species may potentially occur in offshore waters during the non-breeding season.

Northern Sea Otter. The northern sea otter is known to occur in Driftwood Bay. In 2009, the USFWS designated all contiguous waters from the mean high tide line to the 20-m depth contour as well as waters within 100 m of the mean high tide line adjacent to Unalaska Island (Figure H-155) (USFWS 2009).

Steller's Sea Lion. The offshore waters of the former Driftwood Bay site are within the Bogoslof Foraging Area which has been designated as Steller sea lion critical habitat (Figure H-156). There are no major Steller sea lion rookeries or haulouts within the immediate vicinity of Driftwood Bay and the species is expected to be a rare visitor to the shoreline of the former RRS site.

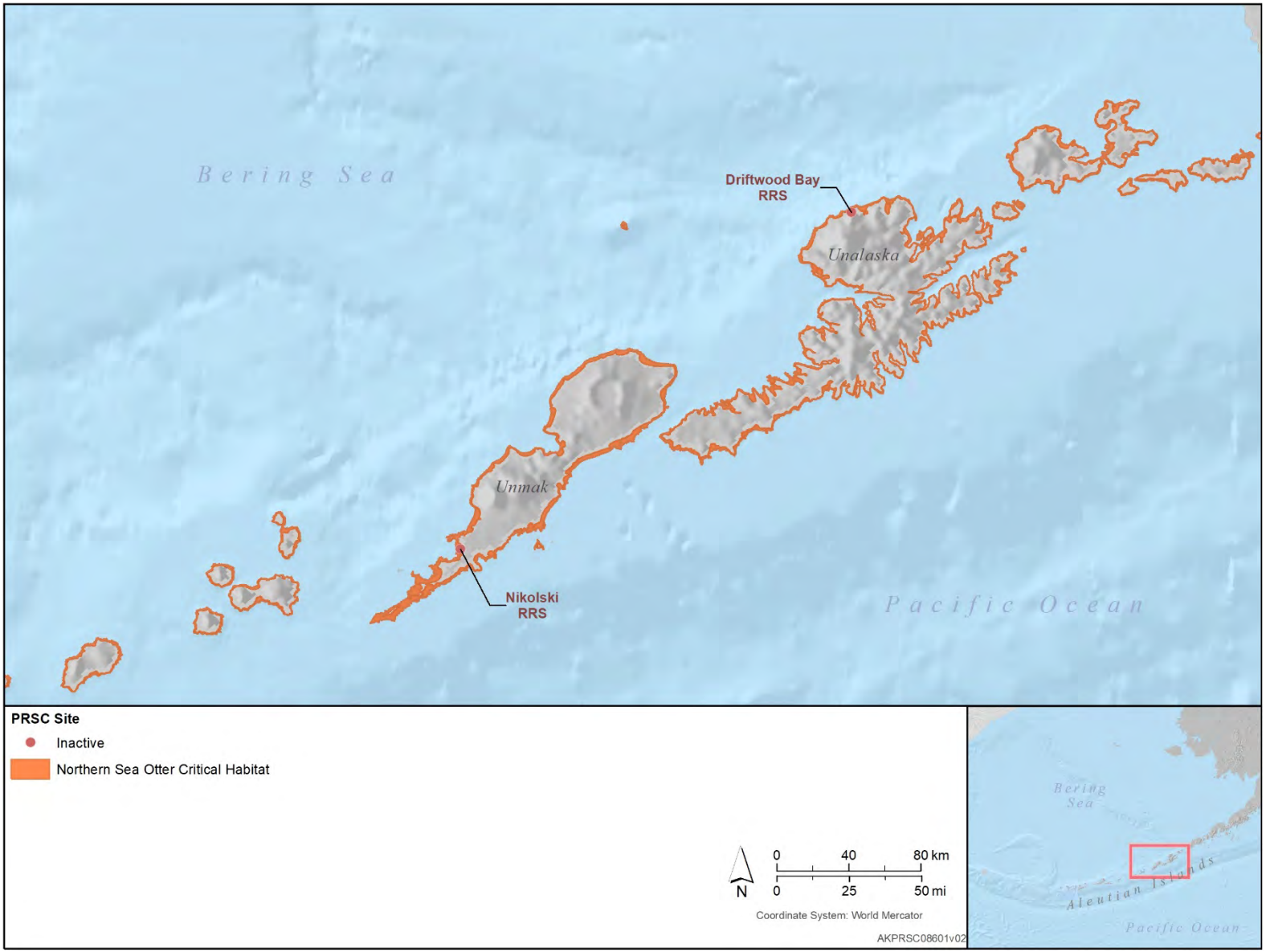

Figure H-155. Northern Sea Otter Critical Habitat within the Vicinity of the Former Driftwood Bay and Nikolski RRS
(*Source*: USFWS 2009c)

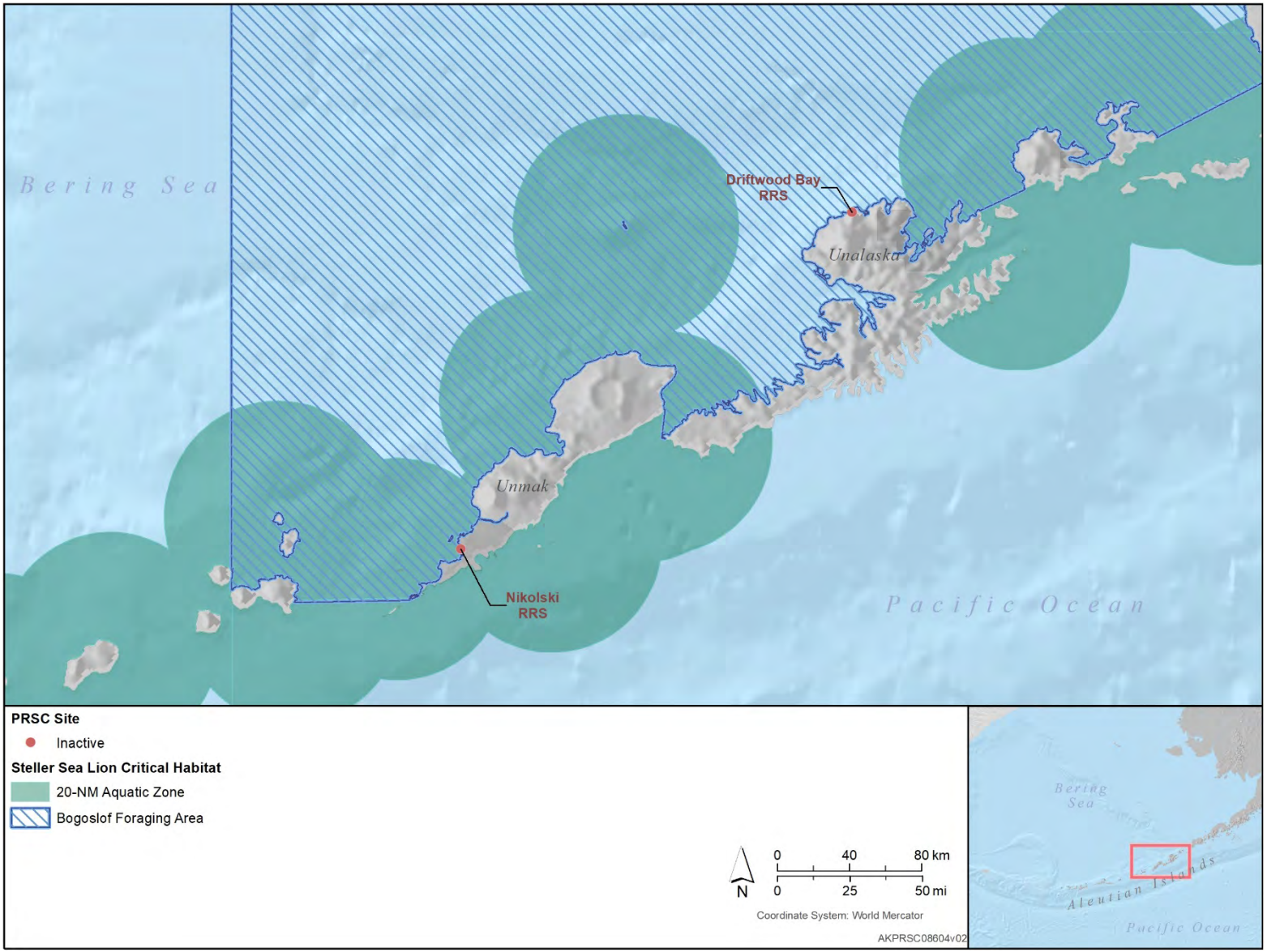

Figure H-156. Steller Sea Lion Critical Habitat within the Vicinity of the Former Driftwood Bay and Nikolski RRS
(*Source*: NMFS 1993)

Humpback, North Pacific Right, Blue, and Fin Whales. These species may be rare visitors to offshore waters.

Other MMPA-listed Species

Baird's and Stejneger's beaked whales, killer whale, gray whale, harbor porpoise, Pacific white-sided dolphin, spotted seal, harbor seal, and northern fur seal may be seen in offshore waters and seals may occassionaly come ashore at Driftwood Bay. Pacific walrus are expected to be rare visitors in the offshore waters.

H.27.10 Other Natural Resources Information

H.27.10.1 Subsistence

Unalaska/Dutch Harbor and are located about 15 miles southeast of the Driftwood Bay site. Almost all subsistence resources harvested by residents of Unalaska are marine-based (marine mammals, fish, and invertebrates). The expense of imported food and local dietary preferences reinforce the importance of subsistence resources to the community. The concentration of resources within the region reduces the need to travel for long distances to acquire food. Residents of Unalaska generally confine subsistence harvest activities to eastern waters of Unalaska Island (Braund and Associates 2004).

H.27.10.2 Outdoor Recreation

Outdoor recreation opportunities available at Driftwood Bay site are limited due to the absence of game species for hunting; fishing in the area is limited to the unnamed creeks and beach fishing along Driftwood Bay. Other activities, such as collection of plants or berries, bird watching, and hiking, are available but are not known to occur at the site.

ATTACHMENT 13: NATURAL RESOURCES OF THE DRIFTWOOD BAY, NIKOLSKI, AND PORT HEIDEN SITES

Table H-119. Vascular Plant Species Observed or Potentially Occurring on or near the Port Heiden (PH), Driftwood Bay (DB), and Nikolski (N) and Sites

Common Name	Scientific Name	PH	DB	N	Observed**
Common yarrow	*Achillea millefolium*	X	X		PH, DB
Sitka alder	*Alnus sinuata*	X			PH
Anaphales margaritacea	*Anaphales margaritacea*		X		DB
Bog rosemary	*Andromeda polifolia*	X			
Rock Jasmine	*Androsace chamaejasme*	X			
Narcissus-flower anemone	*Anemone narcissiflora*	X	X		DB
Northern anemone	*Anemone parviflora*	X			
Yellow anemone	*Anemone richardsonii*	X			
Wild celery	*Angelica lucida*	X	X		PH, DB
Cats paws	*Antennaria monocephala*	X			PH
Lyre-leaf rockcress	*Arabis lyrata*	X			
Pendent grass	*Arctophila fulva*	X			
Alpine bearberry	*Arctostaphylos alpina*	X			PH
Bearberry	*Arctostaphylos uva-ursi*	X	X		PH, DB
Armeria maritima	*Armeria maritjma*	X			PH
Tall meadow arnica	*Arnica chamissonis*	X			
Lessing's arnica	*Arnica lessingii*	X			
Arctic wormwood	*Artemisia arctica*	X			
Purple wormwood	*Artemisia globularia*	X			
Common wormwood	*Artemisia tilesii*	X			
Unalaska wormwood	*Artemisia unalaskensis*		X		DB
Goatsbeard	*Aruncus sylvester*	X			
Siberian aster	*Aster sibiricus*	X			
Northern aster	*Aster subspicatus*	X			
Alpine milk vetch	*Astragalus alpinus*	X			
Hairy arctic milk vetch	*Astragalus umbellatus*	X			
Lady fern	*Athyrium filix-femina*	X	X		DB
Wintercress	*Barbarea orthoceras*	X			PH
Dwarf Arctic birch	*Betula nana*	X			PH
Broomrape	*Boschniakia rossica*	X			
Moonwort	*Botrychium boreale*	X			
Moonwort	*Botrychium lanceolatum*	X			
Moonwort	*Botrychium lunaria*	X			
Rattlesnake fern	*Botrychium virginianum*	X			
Brome	*Bromus inermis*	X			
Bluejoint grass	*Calamagrostis canadensis*	X	X		PH, DB
Reed bentgrass	*Calamagrostis* sp.	X			
Mountain marigold	*Caltha leptosepala*	X			
Marsh marigold	*Caltha palustris*	X			
Bluebell	*Campanula lasiocarpa*	X			
Cuckoo flower	*Cardamine pratensis*	X			
Sedge	*Carex aquatilis*	X			
Sedge	*Carex lyngbyaei*	X			
Sedge	*Carex macrochaeta*	X	X		PH, DB
Alaska cassiope	*Cassiope lycopodiodes*	X			
Starry cassiope	*Cassiope stelleriana*	X			
Paintbrush	*Castilleja* sp.	X			

Table H-119. Vascular Plant Species Observed or Potentially Occurring on or near the Port Heiden (PH), Driftwood Bay (DB), and Nikolski (N) and Sites

Common Name	Scientific Name	PH	DB	N	Observed**
Coastal paintbrush	*Castilleja unalaschensis*	X	X		DB
Bering Sea chickweed	*Cerastrium berringianum*	X			
Chickweed	*Cerastium fischeranum*	X			
Chrysanthemum	*Chrysanthemum bipinnatum*	X			PH
Spring beauty	*Claytonia chamissoi*	X			
Alaska spring beauty	*Claytonia sarmentosa*	X			
Coptis trifolia	*Coptis trifolia*		X		DB
Coral root	*Corallorrhiza trifida*	X			
Bunchberry	*Cornus canadensis*	X			
Lapland cornel	*Cornus suecica*	X			
Pink lady's slipper	*Cypripedium guttatum*	X			
Rose-purple orchis	*Dactylorhiza aristata*	X	X		DB
Deschampsia	*Deschampsia caespitosa*	X			
Mountain avens	*Dryas interifolia*	X			
White mountain avens	*Dryas octopetala*	X			
Wood fern	*Dryopteris dilatata*				
Lyme grass	*Elymus mollis*				
Crowberry	*Empetrum nigrum*	X	X		PH, DB
Fireweed	*Epilobium angustifolium*	X	X		PH, DB
Dwarf fireweed	*Epilobium latifolium*	X			PH
Common horsetail	*Equisetum arvense*	X	X		PH, DB
Horsetail	*Equisetum silvaticum*	X			
Fleabane	*Erigeron humilis*	X			
Arctic fleabane	*Erigeron hyperboreus*	X			
Arctic cotton grass	*Eriophorum scheuchzeri*	X			
Fescue grass	*Festuca altaica*	X			PH
Fescue grass	*Festuca* sp.	X			PH
Indian rice	*Fritillaria camschatcensis*	X			
Northern bedstraw	*Galium boreale*	X			
Whitish gentian	*Gentiana algida*	X			
Wild geranium	*Geranium erianthum*	X	X		PH, DB
Ross avens	*Gerum rossii*	X			PH
Cow parsnip	*Heracleum lanatum*	X	X		PH, DB
Alpine holy grass	*Hierochloe alpina*				
Wild iris	*Iris setosa*	X			
Glaucous weaselsnout	*Lagotis glauca*	X			PH
Vetchling	*Lathyrus palustris*	X			
Narrowleaf Labrador tea	*Ledum decumbens*	X			
Labrador tea	*Ledum palustre*	X			PH
Beach lovage	*Ligusticum scoticum*		X		DB
Twin-flower	*Linnaea borealis*	X	X		DB
Heart-leaf tway blade	*Listera cordata*		X		DB
Alp lily	*Lloydia serotina*	X			
Alpine azalea	*Loiseleuria procumbens*	X			PH
Alaska spirea	*Luetkea pectinata*	X			
Arctic lupine	*Lupinus arcticus*	X			
Nootka lupine	*Lupinus nootkatensis*	X			
Wood rush	*Luzula arcuata*				
Alpine club moss	*Lycopodium alpinum*	X			
Club moss	*Lycopodium clavatum*		X		DB

Table H-119. Vascular Plant Species Observed or Potentially Occurring on or near the Port Heiden (PH), Driftwood Bay (DB), and Nikolski (N) and Sites

Common Name	Scientific Name	PH	DB	N	Observed**
Club moss	*Lycopodium selago*				
Bladder campion	*Melandrium apetalum*	X			
Bogbean (buckbean)	*Menyanthes trifoliata*	X			
Wild snapdragon	*Mimulus guttatus*	X			
Arctic sandwort	*Minuartia arctica*	X			
Alpine mitrewort	*Mitella pentandra*	X			
Grove sandwort	*Moerhingia laterifolia*	X			PH
Alpine forget-me-not	*Myosotis alpestris*	X			
Yellow pond lily	*Nuphar polysepalum*	X			
Blackish oxytrope	*Oxytropis nigrescens*	X			
Oxytrope	*Oxytropis* sp.	X			PH
Alaska poppy	*Papaver alaskanum*	X			
Grass of Parnassus	*Parnassia kotzebuei*	X			PH
Parrya	*Parrya nudicaulis*	X			
Capitate lousewort	*Pedicularis capitata*	X			
Oeder's lousewort	*Pedicularis oederi*	X			
Bumblebee flower	*Pedicularis verticillata*	X			
Frigid coltsfoot	*Petasites frigidus*	X			PH
Aleutian heather	*Phyllodoce aleitica*	X	X		DB
Butterwort	*Pinguicila vulgaris*	X			
Plantago macrocarpa	*Plantago macrocarpa*		X		DB
White bog orchid	*Platanthera convallariaefolia*	X			
Small northern bog orchid	*Platanthera obtusata*	X			
Blue grass	*Poa* sp.	X			
Tall Jacob's ladder	*Polemonium acutiflorum*	X			
Jacob's ladder	*Polemonium pulcherrimum*	X			
Alpine meadow bistort	*Polygonum viviparum*	X	X		PH, DB
Marsh fivefinger	*Potentilla palustris*	X			
Wedge-leafed primrose	*Primula cuneifolia*	X			
Pink pyrola	*Pyrola asarifolia*	X	X		PH, DB
Wintergreen	*Pyrola minor*				
Eschscholtz buttercup	*Ranunculus eschscholtzii*	X			
Buttercup	*Ranunculus* sp.	X			
Kamchatka rhododendron	*Rhododendron camtshaticum*	X	X		DB
Nagoonberry	*Rubus arcticus*	X	X		PH, DB
Cloudberry	*Rubus chamaemorus*	X			
Salmonberry	*Rubus spectabilis*	X	X		DB
Arctic dock	*Rumex arcticus*	X			
Dock	*Rumex graminifolius*	X			
Feltleaf willow	*Salix alaxensis*	X			PH
Arctic willow	*Salix arctica*	X	X		PH, DB
Barclay willow	*Salix barclayi*	X	X		DB
Barren-ground willow	*Salix brachycarpa*	X			
Undergreen willow	*Salix commutata*	X			
Alaska bog willow	*Salix fuscescens*	X			
Grayleaf willow	*Salix glauca*	X			
Oval-leafed willow	*Salix ovalifolia*	X			
Diamondleaf willow	*Salix planifolia pulchra*	X			PH
Netleaf willow	*Salix reticulata*	X			PH
Least willow	*Salix rotundifolia*	X			

Table H-119. Vascular Plant Species Observed or Potentially Occurring on or near the Port Heiden (PH), Driftwood Bay (DB), and Nikolski (N) and Sites

Common Name	Scientific Name	PH	DB	N	Observed**
Sprouting willow	*Salix stolonifera*	X			
Pacific red-elder	*Sambucus callicarpa*	X			
Burnet	*Sanguisorba stipulata*	X	X		PH, DB
Spotted saxifrage	*Saxifraga bronchialis*	X			
Whiplash saxifrage	*Saxifraga flagellaris*	X			
Yellow marsh saxifrage	*Saxifraga hirculis*	X			
Brook saxifrage	*Saxifraga nelsoniana*	X			
Red stemmed saxifrage	*Saxifraga lyalii*	X			
Purple mountain saxifrage	*Saxifraga oppositifolia*	X			
Heart-leaf saxifrage	*Saxifraga punctata*	X			
Thyme-leaved saxifrage	*Saxifraga serpyllifolia*	X			
Roseroot	*Sedum rosea*	X			PH
Marsh fleawort	*Senecio congestus*	X			
Seabeach scenecio	*Senecio pseudo-arnica*	X			
Sibbaldia procumbens	*Sibbaldia procumbens*				
Campion moss	*Silene acaulis*	X			
Goldenrod	*Solidago multiradiata*	X			PH
Ladies' tresses	*Spiranthes romanzoffiana*	X			
Dandelion	*Taraxacum* sp.	X			
False asphodel	*Tofieldia coccinea*	X			PH
Star flower	*Trientalis europea*	X			PH
Arrow grass	*Triglochin maritimum*	X			
Early blueberry	*Vaccinium ovalifolium*	X	X		DB
Bog cranberry	*Vaccinium oxycoccus*	X			
Bog blueberry	*Vaccinium uliginosum*	X			PH
Lowbush cranberry	*Vaccinium vitis-idaea*	X	X		PH, DB
Valerian	*Valeriana capitata*	X			
Two-flowered violet	*Viola biflora*	X			
Alaska violet	*Viola langsdorffii*	X			PH

Table H-120. Fish Species Potentially Occurring on or near the Port Heiden, Driftwood Bay, and Nikolski Sites

Common Name	Scientific Name	Port Heiden	Driftwood Bay	Nikolski
Alaska pollock	*Gadus chalcogrammus*	X	X	X
Arctic char	*Salvelinus alpinus*	X	X	X
Chinook salmon	*Oncorhynchus tshawytscha*	X	X	X
Chum salmon	*Oncorhynchus keta*	X	X	X
Coho salmon	*Oncorhynchus kisutch*	X	X	X
Dolly varden	*Salvelinus malma*	X	X	X
Irish lord	*Hemilepiodotus* sp.	X		
Masked greenling	*Hexagrammos octagrammus*	X		
Ninespine stickleback	*Pungitus pungitus*	X		
Pacific cod	*Gadus macrocephalus*	X	X	X
Pacific halibut	*Hippoglossus stenolepis*	X	X	X
Pacific herring	*Clupea pallasi*	X	X	X
Pacific ocean perch	*Sebastes alutus*	X	X	X
Pacific rainbow smelt	*Osmerus dentex*	X		
Pink salmon	*Oncorhynchus gorbuscha*	X	X	X

Table H-120. Fish Species Potentially Occurring on or near the Port Heiden, Driftwood Bay, and Nikolski Sites

Common Name	Scientific Name	Port Heiden	Driftwood Bay	Nikolski
Rainbow trout	*Oncorhynchus mykiss*	X		X
Sablefish	*Anoplopoma fimbria*		X	X
Saffron cod	*Eleginus gracilis*	X		
Sockeye salmon	*Oncorhynchus nerka*	X	X	X
Surf smelt	*Hypomesus pretiosus*	X		
Three-spined stickleback	*Gasterosteus aculeatus*	X		
Whitespotted greenling	*Hexagrammos stelleri*	X		
Yellowfin sole	*Limanda aspera*	X	X	X

Sources: Morrow, 1980; Robbins et al. 1991; Cansler 1993; CH2M Hill 1993b; 1994b, c, e; 611 ASG 1997, 1998a, 1999d, 2000b, c; Johnson and Blossom 2019c.

Table H-121. Mammal Species Potentially Occurring on or near the Port Heiden, Driftwood Bay, and Nikolski Sites

Common Name (ESA Status)‡	Scientific Name	Port Heiden	Driftwood Bay	Nikolski
TERRESTRIAL				
Alaskan hare	*Lepus othus*	X		
American beaver	*Castor canadensis*	X		
American mink	*Neovison vison*	X		
American pygmy shrew	*Sorex hoyi*			
Arctic fox	*Alopex lagopus*	X	X	X
Arctic ground squirrel	*Spermophilus parryii*	X*	X	X
Brown bear	*Ursus arctos*	X**		
Canadian lynx	*Lynx canadensis*	X		
Caribou	*Rangifer tarandus*	X**		X
Cinereus shrew	*Sorex cinereus*	X		
Common muskrat	*Ondatra zibethicus*	X		
Ermine	*Mustela erminea*	X		
Least weasel	*Mustela nivalis*	X		
Meadow jumping mouse	*Zapus hudsonius*	X		
Meadow vole	*Microtus pennsylvanicus*			
Moose	*Alces americanus*	X		
Nearctic brown lemming	*Lemmus trimucronatus*	X		
Nearctic collared lemming	*Dicrostonyx groenlandicus*		X	X
North American porcupine	*Erethizon dorsata*	X		
North American river otter	*Lontra canadensis*	X		
Northern bog lemming	*Synaptomys borealis*	X		
Northern red-backed vole	*Myodes rutilus*	X		
Red fox	*Vulpes vulpes*	X	X	X
Red squirrel	*Tamiasciurus hudsonicus*			
Root vole	*Microtus oeconomus*		X	X
Vagrant shrew	*Sorex vagrans*	X		
Wolf	*Canis lupus*	X		
Wolverine	*Gulo gulo*	X		
MARINE†				
Baird's beaked whale	*Berardius bairdii*	X	X	X
Blue whale (E)	*Balaenoptera musculus*	X	X	X
Common minke whale	*Balaenoptera acutorostrata*	X	X	X
Fin whale (E)	*Balaenoptera physalus*	X	X	X

Table H-121. Mammal Species Potentially Occurring on or near the Port Heiden, Driftwood Bay, and Nikolski Sites

Common Name (ESA Status)‡	Scientific Name	Port Heiden	Driftwood Bay	Nikolski
Gray whale (E N Pacific)	*Eschrichtius robustus*	X	X	X
Harbor porpoise	*Phocoena phocoena*	X	X	X
Harbor seal	*Phoca vitulina*	X	X	X
Killer whale	*Orcinus orca*	X	X	X
North Pacific right whale (E)	*Eubalaena japonica*	X	X	X
Northern fur seal	*Callorhinus ursinus*		X	X
Northern sea otter (T)	*Enhydra lutris*	X	X	X
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	X	X	X
Sperm whale (E)	*Physeter catadon*	X	X	X
Spotted seal	*Phoca largha*	X	X	X
Stejneger's beaked whale	*Mesoplodon stejnegeri*	X	X	X
Steller sea lion (T)	*Eumetopias jubatus*	X	X	X

Notes: ‡E = endangered, T = threatened; * = observed; ** = tracks, den site, bones, or skull observed. †All marine mammals are listed under the MMPA.
Sources: CH2M Hill 1994b, c, e; University of Alaska 1998; 611 ASG 1997, 1999d, 2000b, c; USFWS 2007a.

Table H-122. Bird Species Observed or Potentially Occurring on or near the Port Heiden (PH), Driftwood Bay (DB), and Nikolski (N) Sites

Common Name	Scientific Name	PH	DB	N	Observed*
Alder flycatcher	*Empidonax alnorum*	X			
Aleutian cackling goose	*Branta hutchinsii leucopareia*		X	X	
Aleutian tern	*Onychoprion aleuticus*	X	X	X	
American dipper	*Cinclus mexicanus*	X	X	X	
American golden-plover	*Pluvialis dominica*	X	X	X	PH
American kestrel	*Falco sparverius*	X	X	X	
American pipit	*Anthus rubescens*	X			
American robin	*Turdus migratorius*	X	X	X	PH
American tree sparrow	*Spizelloides arborea*	X			
American wigeon	*Mareca americana*	X	X	X	
Ancient murrelet	*Synthliboramphus antiquum*	X	X	X	
Arctic tern	*Sterna paradisaea*	X	X	X	PH
Baird's sandpiper	*Calidris bairdii*	X	X	X	
Bald eagle	*Haliaeetus leucocephalus*	X	X	X	PH
Bank swallow	*Riparia riparia*	X			
Barn swallow	*Hirundo rustica*	X	X	X	
Barrow's goldeneye	*Bucephala islandica*	X	X	X	
Bar-tailed godwit	*Limosa lapponica*	X	X	X	
Black oystercatcher	*Haematopus bachmani*		X	X	
Black scoter	*Melanitta americana*	X	X	X	
Black turnstone	*Arenaria melanocephala*	X	X	X	
Black-bellied Plover	*Squatarola squatarola*	X	X	X	
Black-billed magpie	*Pica hudsonia*	X			
Black-capped chickadee	*Poecile atricapilla*	X			
Black-legged kittiwake	*Rissa tridactyle*	X	X	X	
Blackpoll warbler	*Setophaga striata*	X			
Blue-winged teal	*Spatula discors*	X	X	X	
Bohemian waxwing	*Bombycilla garrulous*	X			
Bonaparte's gull	*Chroicocephalus philadelphia*	X	X	X	

Table H-122. Bird Species Observed or Potentially Occurring on or near the Port Heiden (PH), Driftwood Bay (DB), and Nikolski (N) Sites

Common Name	Scientific Name	PH	DB	N	Observed*
Boreal chickadee	*Poecile hudsonica*	X			
Brant	*Branta bernicla*	X	X	X	
Bristle-thighed curlew	*Numenius tahitiensis*	X	X	X	
Bufflehead	*Bucephala albeola*	X	X	X	
Canada goose	*Branta canadensis*	X	X	X	
Canada jay	*Perisoreus canadensis*	X			
Canvasback	*Aythya valisineria*	X	X	X	
Cassin's auklet	*Ptychoramphus aleutica*	X	X	X	
Cliff swallow	*Petrochelidon pyrrhonota*	X			
Common eider	*Somateria mollissima*	X	X	X	
Common goldeneye	*Bucephala clangula*	X	X	X	
Common loon	*Gavia immer*	X	X	X	
Common merganser	*Mergus merganser*	X	X	X	
Common murre	*Uria aalge*	X	X	X	
Common raven	*Corvus corax*	X	X	X	PH
Common redpoll	*Acanthis flammea*	X	X	X	PH
Double-crested cormorant	*Phalacrocorax auritus*	X	X	X	
Dunlin	*Calidris alpina*	X	X	X	
Eastern yellow wagtail	*Motacilla tschutschensis*	X	X	X	
Emperor goose	*Anser canagicus*	X	X	X	
Eurasian wigeon	*Mareca penelope*	X	X	X	
Fork-tailed storm-petrel	*Hydrobates furcatus*	X	X	X	
Fox sparrow	*Passerella iliaca*	X	X	X	
Gadwall	*Mareca strepera*	X	X	X	
Glaucous gull	*Larus hyperboreus*	X	X	X	
Glaucous-winged gull	*Larus glaucescens*	X	X	X	PH
Golden eagle	*Aquila chrysaetos*	X	X	X	
Golden-crowned sparrow	*Zonotrichia atricapilla*	X	X	X	PH
Gray-cheeked thrush	*Catharus minimus*	X			PH
Gray-crowned rosy-finch	*Leucosticte tephrocotis*	X	X	X	
Greater scaup	*Aythya marila*	X	X	X	
Greater white-fronted goose	*Anser albifrons*	X	X	X	
Greater yellowlegs	*Tringa melanoleuca*	X	X	X	
Green-winged teal	*Anas crecca*	X	X	X	
Gyrfalcon	*Falco rusticolus*	X	X	X	
Harlequin duck	*Histrionicus histrionicus*	X	X	X	
Hermit thrush	*Hylocichla guttata*	X			
Herring gull	*Larus argentatus*	X	X	X	
Hoary redpoll	*Acanthis hornemanni*	X	X	X	
Horned grebe	*Podiceps auritus*	X	X	X	
Horned lark	*Eremophila alpestris*	X			
Horned puffin	*Fratercula corniculata*	X	X	X	
Hudsonian godwit	*Limosa haemastica*	X	X	X	
King eider	*Somateria spectabilis*	X	X	X	
Lapland longspur	*Calcarius lapponicus*	X	X	X	PH
Leach's storm-petrel	*Hydrobates leucorhous*	X	X	X	
Least auklet	*Aethia pusilla*	X	X	X	
Least sandpiper	*Calidris minutilla*	X	X	X	
Lesser yellowlegs	*Tringa flavipes*	X			
Lincoln's sparrow	*Melospiza lincolnii*	X			

Table H-122. Bird Species Observed or Potentially Occurring on or near the Port Heiden (PH), Driftwood Bay (DB), and Nikolski (N) Sites

Common Name	Scientific Name	PH	DB	N	Observed*
Long-billed dowitcher	*Limnodromus scolopaceus*	X	X	X	
Long-tailed duck	*Clangula hyemalis*	X	X	X	
Long-tailed jaeger	*Stercorarius longicaudus*	X	X	X	
Mallard	*Anas platyrhynchos*	X	X	X	
Marbled godwit	*Limosa fedoa*	X			
Merlin	*Falco columbarius*	X	X	X	
Mew gull	*Larus canus*	X	X	X	PH
Northern fulmar	*Fulmarus glacialis*	X	X	X	
Northern goshawk	*Accipiter gentillis*	X			
Northern harrier	*Circus hudsonius*	X	X	X	
Northern pintail	*Anas acuta*	X	X	X	
Northern saw-whet owl	*Aegolius acadicus*	X			
Northern shoveler	*Spatula clypeata*	X	X	X	
Northern shrike	*Lanius borealis*	X	X	X	
Northwestern crow	*Corvus caurinus*	X	X	X	
Orange-crowned warbler	*Oreothlypis celata*	X	X	X	PH
Osprey	*Pandion haliaetus*	X	X	X	
Pacific golden-plover	*Pluvialis fulva*	X	X	X	PH
Pacific loon	*Gavia pacifica*	X	X	X	
Parakeet auklet	*Cyclorrhynchus psittacula*	X	X	X	
Parasitic jaeger	*Stercorarius parasiticus*	X	X	X	PH
Pectoral sandpiper	*Calidris melanotos*	X	X	X	
Pelagic cormorant	*Phalacrocroax pelagicus*	X	X	X	
Peregrine falcon	*Falco peregrinus*	X	X	X	
Pigeon guillemot	*Cepphus columba*		X	X	
Pomarine jaeger	*Stercorarius pomarinus*	X	X	X	
Red knot	*Calidris canutus*	X	X	X	
Red phalarope	*Phalaropus fulicarius*	X	X	X	
Red-breasted merganser	*Mergus serrator*	X	X	X	
Red-faced cormorant	*Phalacrocroax urile*	X	X	X	
Redhead	*Aythya americana*	X	X	X	
Red-legged kittiwake	*Rissa brevirostris*	X	X	X	
Red-necked grebe	*Podiceps grisegena*	X	X	X	
Red-necked phalarope	*Phalaropus lobatus*	X	X	X	
Red-tailed hawk	*Buteo jamaicenis*	X			
Red-throated loon	*Gavia stellata*	X	X	X	
Rhinoceros auklet	*Cerorhinca monocerata*	X	X	X	
Ring-billed gull	*Larus delawarensis*	X			
Ring-necked duck	*Aythya collaris*	X	X	X	
Rock dove	*Columba livia*	X			
Rock ptarmigan	*Lagopus muta*	X	X	X	
Rock sandpiper	*Calidris ptilocnemis*	X	X	X	PH
Rough-legged hawk	*Buteo lagopus*	X	X	X	
Ruddy turnstone	*Arenaria interpres*	X	X	X	
Rufous hummingbird	*Selasphorus rufus*	X			
Rusty blackbird	*Euphagus carolinus*	X			
Sabine’s gull	*Xema sabini*	X	X	X	
Sanderling	*Crocethia alba*	X	X	X	
Sandhill crane	*Antigone canadensis*	X	X	X	PH
Savannah sparrow	*Passerculus sandwichensis*	X	X	X	PH

Table H-122. Bird Species Observed or Potentially Occurring on or near the Port Heiden (PH), Driftwood Bay (DB), and Nikolski (N) Sites

Common Name	Scientific Name	PH	DB	N	Observed*
Semipalmated plover	*Charadrius semipalmatus*	X	X	X	PH
Semipalmated sandpiper	*Calidris pusilla*	X	X	X	
Sharp-shinned hawk	*Accipiter striatus*	X	X	X	
Sharp-tailed sandpiper	*Erolia acuminata*	X	X	X	
Short-billed dowitcher	*Limnodromus griseus*	X	X	X	
Short-eared owl	*Asio flammeus*	X	X	X	
Short-tailed shearwater	*Ardenna tenuirostris*	X	X	X	
Slaty-backed gull	*Larus schistisagus*	X			
Snow bunting	*Plectrophenax nivalis*	X	X	X	
Snow goose	*Anser caerulescens*	X	X	X	
Snowy owl	*Bubo scandiacus*	X	X	X	
Solitary sandpiper	*Tringa solitaria*	X			
Sooty shearwater	*Ardenna griseus*	X	X	X	
Spectacled eider	*Somateria fisheri*	X	X	X	
Spotted sandpiper	*Actitis macularius*	X			
Spruce grouse	*Falcipennis canadensis*	X			
Steller's eider	*Polysticta stelleri*	X	X	X	
Surf scoter	*Melanitta perspicillata*	X	X	X	
Surfbird	*Calidris virgata*	X	X	X	
Swainson's thrush	*Catharus ustulatus*	X			
Thick-billed murre	*Uria lomvia*	X	X	X	
Tree swallow	*Tachycineta bicolor*	X			PH
Tufted duck	*Aythya fuligula*	X	X	X	
Tufted puffin	*Fratercula cirrhata*	X	X	X	
Tundra swan	*Cygnus columbianus*	X	X	X	
Varied thrush	*Ixoreus naevius*	X			
Violet-green swallow	*Tachycineta thalassina*	X			
Wandering tattler	*Heteroscelus incanus*	X	X	X	
Western sandpiper	*Calidris mauri*	X	X	X	
Whimbrel	*Numenius phaeopus*	X	X	X	
White wagtail	*Motacilla alba*	X			
White-crowned sparrow	*Zonotrichia leucophrys*	X	X	X	PH
White-winged scoter	*Melanitta deglandi*	X	X	X	
Willow ptarmigan	*Lagopus lagopus*	X	X	X	PH
Wilson's phalarope	*Steganopus tricolor*	X			
Wilson's snipe	*Gallinago delicata*	X	X	X	
Wilson's warbler	*Cardellina pusilla*	X			
Winter wren	*Troglodytes hiemalis*	X	X	X	
Wood sandpiper	*Tringa glareola*	X	X	X	
Yellow warbler	*Setophaga petechia*	X	X	X	PH
Yellow-billed loon	*Gavia adamsii*	X	X	X	
Yellow-rumped warbler	*Setophaga coronata*	X	X	X	

H.28 GRANITE MOUNTAIN RRS (INACTIVE)

H.28.1 Location and Area

The former Granite Mountain RRS is on Seward Peninsula about 33 air miles north of the community of Koyuk and 140 air miles northeast of Nome. The facility encompassed 264 acres and consisted of an Upper Camp and Lower Camp connected by an access road (Figure H-157 and Figure H-158).

Figure H-157. Aerial Views of the Former Granite Mountain RRS, Upper Camp (before [top] and after [bottom] demolition)

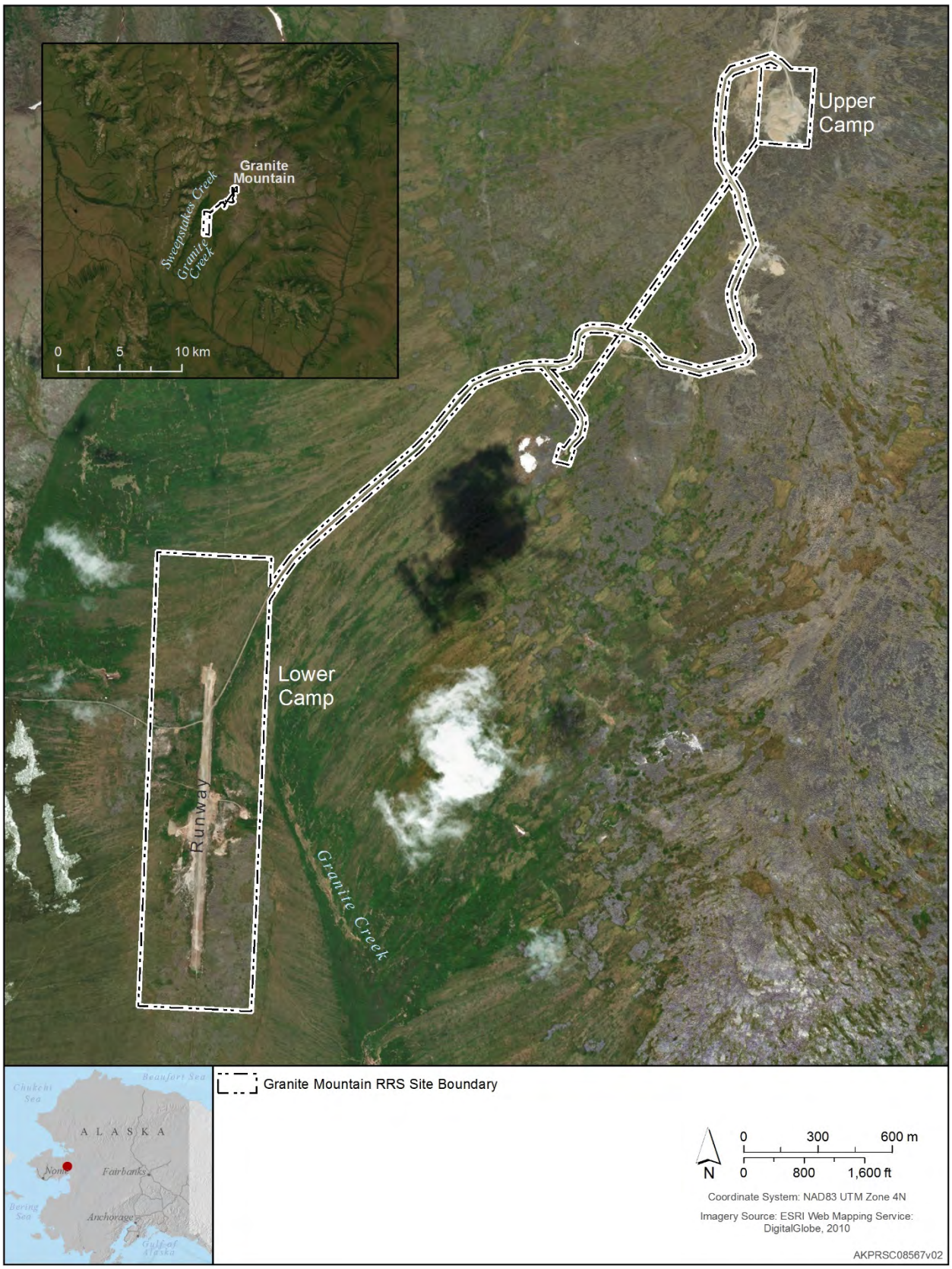

Figure H-158. Overview of the Former Granite Mountain RRS

H.28.2 Installation History

Granite Mountain was 1 of the 31 original WACS sites. When it became operational in 1957, the site was known as the Granite Mountain Communications Station, then renamed Granite Mountain AFS in 1958, then in 1961 became the Granite Mountain RRS. Granite Mountain operated as a combined tropospheric scatter/TD-2 microwave station, which relayed radio information to and from North River, Anvil Mountain, and Kotzebue WACS sites. Granite Mountain was deactivated in 1973. A portion of the facility was leased to Alascom in 1976, and in 1986 the BLM and FAA also leased portions. Abandoned facilities of the Upper Camp include several former disposal areas and a landfill. Abandoned facilities of the Lower Camp include the 4,000-ft gravel runway, and several former disposal areas. Demolition of all structures and remediation of the Granite Mountain site under the Clean Sweep program occurred in 2009 (611 CES 2011b).

H.28.3 Military Mission

The former Granite Mountain RRS is now closed; see Section H.28.2, Installation History.

H.28.4 Surrounding Communities

No persons are thought to live year-round in the area near the Granite Mountain site; however, cabins in the area are used intermittently by miners and hunters. Transportation to the site is primarily limited to aircraft using the Lower Camp's landing strip; however, a trail connects the site to villages to the south (e.g., Koyuk, 33 air miles south of the site).

H.28.5 Regional Land Use

The former Granite Mountain site is surrounded by state lands generally used for subsistence purposes (BLM 2019a).

H.28.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the Granite Mountain site.

H.28.7 Physical Environment

H.28.7.1 Climate

Meterological information for the area of the former Granite Mountain RRS is not available.

H.28.7.2 Topography

The Granite Mountain site is within the Seward Peninsula Physiographic Province, characterized by highlands with rolling topography and gentle slopes. Upper Camp is on Granite Mountain at 2,835 ft MSL. Lower Camp is at about 1,200 ft MSL on a slight north-south oriented ridgeline on the western slope of Granite Mountain.

H.28.7.3 Geology and Soils

The Granite Mountain site is on the Granite Mountain Pluton, which is composed of biotite quartz monzonite rock of mid-Cretaceous age. Outcrops of this unit are a predominant surface feature around the peak of Granite Mountain. The Granite Mountain Pluton is surrounded by an andesitic volcanic unit of early Cretaceous age. This unit is predominantly composed of andesitic trachyandesitic crystal and lithic tuffs, tuffaceous volcanic greywacke, massive andesitic breccia, agglomerate, conglomerate, and intercalated flows of porphyritic pyroxene andesite and basalt. In the vicinity of Granite Mountain these

rocks are characteristically hornfelsic and propylitically altered to a hard, pale green aggregate of chlorite, epidote, calcite, and sodic plagioclase (Jacobs Engineering Group, Inc. 1994).

The Granite Mountain site is in the Pergelic Cryaquepts-Perelic Cryorthents, very gravelly, hilly to steep soil association. The six principal components comprising the association, in order of percent composition in the area, are: Pergelic Cryaquepts, poorly drained; Pergelic Cryaquepts, well drained; Histic Pergelic Cryaquepts, well drained; Histic Pergelic Cryaquepts, poorly drained; Peregelic Ruptic-Histic Cryaquepts; and rough mountain land. Poorly drained soils are found on long uniform slopes, foot slopes, valley bottoms, and steep north-facing slopes. Well drained soils occur on high ridges and steep southfacing slopes. Common frost features are solifluction lobes, frost boils, and stone stripes (Jacobs Engineering Group, Inc. 1994).

H.28.8 Hydrology

Granite Mountain is on a topographic high point and is predominantly rocky and devoid of surface water bodies. Headwaters of many creeks, which are often springs, originate off the flanks of Granite Mountain. Surface water flow originating from rain or snowmelt drains east or west of the Upper Camp into the Peace River or Kiwalik River drainages. Surface water in the area of the Lower Camp drains east and south into Granite and Spring creeks, which are tributaries of Sweepstakes Creek. Sweepstakes Creek discharges into the Peace River (Jacobs Engineering Group, Inc. 1994). Granite Creek is the closest surface water feature to the site (Figure H-158).

Much of the rainfall or snowmelt infiltrates the thin soil layer and enters joints and fractures of underlying granitic rock. These joints and fractures and the extreme topography of the mountain influence the direction of flow. Some groundwater discharges from the mountain at lower elevations in the form of springs, such as a spring about 1.5 to 2 miles northeast of the runway near the access road. Permafrost in the region is almost continuous and ranges in thickness from 15 to more than 260 ft. Surface layers of soil thaw to depths of 1-10 ft. Permafrost serves as a relatively impermeable boundary between any water collected seasonally in the active layer and the underlying subpermafrost aquifer (Jacobs Engineering Group, Inc. 1994).

H.28.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Granite Mountain site. Attachment 11 contains lists of vascular plants (Table H-101), fish (Table H-102), mammals (Table H-103), and birds (Table H-104) known to occur or potentially occurring in the Granite Mountain area. ESA-listed species that may occur at or in the vicinity of the Granite Mountain site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.28.9.1 Ecoregion Classification

The former Granite Mountain RRS is located within the Seward Peninsula Ecoregion. Refer to INRMP Section 2.3.1 (Ecoregion Classification) for details.

H.28.9.2 Vegetation/Habitat

A general vegetation map of the Granite Mountain site has not been prepared. The Granite Mountain area, especially at lower elevations, is composed of gently sloping, non-patterned ground covered with sedge/willow tundra that is wet or moist depending on the microsite. These areas are dominated by such species as *Carex aquatilis*, *C. bigelowii*, *Eriophorum angustifolium*, *E. russeolum*, *Salix planifolia pulchra*, and *S. fuscescens*. These areas alternate with more well-drained sites characterized by drier polygon tundra, typically with boulders in the polygon troughs. These areas are dominated by species, such as *E. vaginatum*,

Betula nana, *Vaccinium vitis-idea*, *V. uliginosum*, and *Rubus chamaemorus*. Small creeks in the area are lined with willow thickets up to 10 ft tall and dominated by *Salix planifolia pulchra* (611 ASG 2001c).

Some surface flow areas, perhaps associated with springs, have water spreading across rocky terrain and result in extensive willow tickets with an understory of wet tundra vegetation. There are substantial areas of frost-heaved boulder talus on steeper slopes that are thickly covered with both crustose lichens and dark-colored foliose lichens. The top of Granite Mountain is primarily granitic boulders and stone polygon tundra. This area is covered with arctic/alpine vegetation, characterized by species such as *Antennaria friesiana*, *Salix phlebophylla*, *Epilobium latifolium*, and *Saxifraga bronchialis* (611 ASG 2001c).

H.28.9.3 Wetlands

Of the approximate 264-acre Granite Mountain site, 51 acres (or 19%) are considered freshwater forested shrub wetlands per the 2018 ANHP mapping (Table H-123 and Figure H-159).

Table H-123. Former Granite Mountain RRS Wetland Types Based on 2018 ANHP Data

Wetland Type	Area (acres)	Proportion
Freshwater Forested Shrub	50.9	19.3%
Upland	213.3	80.7%
Site Total	**264.2**	

Notes: See Figure H-159.
Source: Flagstad et al. 2018.

H.28.9.4 Fish and Wildlife

H.28.9.4.1 Fish

Although the only stream within the Granite Mountain site, Granite Creek, is not listed as an anadromous stream by the ADFG, it does empty into Sweepstakes Creek which eventually flows into the Peace River. The Peace River supports Dolly Varden and chum and pink salmon. In addition, the Kiwalik River, 3 miles west of Lower Camp, also supports Dolly Varden and chum and pink salmon (Johnson and Blossom 2019b).

H.28.9.4.2 Mammals

Large terrestrial mammals inhabiting the area include brown bear, caribou, and moose. The Arctic and red fox, wolf, wolverine, and several species of small mammals potentially occur in the area (Table H-103). The most common small mammal observed on the site during a 1999 site visit was the Arctic ground squirrel. Caribou were also observed during the site visit, and evidence of significant caribou use of the Upper Camp was obvious and may be related to the shade and possible relief from bot flies that the WACS antennas provide (611 ASG 2001c).

H.28.9.4.3 Birds

The moist tundra and brush environment within and adjacent to the site provides nesting and foraging habitat for a variety of bird species (Table H-104). Bird species found breeding in the willow thicket areas include yellow warbler, Wilson's warbler, white-crowned sparrow, and fox sparrow. In open tundra areas Lapland longspur, American golden-plover, Wilson's snipe, and savannah sparrow breed. On the rocky ridge top of the Upper Camp breeding American pipit, northern wheatear, and snow bunting can be found (USFWS 2004b).

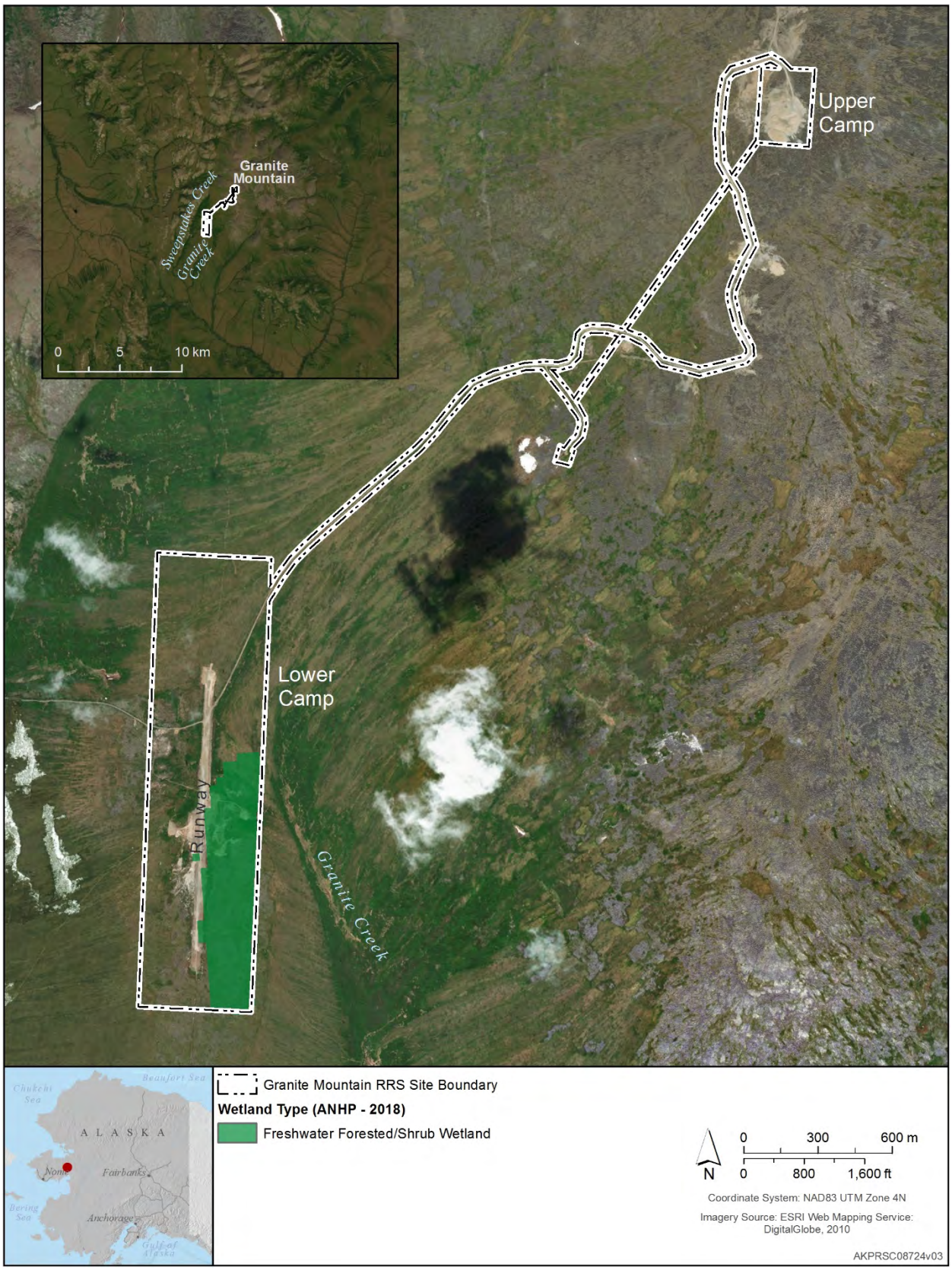

Figure H-159. Former Granite Mountain RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.28.9.5 ESA-listed Species

No ESA-listed candidate species have been reported within the boundaries of the former Granite Mountain RRS.

H.28.10 Other Natural Resources Information

H.28.10.1 Subsistence

The Granite Mountain site is about 33 air miles from Koyuk. Cultural preferences, the relative lack of wage employment, and the expense of imported food and goods all contribute to the importance of subsistence resource harvesting to the community of Koyuk. Main sources of meat are fish, reindeer, seal, beluga, and moose. Participation rates are very high for Koyuk. No subsistence use area data are available for Koyuk (Braund and Associates 2004).

H.28.10.2 Outdoor Recreation

Outdoor recreational activities are limited due to the isolation and location of Granite Mountain. Access to the area is limited, with aircraft providing the only year-round access. Hunters use facilities of the Lower Camp for camping and processing game. Miners in the area may use natural resources on the site periodically.

H.29 KALAKAKET CREEK RRS (INACTIVE)

H.29.1 Location and Area

The former Kalakaket Creek RRS is in west central Alaska about 22 miles south of the City of Galena, 20 miles south of the former Campion AFS, 270 miles west of Fairbanks, and 325 miles north of Anchorage. The site occupies 315 acres on a fairly level mountaintop and consisted of an Upper Camp (radar facilities) and a Lower Camp (airstrip and support facilities) (Figure H-160).

H.29.2 Installation History

Activiated in 1957, the Kalakaket Creek site was 1 of the 31 original WACS sites. Initially called the Kalakaket Creek Communications Station, it was renamed Kalakaket Creek AFS in 1958, and in 1961 became the Kalakaket Creek RRS. Kalakaket Creek operated as a combined tropospheric scatter/TD-2 microwave station, which relayed radio information to and from other WACS sites (Reynolds 1988). The site was deactivated in 1973. Abandoned facilities of Upper Camp included a dormitory/equipment/annex building complex, an equipment maintenance building, six antennas (four tropospheric antennas and two dish antennas), two water storage tanks, two fuel oil storage tanks, and a septic tank. Abandoned facilities of Lower Camp included a temporary garage, a fuel storage tank, 4,000-ft gravel runway, and two former disposal areas. A water supply well and pumphouse, and a former disposal area are located between the Upper and Lower camps. A gravel access road connects Upper and Lower camps (CH2M Hill 1993b). Demolition and remediation of the Kalakaket Creek site under the Clean Sweep program occurred in 2009.

H.29.3 Military Mission

The former Kalakaket Creek RRS is now closed; see Section H.29.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is currently scheduled for 2020.

H.29.4 Surrounding Communities

Galena is the nearest community to the Kalakaket Creek site, about 22 miles north. Refer to Section H.18.4 under the former Campion AFS for details. Access to the site is by air.

H.29.5 Regional Land Use

Regional land use is similar to the former Campion AFS site; refer to Section H.18.5.

H.29.6 Local and Regional Natural Areas

The Koyukuk NWR and the Innoko NWR are near the Kalakaket Creek site. Refer to Section H.18.6 under the discussion of the former Campion AFS for details.

H.29.7 Physical Environment

H.29.7.1 Climate

As the former Kalakaket Creek RRS is 20 miles south of the former Campion AFS, the climate is expected to be similar (see Section H.18.7.1).

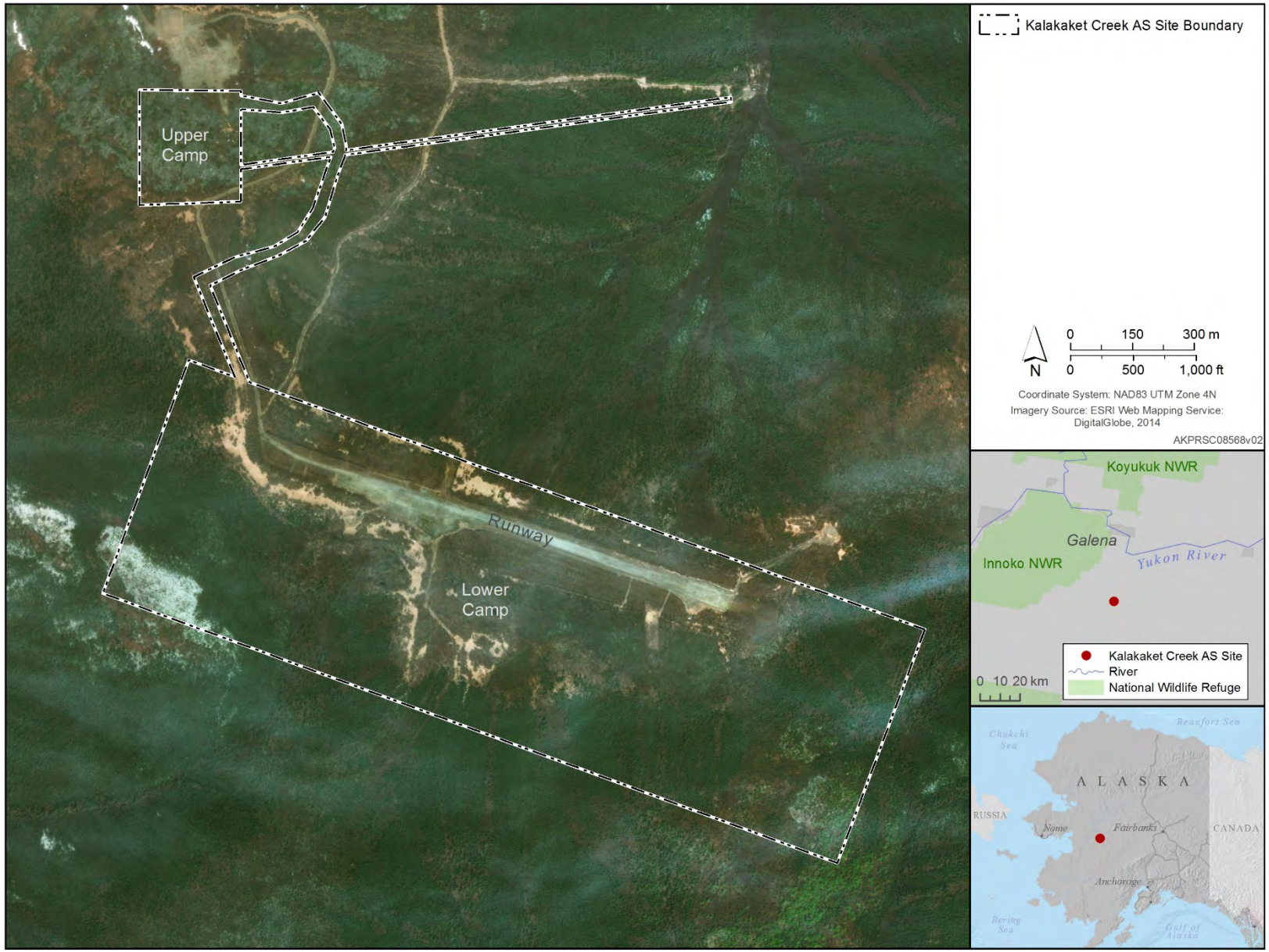

Figure H-160. Overview of the Former Kalakaket Creek RRS

H.29.7.2 Topography

The Kalakaket Creek site is within the Central Yukon Subregion of the Yukon physiographic region. It lies geographically within the drainage area of the Yukon River between the confluence of the Yukon and Tanana rivers and the confluence of the Koyukuk and Yukon rivers (Woodward-Clyde, Inc. 1991c). Upper Camp lies on a fairly level mountaintop at an elevation of about 1,950 ft MSL. The Lower Camp and runway are on a relatively flat bench at an elevation of about 1,700 ft MSL (CH2M Hill 1993d).

H.29.7.3 Geology and Soils

Metamorphosed igneous rocks comprise the surface material at the Kalakaket Creek site. These rocks are underlain by a metamorphic complex of the late Precambrian or early Paleozoic age. The metamorphic complex is composed of quartz-mica schist, quartzitic schist, mica schist albite-chlorite schist, albite-mica schist, ottrelite-mica schist, glaucophane-mica schist, some phyllite, slate, sheared chert, and quartzite (CH2M Hill 1993d).

The Kalakaket Creek site is in the Kuskokwim Highlands, an area generally characterized by soils of the Histic Pergelic Cryaquepts and Typic Cryochrepts association (Reiger et al. 1979). These soil associations are extensive and widespread in the central and eastern parts of interior Alaska and form on broad, low plains, low terraces, and mountain foot-slopes. The soils are associated with alluvial and eolian deposits and consist of silt loam, sandy loam, and gravelly loam, with organic soil coverings. Permafrost in the area of the site is discontinuous (CH2M Hill 1993d).

H.29.8 Hydrology

The Kalakaket Creek site is about 1.6 miles east of Kalakaket Creek. Kalakaket Creek flows north into Kala Creek, which eventually empties into the Yukon River. Both creeks are characterized by low gradient, meandering courses, and spring flooding. Surface water runoff from northern and western portions of the site flows to the north or northwest into a small tributary of Kalakaket Creek. Runoff from the southern portion of the site and the airfield flows toward the southwest into another tributary. Runoff from the eastern and southeastern portions of the site flows to the east into an unnamed creek that flows directly into Kala Creek.

The depth to groundwater at the Kalakaket Creek site is unknown. Due to the proximity to Kalakaket and Kala creeks, a riverbed talik aquifer may exist near the site. Groundwater at shallow depths is likely seasonal due to permafrost at shallow depths. The remaining aquifers beneath the site are subpermafrost aquifers (CH2M Hill 1993d).

H.29.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the Kalakaket Creek site. Attachment 9 contains lists of vascular plants (Table H-84), fish (Table H-85), mammals (Table H-86), and birds (Table H-87) known to occur or potentially occurring in the Kalakaket Creek area. ESA-listed species that may occur at or in the vicinity of the Kalakaket Creek site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.29.9.1 Ecoregion Classification

The Kalakaket Creek site is located in the Kuskokwim Mountains ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.29.9.2 Vegetation/Habitat

A general vegetation map of the Kalakaket Creek site has not been prepared. Vegetation types are typical of the boreal forest or taiga of interior Alaska. White spruce occurs in large stands along rivers where soils are better drained. The vegetative cover of the Kalakaket Creek site is characterized as upland spruce-hardwood forest. This forest consists of fairly dense white spruce, birch, aspen, and balsam poplar. Typical undergrowth includes willow species, alder, ferns, rose, and horsetail (Selkregg 1984).

The incidence of fire in the Yukon-Koyukuk area is one of the highest in Alaska. Lowland areas burn about once every 108 years with a slightly longer fire cycle in upland areas. Fires have set vast areas back to earlier seral stages consisting of aspen, birch, and willow (611 ASG 1999d).

H.29.9.3 Wetlands

Of the approximate 315-acre Kalakaket Creek site, 2 acres (or <1%) are considered freshwater bryophyte wetlands per the 2018 ANHP mapping (Table H-124 and Figure H-161).

Table H-124. Former Kalakaket Creek RRS Wetland Types Based on 2018 ANHP Data

Wetland Type	Area (acres)	Proportion
Freshwater bryophyte	2.1	0.7%
Upland	313.2	99.3%
Site Total	**315.3**	

Notes: See Figure H-161.
Source: Flagstad et al. 2018.

H.29.9.4 Fish and Wildlife

H.29.9.4.1 Fish

Kalakaket Creek provides habitat for chinook salmon. Kala Creek provides habitat for chum and chinook salmon (Johnson and Blossom 2019c).

H.29.9.4.2 Mammals

The area surrounding Kalakaket Creek site supports mammal species typical for interior Alaska (Table H-86). Galena Mountain and Kokrines Hills support caribou from the Western Arctic herd. The marten is one of the most important furbearers to trappers in the Koyukuk area and is widely trapped by local residents (611 ASG 1999d).

H.29.9.4.3 Birds

Some of the more common migratory waterfowl that nest or stop over in the area during migration include American wigeon, mallard, green-winged teal, loons, horned and red-necked grebe, northern pintail, surf and white-winged scoter, and Canada and white-fronted geese. The area also provides habitat for a variety of shorebirds, such as Wilson's snipe, spotted and solitary sandpiper, semi-palmated plover, and occasionally, whimbrel, godwits, and lesser yellowleg can be sighted in the area. Raptors such as bald eagle, osprey, red-tailed hawk, great grey owl, short-eared owl, and peregrine falcon are found in the area. Passerines include American robin, yellow and yellow-rumped warblers, hermit thrush, cliff swallow, and white-crowned sparrow (611 ASG 1999d).

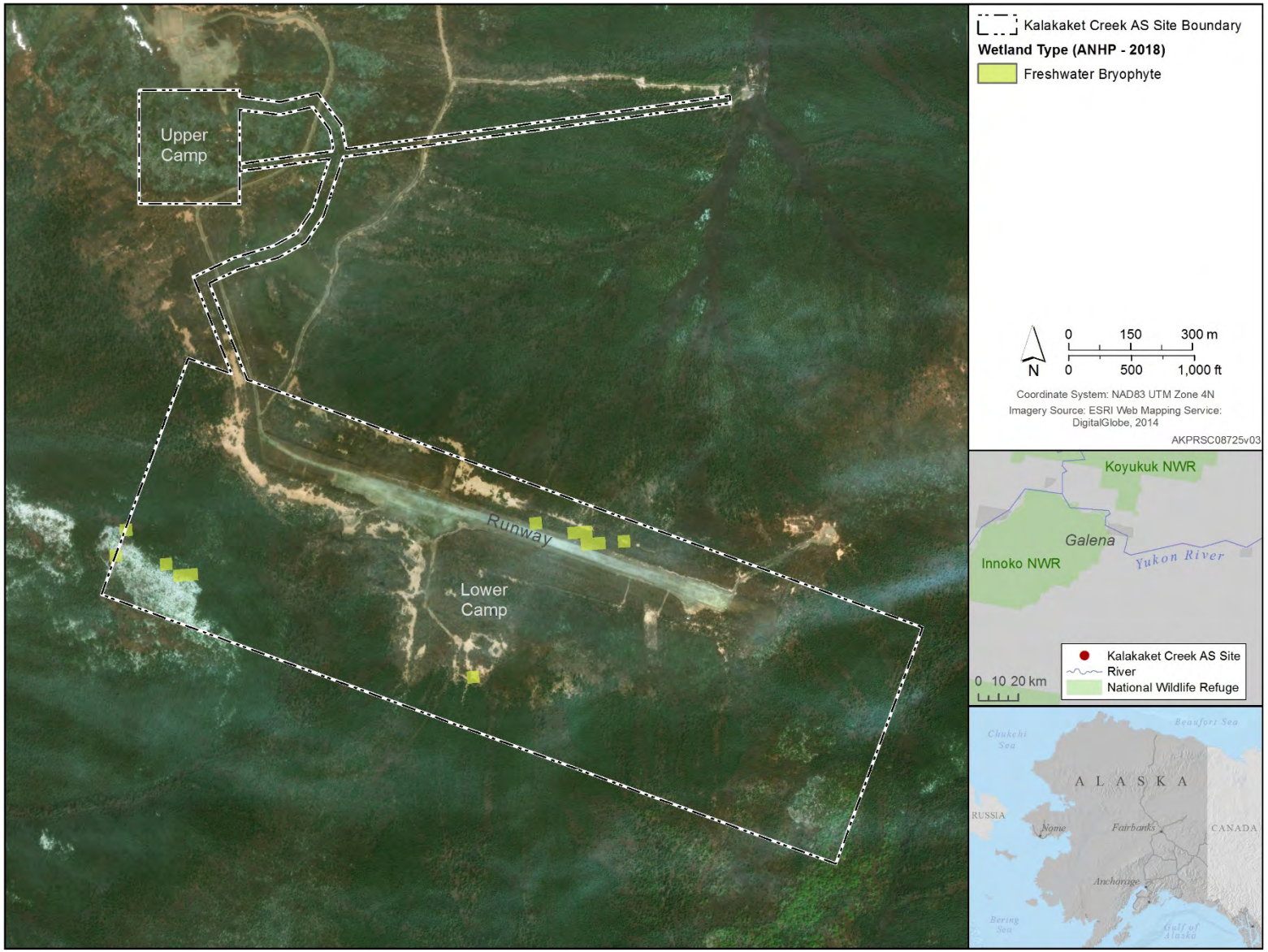

Figure H-161. Former Kalakaket Creek RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.29.9.5 ESA-listed Species

No ESA-listed candidate species have been reported within the boundaries of the Kalakaket Creek site.

H.29.10 Other Natural Resources Information

H.29.10.1 Subsistence

The nearest community to the Kalakaket Creek site is Galena. Refer to the discussion under the former Campion AFS for further details (Section H.18.10.1).

H.29.10.2 Outdoor Recreation

Recreational opportunities at the former Kalakaket Creek site are primarily limited to hunting and trapping. The Lower Camp's runway allows relatively easy access by small plane. The runway may be used during fall and winter hunts by both subsistence and recreational hunters.

H.30 NAKNEK RECREATION ANNEX 1 (RAPIDS CAMP) AND ANNEX 2 (LAKE CAMP) (INACTIVE)

H.30.1 Location and Area

The former Naknek Recreation Annex 1 (Rapids Camp) and Annex 2 (Lake Camp) are located in the northeastern section of the Alaska Peninsula 3 and 6 miles, respectively, east of the King Salmon Airport. The 10-acre Rapids Camp is on the north shore of the Naknek River and 1.5 miles south of the EOD area associated with the King Salmon Airport. The 7-acre Lake Camp is about 400 ft west of the shoreline of Naknek Lake (Figure H-162).

H.30.2 Installation History

The former Naknek Recreation Annexes provided support (recreation facilities) for King Salmon AFS, now called King Salmon Airport. Established and activated in 1949, the former Naknek Rest Camp was later renamed Naknek Recreation Annex #1 and Naknek Recreation Annex #2, and subsequently called Naknek #1 or Rapids Camp and Naknek #2 or Lake Camp.

Rapids Camp was a recreational fishing and camping facility used during 1956-1977. Facilities included a lodge building, recreation building, three support buildings, utility lines, roads, fuel storage tanks, and water tanks (Dynamac Corporation, Inc. 1989c). Remediation at Rapids Camps was completed in 2008.

Lake Camp was a fishing, hunting, and recreation facility used during 1956-76. Facilities included a lodge and a recreation building, waste treatment building, boat storage building, and floating dock. The lodge and recreation buildings were destroyed by fire in 1978 (Dynamac Corporation, Inc. 1989b). The remediation of Lake Camp was completed in 2012.

H.30.3 Military Mission

The former Naknek recreation sites are now closed; refer to Section H.30.2, Installation History. The sites are visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit to Lake Camp is currently scheduled for 2022.

H.30.4 Surrounding Communities

Due to the proximity of the Naknek sites to King Salmon, refer to the King Salmon Airport discussion (Section H.2.4) for details on the surrounding communities.

H.30.5 Regional Land Use

Due to the proximity of the Naknek sites to King Salmon, refer to the King Salmon Airport discussion (Section H.2.5) for details on the regional land use.

H.30.6 Local and Regional Natural Areas

Due to the proximity of the Naknek sites to King Salmon, refer to the King Salmon Airport discussion (Section 0) for details on the local and regional natural areas.

H.30.7 Physical Environment

H.30.7.1 Climate

Due to the proximity of the Naknek sites to King Salmon, refer to the King Salmon Airport discussion (Section H.2.6.1) for details on climate.

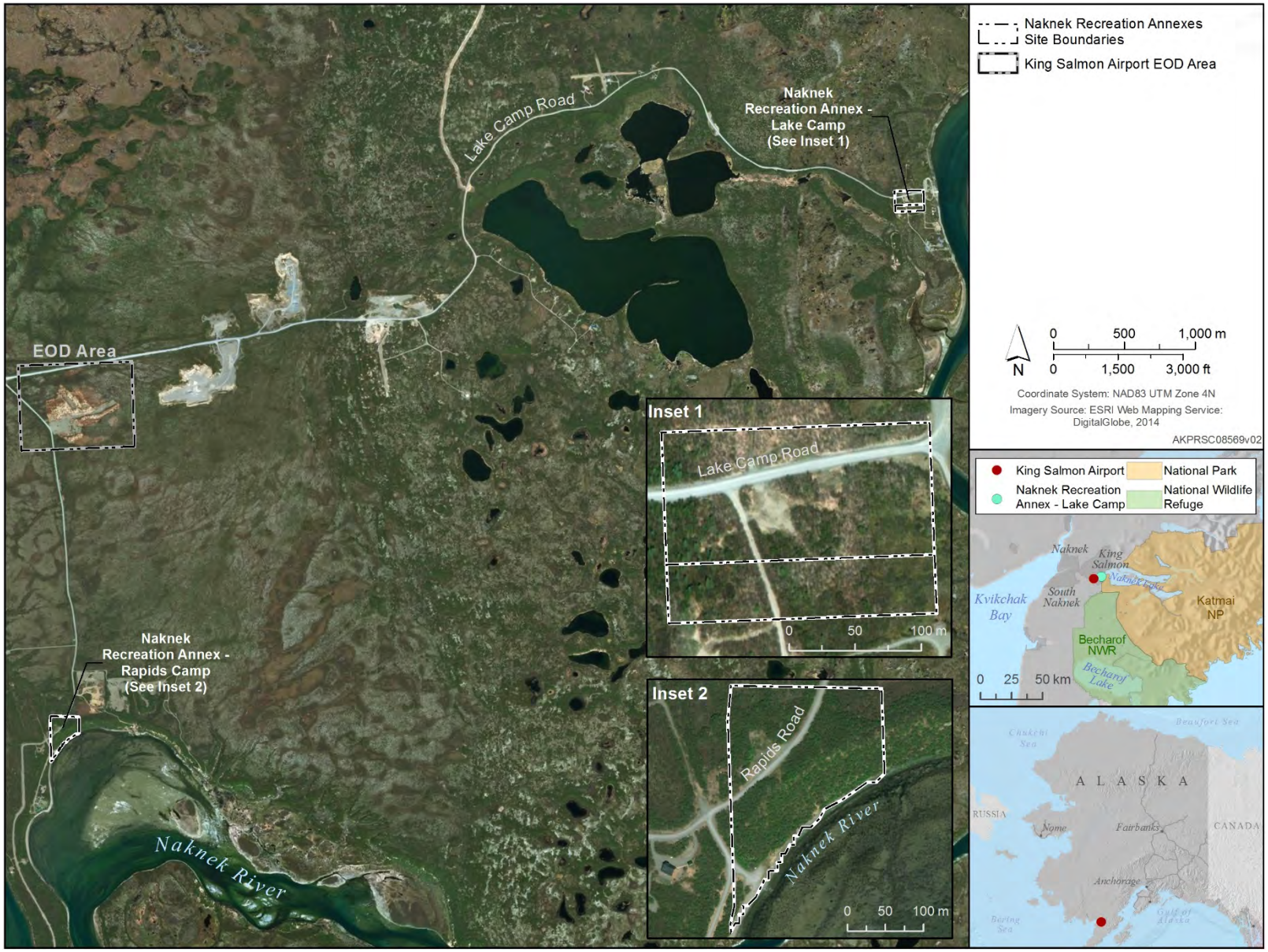

Figure H-162. Overview of the Former Naknek Recreation Annexes

H.30.7.2 Topography

Due to the proximity of the Naknek sites to King Salmon, refer to the King Salmon Airport discussion (Section H.2.6.2) for details on topography.

H.30.7.3 Geology and Soils

The terrace and escarpment of Rapids Camp are composed of unconsolidated glacial outwash deposits of Pleistocene age; the flood plain is composed of unconsolidated recent fluvial deposits. The terrace of Lake Camp overlies morainal deposits of the Iliamna Stade and is composed of thick sand deposits. Soils at the former Naknek recreation sites consist of the Typic Cryandepts-Histic Pergelic Cryaquepts complex (Reiger et al. 1979; Dynamac Corporation, Inc. 1989c).

H.30.8 Hydrology

The Naknek River is a principal drainage feature of the Katmai National Park and flows westward from Naknek Lake to its outfall into Bristol Bay. Surface runoff from Rapids Camp flows south into the Naknek River, and runoff from Lake Camp flows into Naknek Lake. The lower portion of Rapids Camp is within the floodplain of the Naknek River. Lake Camp is beyond the floodplain of Naknek Lake. Further details on the regional hydrology of the King Salmon area can be found in Section H.2.7.

H.30.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the former Naknek recreation sites and the surrounding area. Attachment 12 contains lists of plants (Table H-111), fish (Table H-112), mammals (Table H-113), and birds (Table H-114). ESA- and MMPA-listed Species that may occur at the former Naknek Recreation sitess are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.30.9.1 Ecoregion Classification

The former Naknek recreation sites are located in the Bristol Bay Lowlands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.30.9.2 Vegetation/Habitat

A general vegetation map of the former Naknek recreation sites has not been prepared. The King Salmon area has relatively few trees, and most plants are low-growing and small in size. The moist tundra, a tussock community with a complex plant association, is characterized by a variety of shrubs, herbs, grasses, and sedges, rooted in a continuous mat of lichens and mosses. Grasses and sedges are found in depressions while crowberry, dwarf birch, several willow species, and blueberry are on raised hummocks and hills. In summer the tundra blooms with monkshood, lousewort, buttercup, lupine, fireweed, and other wild flowers (611 ASG 2001d).

All Air Force facilities have been removed from the former Naknek recreation sites. The sites have naturally revegetated with low successional stage species and are dominated by alders. Open areas are dominated by bluejoint grass (611 ASG 2001d).

H.30.9.3 Wetlands

The current mapping of wetlands at the former Naknek recreation sites is based on 2019 NWI data (USFWS 2019d). However, an additional wetlands dataset from the ANHP (Flagstad et al. 2018) has been provided for comparison purposes only. The wetlands discussion will be based on the 2019 NWI mapping. [*Note:*

For this initial draft document, both datasets and associated wetland maps are presented to provide a comparison and to show the availability of an alternate wetlands dataset besides NWI. A discussion as to the reasons for the differences between the two mapping efforts is not provided at this time.]

Of the approximate 17-acre Naknek sites (Lake and Rapids camps combined), 1.5 acres (or 9%) are considered freshwater forested/shrub wetlands per the NWI mapping (Table H-125 and Figure H-163).

Table H-125. Former Naknek Recreation Annexes Wetland Types Based on 2019 NWI and 2018 ANHP Data

Wetland Type	2019 NWI*(1)		2018 ANHP†(2)	
	Area (acres)	Proportion	Area (acres)	Proportion
LAKE CAMP (7.3 acres)				
Freshwater Forested/Shrub	0.7	4.1%	0.6	3.5%
RAPIDS CAMP (9.8 acres)				
Freshwater Forested/Shrub	0.8	4.7%	1.7	9.9%
Riverine	0	0	0.2	1.2%
Wetlands Total	**1.5**	**8.8%**	**2.5**	**14.6%**
Upland	15.6	91.2%	14.6	85.4%
Sites Total	**17.1**		**17.1**	

Notes: *See Figure H-163. †See Figure H-164.
Sources: (1)USFWS 2019d. (2)Flagstad et al. 2018.

H.30.9.4 Fish and Wildlife

H.30.9.4.1 Fish

Due to the proximity of the Naknek sites to King Salmon, refer to the King Salmon Airport discussion (Section H.2.8.4.1) for details on the occurrence of fish within the vicinity of the former Naknek sites. Also refer to Table H-112 for a list of fish species within the vicinity of the former Naknek sites.

H.30.9.4.2 Mammals

Due to the proximity of the Naknek sites to King Salmon, refer to the King Salmon Airport discussion (Section H.2.8.4.2) for details on the occurrence of mammals within the vicinity of the former Naknek sites. Also refer to Table H-113 for a list of mammal species on or within the vicinity of the former Naknek sites.

H.30.9.4.3 Birds

Due to the proximity of the Naknek sites to King Salmon, refer to the King Salmon Airport discussion (Section H.2.8.4.3) for details on the occurrence of birds and the Upper Naknek River IBA (Figure H-23) within the vicinity of the former Naknek sites. Also refer to Table H-114 for a list of bird species on or within the vicinity of the former Naknek sites.

H.30.9.5 ESA- and MMPA-listed Species

No ESA- or MMPA-listed species have been reported within the boundaries of the former Naknek recreation sites.

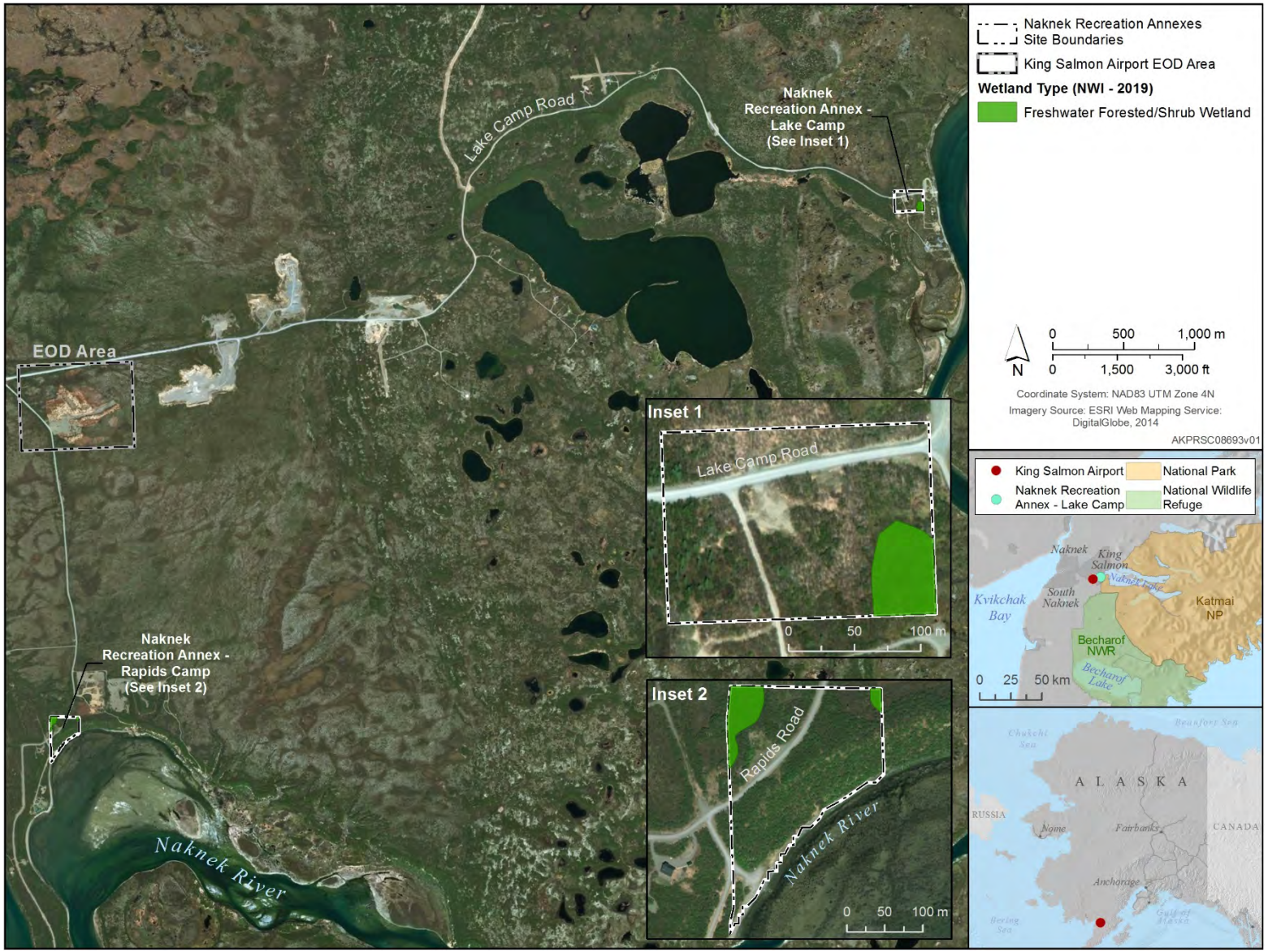

Figure H-163. Former Naknek Recreation Annexes Wetlands (2019 NWI)
(*Source*: USFWS 2019)

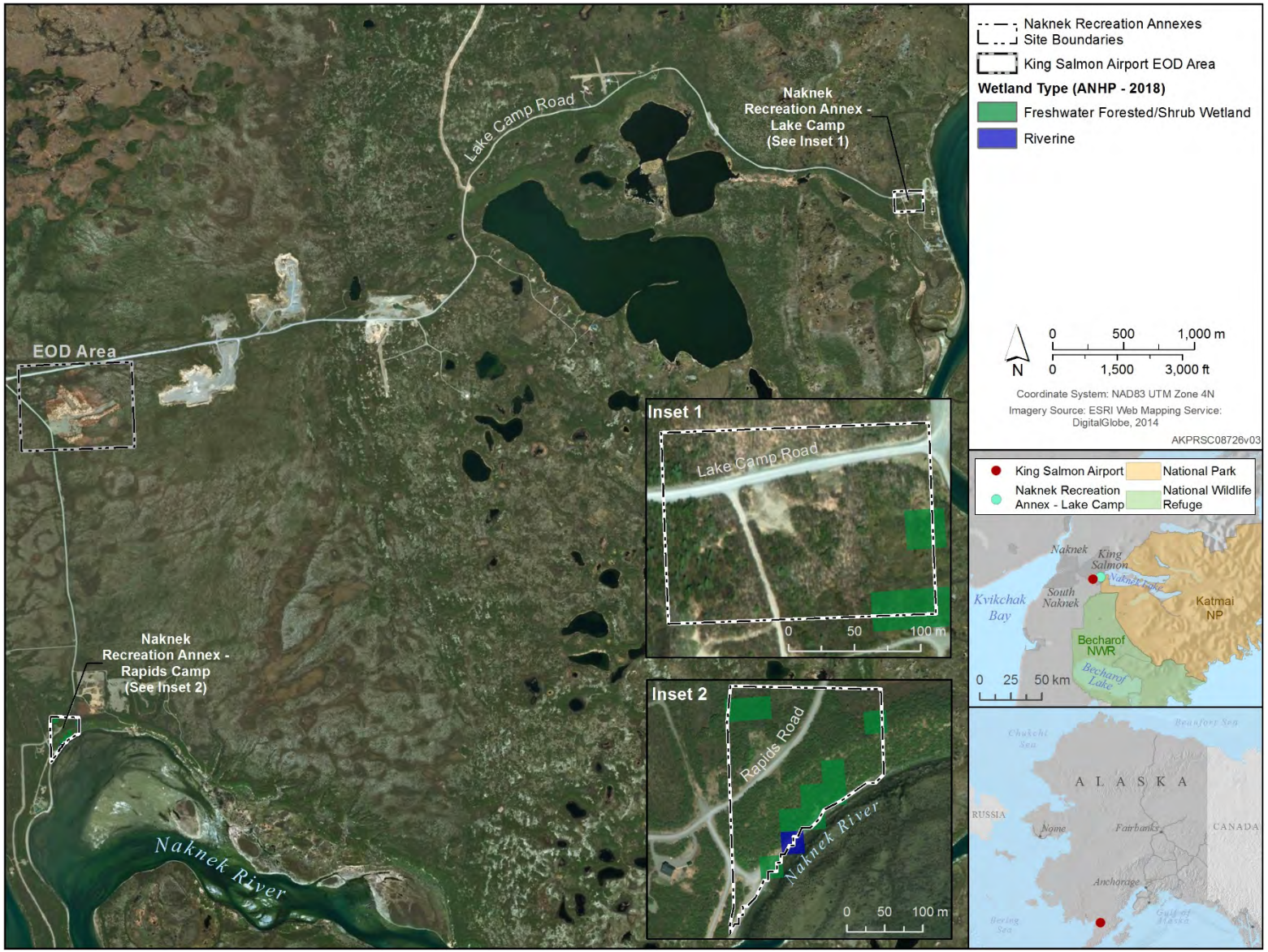

Figure H-164. Former Naknek Recreation Annexes Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.30.10 Other Natural Resources Information

H.30.10.1 Subsistence

Subsistence resources are relied upon by King Salmon residents. Cultural preferences and the relatively high cost of imported food foster continued use of subsistence resources. The importance of subsistence to King Salmon residents is reflected in the high participation rates of households that harvest (88%) subsistence resources. The annual subsistence round at King Salmon is defined by the seasonal salmon runs in local streams. Residents also rely heavily on land mammals. Fish account for 54% and land mammals for 46% of the annual subsistence harvest in terms of total pounds. The importance of subsistence resources is even more significant to residents of Naknek and South Naknek due to the mixed economy of Naknek and the seasonality of wage work at South Naknek (Braund and Associates 2004).

H.30.10.2 Outdoor Recreation

There are no organized outdoor recreation opportunities at the Rapids Camp or Lake Camp. Demand for hunting near the sites consists essentially of big game hunting for caribou, brown bear, and moose. Small game hunting is limited, but hares, grouse, and ptarmigan can be found. Waterfowl staging areas along the Naknek River provide hunting opportunities, and fur trapping occurs in the area. The Naknek River provides recreational fishing opportunities. Various salmon species are targeted, although other species may be taken, such as rainbow trout, Dolly Varden, and northern pike. The Lake Camp parcel is also used as a boating access point for recreational users. A boat ramp at this site is being managed by NPS for transporting fuel and supplies to Katmai National Park.

H.31 NIKOLSKI RRS (INACTIVE)

H.31.1 Location and Area

The former Nikolski RRS is located on the southern portion of Umnak Island in the Aleutian Islands about 900 air miles southwest of Anchorage. The site occupied 432 acres, including access roads and airstrip, with the main facility located 2.3 miles north of the village of Nikolski (Figure H-165). Air Force holdings are within the Alaska Maritime NWR.

H.31.2 Installation History

The Nikolski site was constructed in 1958 and became operational in 1961 as a DEW Line station collocated with WACS facilities. In 1969, the site was redesignated an RRS. The main facility was northern-most parcel and included of four tropospheric antennas; a composite building with dormitories, office space, storage, and equipment for standby power generation; septic system; POL outfall; two underground storage tanks; and four above ground storage tanks. A landfill and a demolition debris disposal area are located about 0.25 mile east of the site. A POL storage and distribution facility was located about 1 mile north of the village of Nikolski and a fuel pipeline extended from the POL tank area to the main site on High Hill. An airstrip, a drum storage area, and a deactivated airstrip lighting vault are adjacent to the village of Nikolski. The Nikolski facility was deactivated in 1977, and most facility buildings and structures were demolished in 1980, including all aboveground structures at the main facility; the remaining structures were demolished and removed in 1998. Nonhazardous and asbestos-containing demolition debris, including building debris and empty drums, were placed into the site demolition landfill. Hazardous materials generated during the 1988 demolition were transported via barge to the Elmendorf AFB. Conveyance of the uncontaminated landing strip property to the village was completed in 2005 (611 CES 2011c).

H.31.3 Military Mission

The former Nikolski RRS is now closed; refer to Section H.31.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visit is currently scheduled for 2020.

H.31.4 Surrounding Communities

The village of Nikolski is adjacent to the airstrip and about 2 miles south of the former main RRS facility. Nikolski has a 2018 estimated population of 18, with 53% Alaska Native (Unangan) and 33% white. The village is reputed to be the oldest continuously occupied community in the world. Access to Umnak Island is only via air or sea. A 3,500-ft unlighted gravel airstrip provides passenger, mail, and cargo service. Although the island has no port facilities, barges deliver cargo once or twice a year. Subsistence activities, sheep and cattle raising, and fishing-related employment sustain the community. Most residents support themselves by working outside the village at crab canneries and on processing ships (Aleutian Pribilof Islands Association 2019; State of Alaska 2018, 2019).

H.31.5 Regional Land Use

Unmak Island is located within and is part of the Alaska Maritime NWR (see next section). The area surrounding Nikolski is generally used for recreation and subsistence purposes.

Figure H-165. Overview of the Former Nikolski RRS

H.31.6 Local and Regional Natural Areas

Unmak Island is located within and is part of the Alaska Maritime NWR. The NWR is spread along most of the 47,300 miles of Alaska's coastline. The refuge includes more than 2,500 islands, islets, spires, rocks, reefs, waters and headlands extending from Forrester Island to the north of Canada's Queen Charlotte Islands deep in the southeastern tongue of the state, to the westernmost tip of the Aleutians, and north to Cape Lisburne on the Arctic Ocean. Alaska Maritime's seashore lands provide nesting habitat for approximately 40 million seabirds, or about 80% of Alaska's nesting seabird population. The refuge hosts seabird populations of both national and international significance. Activities focus on long-term ecosystem monitoring, marine resources research, and invasive species management (USFWS 2019a).

H.31.7 Physical Environment

H.31.7.1 Climate

The Nikolski site has a cold maritime climate characterized by high humidity, considerable cloudiness, frequent fog, and light rain or snow. Average summer high temperatures are typically in the mid-50s °F, and average winter low temperatures are in the mid- to upper 20s °F (Table H-126). Annual snowfall averages 53 inches; total precipitation averages 42 inches. Strong winds are frequent during the winter, and fog during the summer, which limits accessibility.

Table H-126. Monthly Climatic Averages for Umnak, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Avg. High (ºF)	36.9	33.2	37.9	40.6	45.1	50.0	54.9	55.6	52.0	44.9	39.3	36.8	
Avg. Low (ºF)	29.6	24.6	29.6	31.8	35.4	40.3	43.8	44.7	39.8	33.8	31.1	27.9	
Avg. Precipitation (inches)	4.0	1.9	2.0	2.0	3.0	2.4	3.5	5.4	4.8	5.8	4.3	2.9	42
Avg. Snowfall (inches)	5.2	12.0	10.3	4.9	1.7	0	0	0	0	2.9	6.1	9.6	52.7

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.31.7.2 Topography

The Nikolski site is located in the southwestern portion of Umnak Island, which consists of low rolling hills with flat to moderately sloped terrain between the hills. The site is on High Hill, a topographic high point of the southwestern portion of the island, at about 700 ft msl. POL facilities were located at about 100 ft msl (Hart Crowser, Inc. 1997b). Umnak Island is almost separated into two islands, becoming very narrow at Inanudak Bay. Prominent topographical features of the southern half of the island are Mount Vsevidof and Mount Recheshnoi. Tulik Volcano and Okmok Caldera are prominent on the northern half of the island.

H.31.7.3 Geology and Soils

The Aleutian Islands formed in a large curve, the Aleutian Arc, as a result of convergence of oceanic plates from the north and south. Oceanic plates from the south pushed under the northern plate forming an area known as the Aleutian Trench. Hot magma extruded and intruded in the form of volcanoes and plutons which are the Aleutian Islands (EMCON Alaska, Inc. 1995b).

Umnak Island is composed of volcanic, volcaniclastic sedimentary and intrusive rocks. The plain that surrounds the site to the foot of Mount Vsevidof is predominantly albitized bedded argillite and tuff and albite rich lava flows and shallow intrusives. Numerous cobbles of felsite scoria are present along the shore of Nikolski Bay. High Hill is a classic volcanic neck, exhibiting vertical sides and excellent columnar jointing. This neck rock is durable basaltic porphyry that boldly rises from the shoreline (611 CES/CEVO 1998).

The Aleutian Islands are generally characterized by soils of the Typic Cryandepts association. These soils occupy mountain-foot slopes, plateaus, and valleys and are generally well drained. Soils are characterized by a thin organic layer underlain by sandy and silty volcanic ash with cinders. Soils of the Nikolski site are considered to be predominantly medium-textured soils with moderate infiltration rates (CH2M Hill 1994c).

H.31.8 Hydrology

Surface water flows radially off the site, with water flowing north and west entering the Bering Sea and water flowing east and south entering Sheep Creek drainage and discharging into Nikolski Bay. Nikolski Bay and the Bering Sea are about 0.5 mile from the site. The area surrounding the site has a number of lakes, some approaching a mile in diameter. When the site was active, drinking water was pumped from a lake about 0.5 mile southeast of the site (CH2M Hill 1994c).

There are no known records of groundwater at the site and permafrost does not occur (CH2M Hill 1994c).

H.31.9 Biotic Environment

INRMP Section 2.3 (Biotic Environment) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the former Nikolski site. Attachment 13 contains lists of vascular plants (Table H-119), fish (Table H-120), mammals (Table H-121), and birds (Table H-122) known to occur or potentially occurring in the vicinity of the site. ESA-listed species that may occur at or in the vicinity of the site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.31.9.1 Ecoregion Classification

The former Nikolski site is located in the Aleutian Islands ecoregion. See INRMP Section 2.3.1 for further details on this ecoregion.

H.31.9.2 Vegetation/Habitat

A general vegetation map of the Nikolski site has not been prepared. Vegetation of the Aleutian Islands, including Umnak Island and the Nikolski site, is classified as maritime tundra. High upland areas and mountain slopes support a variety of lichens, mosses, and low-growing alpine plants. Lowland areas are covered with tall herbaceous meadows (USFWS 1988). Many trees were introduced during World War II, which resulted in small groves at Nikolski village (Sekora 1973).

H.31.9.3 Wetlands

Of the approximate 432-acre former Nikolski site, approx. 50 acres (or 12%) are considered wetlands associated with lakes and esturarine/marine deepwater areas per the 2018 ANHP mapping (Table H-127 and Figure H-166) (Flagstad et al. 2018).

Table H-127. Former Nikolski RRS Wetland Types Based on 2018 ANHP Data

Wetland Type	Area (acres)	Proportion
Lake	42.6	9.9%
Estuarine and Marine Deepwater	6.9	1.6%
Wetlands Total	**49.5**	**11.5%**
Upland	382.2	88.5%
Site Total	**431.7**	

Notes: See Figure H-166.
Source: Flagstad et al. 2018.

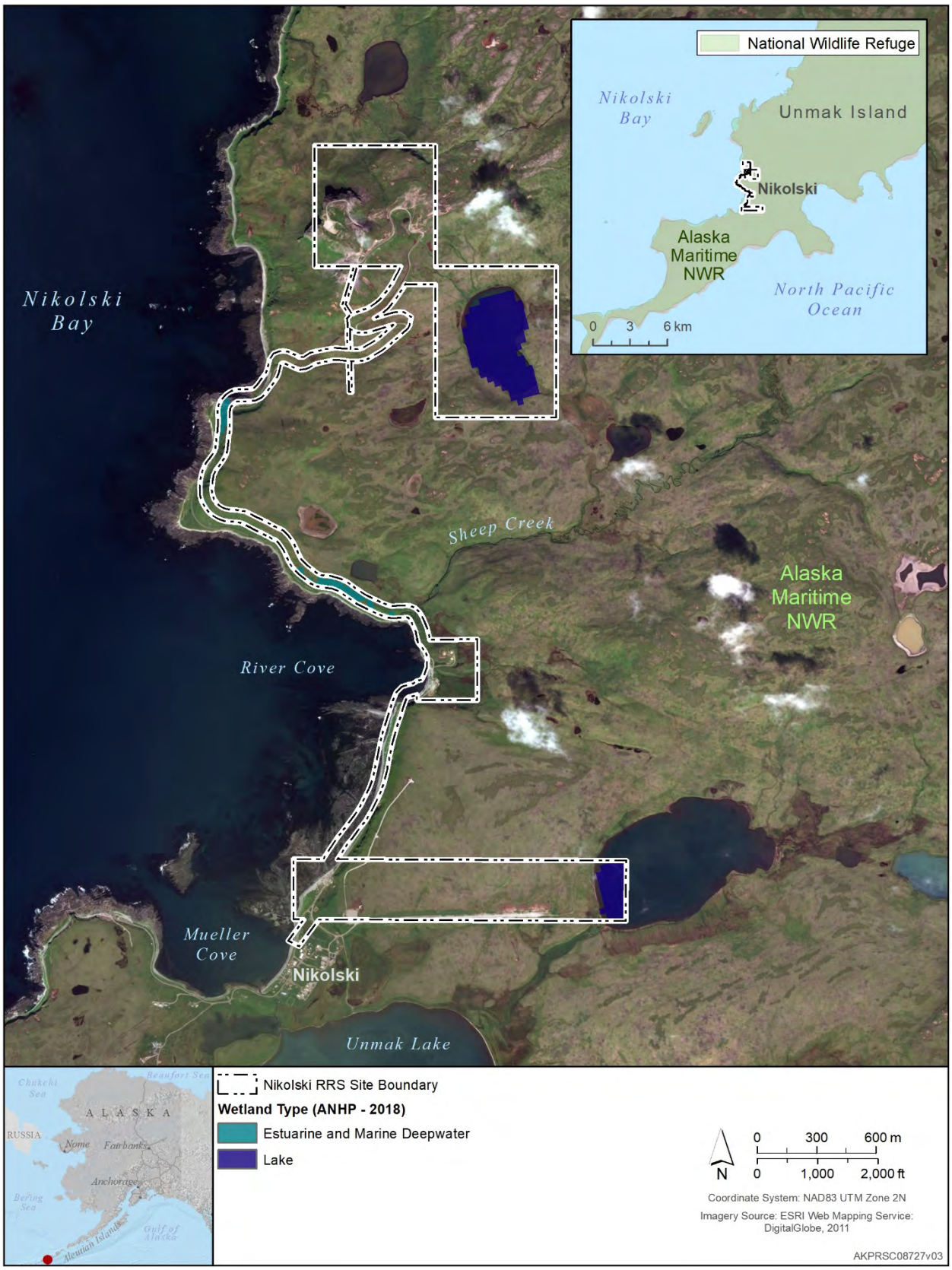

Figure H-166. Former Nikolski RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.31.9.4 Fish and Wildlife

H.31.9.4.1 Fish

Freshwater environments within the general area of the Nikolski site provide habitat for coho, pink, and sockeye salmon and Arctic char. All five Pacific salmon species use the area for spawning (CH2M Hill 1994c). Sheep Creek, in the vicinity of the former Nikolski site parcels, supports coho, pink, and sockeye salmon (Johnson and Blossom 2019a).

H.31.9.4.2 Mammals

Terrestrial Mammals

Terrestrial mammals inhabiting Unmak Island include red fox, Arctic fox, Arctic ground squirrel, collared lemming, root vole, and domestic sheep, cattle, and horses (Table H-121) (CH2M Hill 1994c).

Marine Mammals

Two species of dolphin and porpoise, nine species of whale, three species of seal, Steller sea lion, and northern sea otter may occur in the Nikolski area (Table H-121). Marine mammals are discussed in detail in Section H.31.9.5 (ESA- and MMPA-listed Species).

H.31.9.4.3 Birds

Pelagic species commonly found in the Unmak Island region include fulmars, cormorants, gulls, kittiwakes, auklets, and puffins. Leach's storm-petrel and tufted puffin are known to nest on Umnak Island. Black oystercatcher and rock sandpiper are permanent residents. Turnstones, sandpipers, and phalaropes are common migratory shorebirds. Numerous waterfowl species are found along the eastern Aleutian Islands including emperor goose, Canada goose, scaup, goldeneye, bufflehead, long-tailed duck, green-winged teal, grebes, common eider, and brant. Bald eagle and common raven are common and gyrfalcon and snowy owl may be seen on occasion (Table H-122) (CH2M Hill 1994c).

Important Bird Areas (IBAs)

The former Nikolski RRS is adjacent to the Kagamil Island Marine IBA (Figure H-167). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. The IBA occupies occupies 862 mi^2 of pelagic open water habitat and is an IBA for large breeding populations of glaucous-winged gull and whiskered auklet (Audubon Alaska 2014; BirdLife International 2019).

H.31.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Ten ESA-listed species have the potential to occur in the vicinity of the Nikolski site: endangered short-tailed albatross, threatened Steller's and spectacled eiders, endangered Steller sea lion, threatened northern sea otter, and endangered humpback, North Pacific right, sperm, blue, and fin whales (Table H-121 and Table H-122 and INRMP Table 6). The sea otter, Steller sea lion, and whale species are also listed under the MMPA.

Short-tailed Albatross and Steller's and Spectacled Eiders. All three species may potentially occur in offshore waters during the non-breeding season.

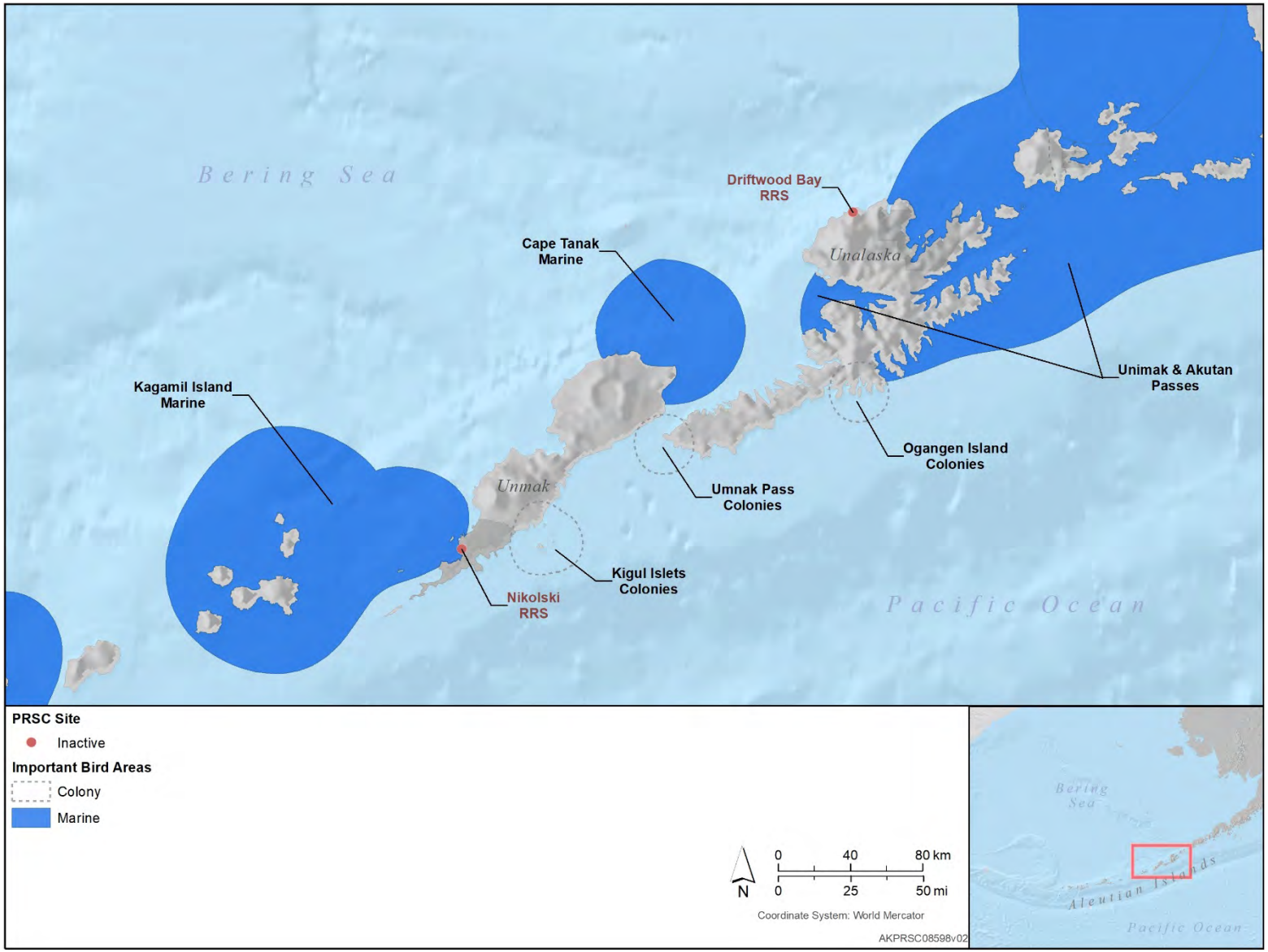

Figure H-167. Important Bird Areas (IBAs) within the Vicinity of the Former Nikolski RRS
(*Source*: Audubon Alaska 2014)

Northern Sea Otter. The northern sea otter is known to occur in Nikolski Bay. In 2009, the USFWS designated all contiguous waters from the mean high tide line to the 20-m depth contour as well as waters within 100 m of the mean high tide line adjacent to Unmak Island (Figure H-155) (USFWS 2009).

Steller's Sea Lion. Steller sea lions are expected to occur in the offshore waters of the former Nikolski site, and the offshore waters are designated as Steller sea lion critical habitat (Figure H-156). In addition, the offshore waters are within within the Bogoslof Foraging Area for Steller sea lions.

Humpback, North Pacific Right, Blue, Sperm, and Fin Whales. These species may be rare visitors to offshore waters.

Other MMPA-listed Species

Baird's and Stejneger's beaked whales, killer whale, gray whale, harbor porpoise, Pacific white-sided dolphin, spotted seal, harbor seal, and northern fur seal may be seen in offshore waters and seals may occassionaly come ashore at Nikolski Bay. Pacific walrus is expected to be a rare visitor to offshore waters.

H.31.10 Other Natural Resources Information

H.31.10.1 Subsistence

Subsistence plays a crucial role in the village of Nikolski, because economic opportunities are extremely limited. Beyond cultural preferences for subsistence food, the costs for importing foods are very high. Residents who have left Nikolski for jobs in other communities often depend on some sharing of resources from those who still live in the village. The marine environment of Nikolski is the primary use area. While no specific subsistence use area data are available for Nikolski, the Fox Island group is likely the main area used for subsistence harvesting. Feral cattle and sheep are grazed on the island and ranched, rather than herded. Nikolski residents harvest these cattle and sheep annually (Braund and Associates 2004). Lakes in the vicinity of the village of Nikolski that support salmon runs are also an important subsistence resource to village residents (USFWS 1988). Village residents harvest mollusks and other indigenous species from a reef within Nikolski Bay and may harvest salmon and other fish species from local creeks and lakes (Hart Crowser, Inc. 1997b).

H.31.10.2 Outdoor Recreation

Outdoor recreation opportunities available at the Nikolski site are limited due to the absence of game species for hunting; fishing in the area surrounding the site is available, but recreational fishing has not been documented (CH2M Hill 1994c). Nonconsumptive activities, such as ATV riding along gravel roads, bird watching, and hiking, are available, but use is minimal due to the small population of the village (Hart Crowser, Inc. 1997b).

H.32 NORTH RIVER RRS (INACTIVE)

H.32.1 Location and Area

The 89-acre former North River (also known as Unalakleet) RRS is 8.5 air miles east (12 road miles) of the village of Unalakleet on Norton Sound and 400 air miles northwest of Anchorage. The property includes access roads connecting to the main site which was located on a hilltop north of the Unalakleet River and east of the North River (Figure H-168 and Figure H-169). Access to the North River site is via a gravel road from Unalakleet.

Figure H-168. Ground-level View of the Former North River RRS

H.32.2 Installation History

One of the 31 original WACS sites, North River facilities were operational in 1957. The site was initially called the North River Communications Station, renamed North River AFS in 1958, and then became the North River RRS in 1961. North River operated as a combined tropospheric scatter/TD-2 microwave station, which relayed radio information to and from the Granite Mountain and Kalakaket Creek WACS sites. North River was inactivated in 1978 and all structures at the site were demolished and removed by 1996 (ADEC 2006). Remedial actions are ongoing at some sites within the former North River parcels.

H.32.3 Military Mission

The former North River RRS is now closed; refer to Section H.32.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visits are currently scheduled for 2020, 2023, and 2025.

H.32.4 Surrounding Communities

The nearest community is Unalakleet, approx. 12 road miles to the west of the former RRS site. It had a 2018 estimated population of 722, primarily consisting of 74% Alaska Native. The local economy is the most active in Norton Sound, along with a traditional Unaligmiut Yup'ik subsistence lifestyle. Commercial fishing for herring, herring roe, and subsistence activities are major components of Unalakleet's economy. The Norton Sound Economic Development Council operates a fish processing plant, and government and school positions are relatively numerous. Tourism is becoming increasingly important; there is world-class silver salmon fishing in the area (State of Alaska 2018, 2019).

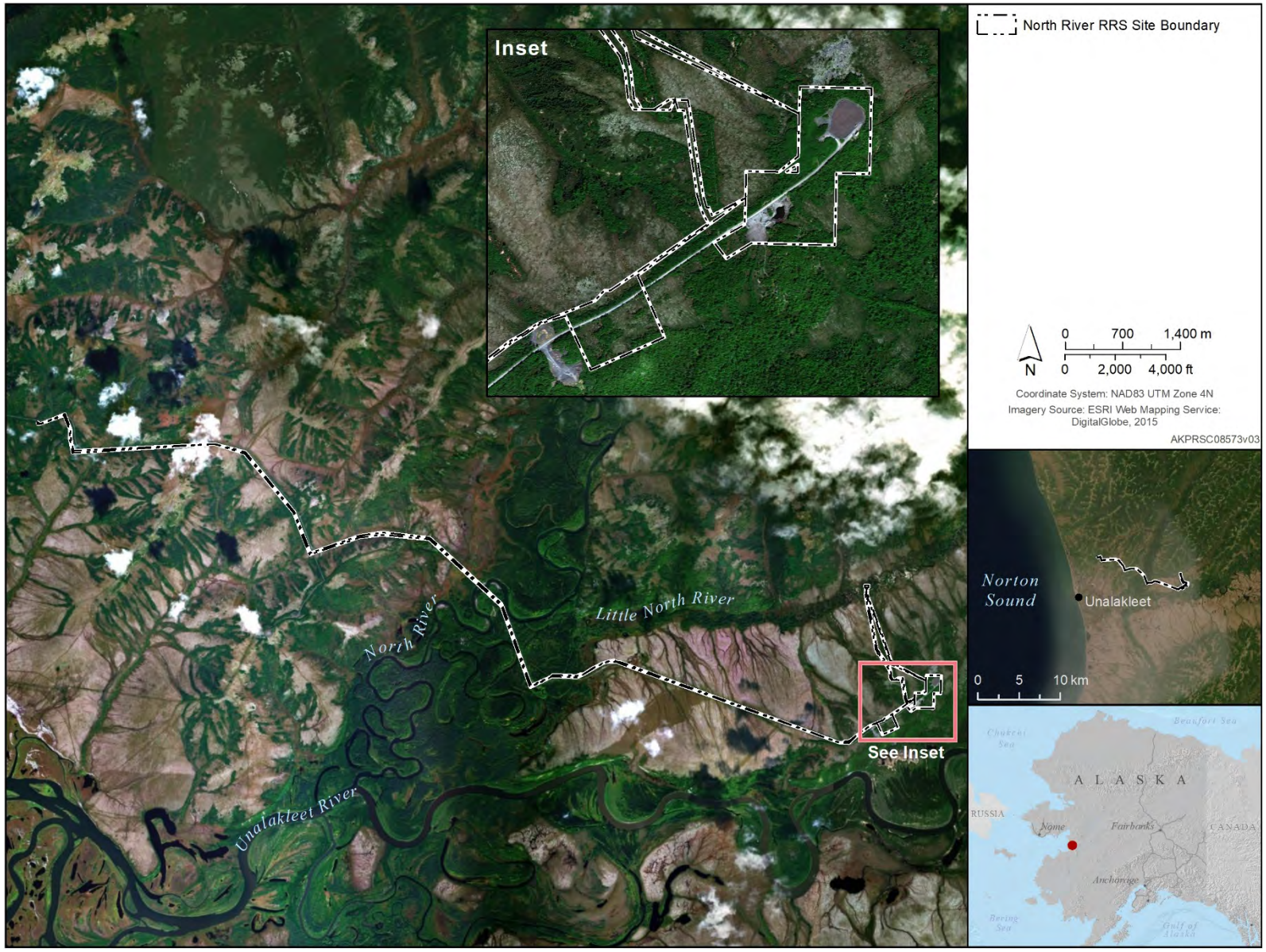

Figure H-169. Overview of the Former North River RRS

H.32.5 Regional Land Use

Surrounding lands are primarily Alaska Native Allotments or Native Lands that are used for recreation or subsistence purposes (BLM 2019a).

H.32.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the former North River site.

H.32.7 Physical Environment

H.32.7.1 Climate

The North River site has a cold maritime climate characterized by high humidity, considerable cloudiness, frequent fog, and light rain and snow. Unalakleet has a subarctic climate with considerable maritime influences when Norton Sound is ice-free, usually from May to October. Winters are cold and dry. Average summer high range from the high 50s to low 60s °F; average low temperatures are below freezing from October through May (Table H-128). Precipitation averages 12 inches annually, with 35 inches of snow.

Table H-128. Monthly Climatic Averages for Unalakleet Airport, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Avg. High (ºF)	9.9	10.3	16.9	29.3	45.8	54.6	61.0	59.8	51.2	33.0	19.1	8.4	
Avg. Low (ºF)	-3.7	-5.1	-0.5	12.7	30.4	41.4	47.6	46.1	36.7	20.8	7.3	-4.8	
Avg. Precipitation (inches)	0.5	0.4	0.6	0.4	0.6	1.1	2.0	3.3	2.2	.09	0.6	0.5	12.29
Avg. Snowfall (inches)	5.4	4.9	5.3	3.4	0.9	0	0	0	0.7	3.9	6.3	4.7	35.5

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.32.7.2 Topography

The North River site is on a topographic high point at about 500 ft MSL. The surrounding terrain is hilly alpine tundra, but the facilities were situated mostly on gravel fill.

H.32.7.3 Geology and Soils

The North River site is in the Lower Yukon Subregion. This coastal area is underlain by Cenozoic gravel and silts and basalts; the northern part may be underlain by granodiorite. The Nulato Hills consist of folded Cretaceous greywacke and slate with Mesozoic and Paleozoic volcanics at the eastern and southern ends. These rocks are locally intruded by stocks and dikes ranging in composition from monzonite to diabase. The subregion is transected by the Kaltag Fault, a major structural feature that trends north northwest between Unalakleet and Kaltag. Most rocks are intensely folded and faulted (Aman Environmental Construction, Inc. 1995).

The North River site is on the Norton Sound Highlands, an area generally characterized by soils of the Histic Pergelic Cryaquepts and Pergelic Cryunbrepts associations (Reiger et al. 1979). The Unalakleet River basin is underlain by sedimentary bedrock consisting of graywacke, shale, grit, and conglomerate. Coarse clastic rocks form rubble-covered ridges and hills; shale underlies slopes and valleys (Hart Crowser, Inc. 1997d). Soil at the North River site is poorly developed, consisting of a thin layer of topsoil over crystalline bedrock. Topsoil thickness varies from less than 1 inch on the hilltop to 10 inches on the hillside. Permafrost is discontinuous in the Unalakleet area. Permafrost is not expected to be present at the North River site due to the shallow depth to bedrock (USACE 1991).

H.32.8 Hydrology

Major surface water features in the immediate area of the North River site are the Unalakleet and North rivers. North River is a tributary of the Unalakleet River, which discharges into Norton Sound at Unalakleet. Unalakleet River is about 0.5 mile south, and North River is about 3 miles west of the site. Developed drainages are not present on the site, and precipitation runs off by sheetflow.

Permafrost is present in most of the Unalakleet River basin, but its extent and thickness have not been determined. Unfrozen zones occur in alluvium underlying and adjacent to the streams, and certain types of vegetation, such as aspen trees, indicate that some of the well-drained, south-facing slopes also may be free of permafrost. Groundwater can be found in unfrozen alluvium in stream valleys. Because of the presence of permafrost and low-permeability bedrock in most of the basin, groundwater is both recharged and discharged principally along stream courses in the alluvium (CH2M Hill 1994d).

The water table is expected to be greater than 10 ft deep at the North River site (USACE 1991). Groundwater resources within the basin are virtually unused for water supply. A well near the Little North River was once used to supply the North River site (Sloan et al. 1986).

H.32.9 Biotic Environment

INRMP Section 2.3 (*Biotic Environment*) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the former North River site. Attachment 11 contains lists of vascular plants (Table H-101), fish (Table H-102), mammals (Table H-103), and birds (Table H-104) known to occur or potentially occurring in the North River. ESA-listed species that may occur at or in the vicinity of the North River site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.32.9.1 Ecoregion Classification

The former North River RRS is located within the Nulato Hills Ecoregion. Refer to INRMP Section 2.3.1 (Ecoregion Classification) for details.

H.32.9.2 Vegetation/Habitat

A general vegetation map of the North River site has not been prepared. Gravel pads of the North River site are revegetating to grasses, primarily *Festuca rubra*, *Trisetum spicatum*, and *Poa* sp., and various forb species. Short, steep slopes of the gravel pads are nearly 100% revegetated with *Alnus crispa*. Surrounding undisturbed terrain on the hilltop is primarily moist to wet tussock tundra with some small patches of open rock (frost-heaved talus) and small riparian drainages lined with shrub-sized willow and alder. The tundra is dominated by large tussocks of *Eriophorum vaginatum* with associated species, such as *Betula nana*, *Vaccinium vitis-idea*, *V. uliginosum*, and *Ledum palustre* (611 ASG 2001c).

Some well drained portions of the hilltop support arctic/alpine vegetation. Slopes and broad valley bottoms in the area are dominated by expansive stands of *E. vaginatum* tussocks with intermingled and stunted *Picea mariana*. Along larger riparian sites are localized stands of *Picea glauca*, *Populus balsamifera*, and *P. tremuloides* with shrub-sized willow and alder. Herbaceous vegetation in these areas is more typical of boreal forest taxa with such species as *Cornus canadensis*, *Galium boreale*, *Orthilia secunda*, and *Pyrola chlorantha* (611 ASG 2001c).

H.32.9.3 Wetlands

Per the 2018 ANHP mapping, of the approximate 89-acre former North River site, about 15 acres (or 17%) are considered freshwater forested/shrub and freshwater emergent wetlands, primarily associated with the access road (Table H-129 and Figure H-170) (Flagstad et al. 2018).

Table H-129. Former North River RRS Wetland Types Based on 2018 ANHP Data

Wetland Type	Area (acres)	Proportion
Freshwater Forested/Shrub	12.6	14.2%
Freshwater Emergent	1.8	2.0%
Riverine	0.4	0.5%
Wetlands Total	**14.8**	**16.7%**
Upland	74.0	83.3%
Site Total	**88.8**	

Notes: See Figure H-170.
Source: Flagstad et al. 2018.

H.32.9.4 Fish and Wildlife

H.32.9.4.1 Fish

The Unalakleet and North rivers support all five species of Pacific salmon as well as Dolly varden and whitefish (Table H-102) (Johnson and Blossom 2019b).

H.32.9.4.2 Mammals

The North River area is inhabited by the expected northern Alaskan terrestrial mammals including brown bear, moose, caribou, wolves, Arctic ground squirrel, Arctic and snowshoe hares, red foxes, American mink, martens, beavers, muskrats, weasels, etc. (Table H-103).

H.32.9.4.3 Birds

Habitats of the Nulato Hills provide nesting and foraging opportunities for a wide variety of bird species (Table H-104). Common birds of the area include spruce grouse, rock and willow ptarmigan, common raven, parasitic jaeger, savannah sparrow, lapland longspur, snow bunting, and raptors, such as gyrfalcon, northern harrier, merlin, snowy owl, rough-legged hawk, and golden eagle. The following species have been observed nesting on the site and in the area: American robin, varied thrush, Swainson's thrush, ruby-crowned kinglet, yellow warbler, yellow-rumped warbler, Wilson's warbler, alder flycatcher, olive-sided flycatcher, dark-eyed junco, white-crowned sparrow, fox sparrow, savannah sparrow, and American tree sparrow (Hart Crowser, Inc. 1997d).

H.32.9.5 ESA-listed Species

No ESA-listed species have been reported on or within the vicinity of the former North River RRS site.

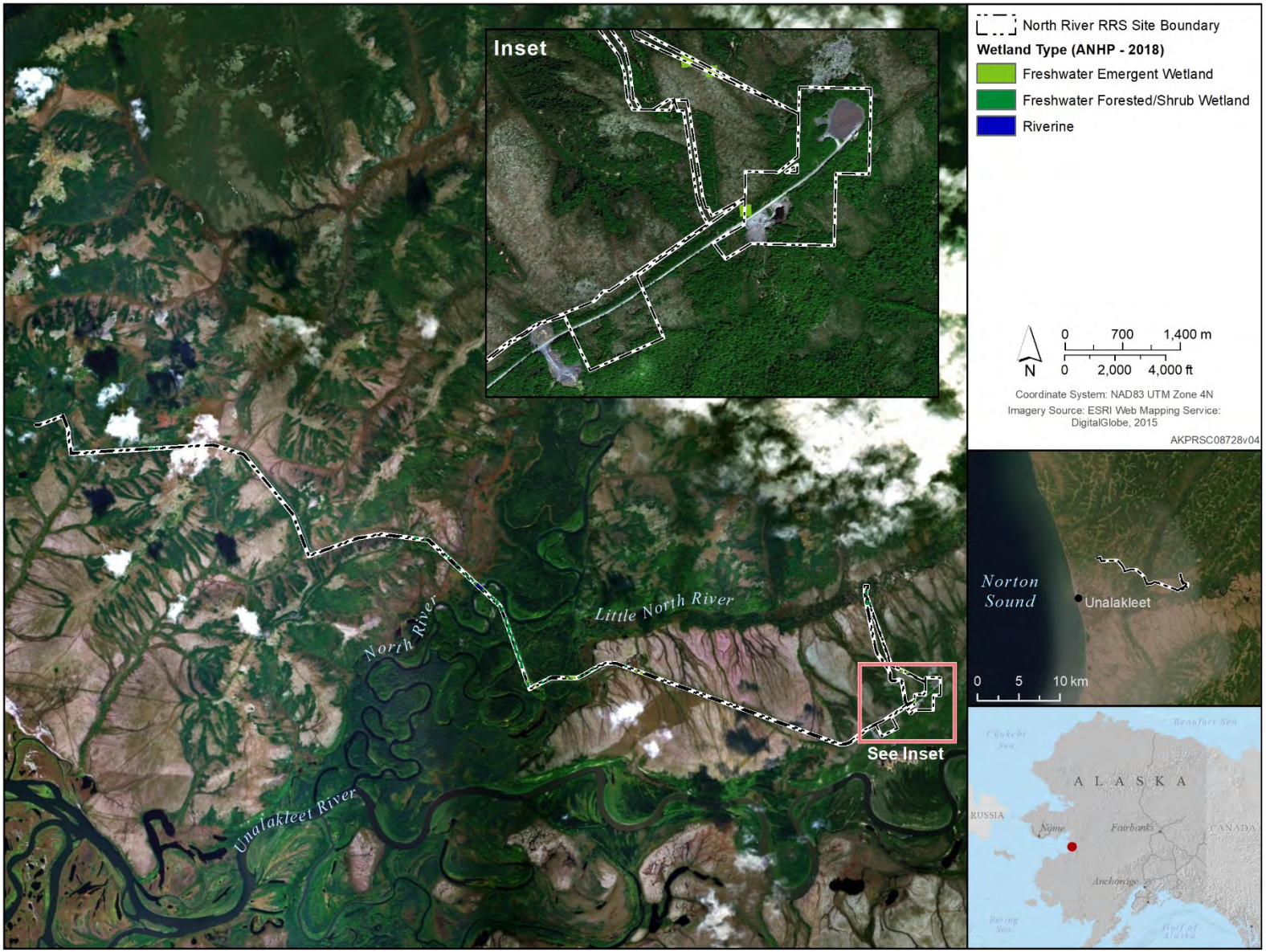

Figure H-170. Former North River RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.32.10 Other Natural Resources Information

H.32.10.1 Subsistence

Unalakleet is about 8 miles west of the North River site. Subsistence resource harvesting plays a significant role in supporting the community and is a primary occupation of the village. The limited number of wage jobs, cultural preferences and the expense and difficulty in procuring imported foods are important factors. More important is the integration of subsistence resource harvesting into the web of social relations, not only in Unalakleet but also among other coastal villages of Norton Sound. A system of reciprocity helps insulate people from local shortages as well as support those who cannot harvest resources for various reasons (Braund and Associates 2004).

Harvest data for the village of Unalakleet are limited to birds and eggs, and in 1995, 56% of sampled households harvested birds and eggs. Marine mammals are harvested offshore and on islands in Norton Sound near St. Michael and in Golovin Bay. Caribou are hunted in the Andreafsky Mountains and along McDonald Creek to the south and in the environs of Debauch Mountain north through the Seward Peninsula towards Buckland. Moose are taken along rivers from the Golsovia River north to Egavik, and along tributaries of Unalakleet River. These areas are also used to harvest hares, fox, American mink, river otter, and bears (Braund and Associates 2004).

H.32.10.2 Outdoor Recreation

The former North River site and the surrounding area are used primarily by residents of Unalakleet for hunting, fishing, trapping, and gathering (berry picking). The road and rivers in the area allow for access to the site and the surrounding area. Unalakleet is a departure point for recreational fishing in Norton Sound and the Unalakleet and North rivers. Other recreation activities include camping, hiking, and wildlife viewing.

H.33 PORT HEIDEN RRS (INACTIVE)

H.33.1 Location and Area

The 171-acre former Port Heiden RRS is on the west coast of the Alaska Peninsula on Bristol Bay about 2.5 miles north of the community of Port Heiden and 400 air miles southwest of Anchorage (Figure H-171). Access to the site is by commercial air carrier to the state-owned airstrip just south of the former RRS or by sea at the barge landing area approximately 5 miles southwest near Goldfish Lake.

H.33.2 Installation History

The former Port Heiden RRS is located within the former Fort Morrow, a World War II Army Air Corps Base. The Aleutian Segment of the DEW Line was completed in 1958 and Port Heiden's WACS became operational in 1961. The WACS site consisted of four tropospheric antennas; a composite building with dormitories, office space, storage, a garage, and standby power generation equipment; a heliport; septic system; waste POL collection pits; and three underground fuel storage tanks. A POL tank farm and barge landing area were located on the coast, about 5 miles southwest of the site. The tank farm consisted of two large aboveground tanks, a pumphouse, and piping, which distributed fuel to the site. The DEW Line station closed in 1969, the RRS was deactivated in 1978, and demolition of facilities occurred in 1990. Remediation activities are ongoing (Denfield 1994; AFCEC 2014).

H.33.3 Military Mission

The former Port Heiden RRS is now closed; refer to Section H.33.2, Installation History. The site is visited periodically as part of long-term management under the USAF Environmental Restoration Program. The next site visits are currently scheduled for 2020 and 2021.

H.33.4 Surrounding Communities

Located about 2.5 miles south of the former RRS, the community of Port Heiden is a traditional Alutiiq community with a commercial fishing and subsistence lifestyle. The estimated 2018 population was 119 consisting of 71% Alaska Native and 26% white. The state-owned airport consists of a lighted, gravel runway and a gravel crosswind runway. There is a natural boat harbor but no dock. A boat haul-out, a beach off-loading area, boat fuel sales, and marine storage facilities are available. Cargo from Seattle is delivered twice yearly by barge and is lightered and offloaded on the beach.

H.33.5 Regional Land Use

Surrounding lands are primarily Alaska Native Allotments or Native Lands that are used for recreation or subsistence purposes (BLM 2019a).

H.33.6 Local and Regional Natural Areas

There are no special natural areas (e.g., refuges, parks, preserves) in the vicinity of the former Port Heiden site.

Figure H-171. Overview of the Former Port Heiden RRS

H.33.7 Physical Environment

H.33.7.1 Climate

The climate of the Port Heiden region is classified as a cold maritime climate characterized by high humidity, considerable cloudiness, frequent fog, and light rain or snow. Port Heiden has cool summers and relatively warm winters. Average summer high temperatures are in the mid- to upper 50s °F, and winter lows typically range between 15 and 20 °F (Table H-130). The mean annual precipitation is 15 inches with about an inch of rain occurring each month of the year. Annual snowfall is around 54 inches.

Table H-130. Monthly Climatic Averages for Port Heiden Airport, Alaska

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. High (ºF)	28.5	28.0	32.5	37.6	46.5	52.7	57.3	58.1	53.6	43.1	36.2	29.8
Avg. Low (ºF)	16.4	15.8	19.8	26.0	34.7	41.1	46.4	47.7	42.6	32.1	25.2	18.5
Avg. Precipitation (inches)	0.9	0.5	0.9	0.7	0.8	1.1	1.6	2.0	2.0	2.2	1.4	1.0
Avg. Snowfall (inches)	11.3	9.0	6.9	6.9	1.8	0.1	0	0	0	2.5	5.8	9.5

Source: Western Regional Climate Center 2019 (https://wrcc.dri.edu).

H.33.7.2 Topography

The former Port Heiden site is adjacent to a large shallow bay on a relatively flat coastal plain that slopes gently toward Bristol Bay. The area exhibits lateral and terminal moraines, evidence of past glaciation. The site was constructed on a glacial moraine at about 140 ft MSL. The most significant topographic feature in the area is Aniakchak Crater, about 20 miles east of the site. Ponds, lakes, and wetlands are numerous in the vicinity of the site (EMCON Alaska, Inc. 1996b).

H.33.7.3 Geology and Soils

The Alaska Peninsula is composed mainly of volcanic rocks, volcaniclastic sedimentary rocks, and occasional plutons. Two volcanoes in the Port Heiden area, Aniakchak Crater and Mount Veniaminof, form the major geologic features. The area also exhibits glacial features, including moraines and paraglacial lakes, and evidence of fluvial surface processes that have produced outwash, floodplains, alluvial fans, beaches, spits, and deltas (EMCON Alaska, Inc. 1996b).

Bristol Bay Coastal Plain soils are generally characterized as soils of the Typic Cryandepts association. These soils occupy coastal plains and mountain footslopes and occur where thick layers of volcanic ash and cinder overlay glacial till or outwash. Soils at the Port Heiden site are primarily volcanic in origin. Upland soils are composed of volcanic ash interspersed with rocks, rubble, or cinders and are typically silty or sandy. Soils in the lowland areas are thicker and consist of ash with a loamy texture with high organic content (CH2M Hill 1994e).

H.33.8 Hydrology

The prominent surface water features in the area include Reindeer Creek (approx. 2 miles north of the former RRS) and an unnamed tributary about 1 mile north of the site. A lowland area with small shallow ponds begins about 1 mile south of the site and extends south another mile to Abbott Creek (Figure H-171). The lowland drains to Bristol Bay and Port Heiden through unnamed streams and Abbott Creek. The overall surface water drainage of the area is to the west into Bristol Bay. The area surrounding the site consists of undulating moist tundra with no defined drainage patterns (CH2M Hill 1994e). In addition, the Port Heiden site is just north of the Meshik River delta, a major river system of the Alaska Peninsula.

The Port Heiden site is in a permafrost free area. Groundwater beneath the site occurs in unconsolidated sediments at a depth of 20-35 ft. Groundwater is believed to recharge shallow ponds, lakes, and creeks in the area (CH2M Hill 1994e).

H.33.9 Biotic Environment

INRMP Section 2.3 (Biotic Environment) provides general information on biological resources on and near PRSC sites. The following subsections provide more detailed summaries of natural resources occurring on the former Port Heiden site. Attachment 13 contains lists of vascular plants (Table H-119), fish (Table H-120), mammals (Table H-121), and birds (Table H-122) known to occur or potentially occurring in the vicinity of the site. ESA- and MMPA-listed species that may occur at or in the vicinity of the site are discussed in general in INRMP Section 2.3.4 (Table 6) and in detail below.

H.33.9.1 Ecoregion Classification

The former Port Heiden RRS is located within the Alaska Peninsula Ecoregion. Refer to INRMP Section 2.3.1 (Ecoregion Classification) for details.

H.33.9.2 Vegetation/Habitat

A general vegetation map of the Port Heiden site has not been prepared. The Port Heiden site is primarily open, low shrub, and ericaceous tundra dominated by substantial areas of low willow scrub. Some natural patches of bare ground and previously disturbed areas covered with grass, are dominated by festuca species and herbs. Several small shallow ponds, small lakes, and creeks occur in the immediate area of the site and support various aquatic plant species (611 ASG 2001e).

H.33.9.3 Wetlands

Of the approximate 169-acre Port Heiden site, 10 acres (or 6%) are considered freshwater emergent, freshwater forested/shrub, and estuarine and marine wetlands per the 2018 ANHP mapping (Table H-131 and Figure H-172) (Flagstad et al. 2018).

Table H-131. Former Port Heiden RRS Wetland Types Based on 2018 ANHP Data

Wetland Type	Area (acres)	Proportion
Freshwater Emergent	6.4	3.8%
Freshwater Forested/Shrub	2.4	1.4%
Estuarine and Marine	1.0	0.6%
Pond	0.1	<0.1%
Wetlands Total	**9.9**	**5.9%**
Upland	158.6	94.1%
Site Total	**168.5**	

Notes: See Figure H-172.
Source: Flagstad et al. 2018.

Figure H-172. Former Port Heiden RRS Wetlands (2018 ANHP)
(*Source*: Flagstad et al. 2018)

H.33.9.4 Fish and Wildlife

H.33.9.4.1 Fish

Freshwater resources in the area of the Port Heiden site include Abbott Creek (about 1.75 miles south), Reindeer Creek (about 2 miles north), Barbara Creek (about 6 miles south), and the Meshik River (11 miles south). Reindeer Creek and Barbara creeks support chum, coho, and sockeye salmon. The Meshik River supports chum, coho, chinook, pink, and sockeye salmon and Dolly Varden (Johnson and Blossom 2019a). Coastal areas provide feeding areas for Pacific herring and habitat for chum, king, coho, and sockeye salmon (CH2M Hill 1994e) (Table H-120).

H.33.9.4.2 Mammals

Terrestrial Mammals

The Port Heiden area is used seasonally by brown bear, moose, and caribou. Caribou use calving grounds primarily south of Port Heiden on a plain between Bear River and Port Heiden Bay. Red fox, wolves, wolverine, river otter, American mink, least weasel, ermine, muskrat, beaver, lemmings, porcupine, Arctic ground squirrel, and occasionally Arctic fox and lynx inhabit the area (EMCON Alaska, Inc. 1996b) (Table H-121).

Marine Mammals

Two species of dolphin and porpoise, nine species of whale, three species of seal, Steller sea lion, and northern sea otter may occur in the Port Heiden area (Table H-121). Marine mammals are discussed in detail in Section H.33.9.5 (ESA- and MMPA-listed Species).

H.33.9.4.3 Birds

The Port Heiden area supports diverse and abundant marine species, including waterfowl and seabirds, that use marine waters for feeding and resting (Table H-122). Waterfowl and shorebirds also use numerous ponds and lakes in the area during migrations. The Alaska Peninsula supports raptors, such as the bald eagle, rough-legged hawk, harrier, osprey, merlin, gyrfalcon, and short-eared owl. Willow and rock ptarmigan are abundant, and passerine species pass through in large numbers during seasonal migrations. Bird species common to the site area include semipalmated plover, American golden-plover, Lapland longspur, golden-crowned sparrow, common redpoll, yellow warbler, orange-crowned warbler, rock sandpiper, Arctic tern, parasitic jaeger, and mew gull.

Important Bird Areas (IBAs)

The former Port Heiden RRS is adjacent to the Northern Alaska Peninsula Coastal IBA (Figure H-59). See Section H.1.9.4.3 (Eareckson AS, Birds) for a discussion of the IBA program. This IBA has the largest number of recorded species in an IBA, with 69. The IBA is globally significant for black scoter, emperor goose, glaucous-winged gull, king eider, Steller's eider, and white-winged scoter (Audubon Alaska 2014; Smith et al. 2017).

H.33.9.5 ESA- and MMPA-listed Species

ESA-listed Species

Ten ESA-listed species have the potential to occur in the vicinity of the Port Heiden site: endangered short-tailed albatross, threatened Steller's and spectacled eiders, endangered Steller sea lion, threatened northern sea otter, and endangered humpback, North Pacific right, sperm, blue, and fin whales (Table H-121 and

Table H-122 and INRMP Table 6). The sea otter, Steller sea lion, and whale species are also listed under the MMPA.

Short-tailed Albatross and Steller's and Spectacled Eiders. All three species may potentially occur in offshore waters during the non-breeding season. A primary molting area for Steller's eiders occurs along the north side of the Alaska Peninsula, including the coastal waters of Port Heiden (USFWS 2019e).

Northern Sea Otter. The northern sea otter may potentially occur in the offshore waters of Port Heiden. In 2015, the USAF funded the USFWS to analyze 2000 sea otter data to determine the location of significant "hotspots" near PRSC installations. This effort revealed a small but significant hotspot approx. 20 miles southwest of the former Port Heiden RRS (USFWS 2015).

Steller's Sea Lion. Steller sea lions are expected to occur in the offshore waters of the former Port Heiden site as they may be attracted by the large influx of salmon into the Meshik River system (CH2M Hill 1994e).

Humpback, North Pacific Right, Blue, Sperm, and Fin Whales. These species may be rare visitors to offshore waters.

Other MMPA-listed Species

Baird's and Stejneger's beaked whales, killer whale, gray whale, harbor porpoise, Pacific white-sided dolphin, spotted seal, harbor seal, and northern fur seal may be seen in offshore waters. These marine mammals are attracted by the large influx of salmon into the Meshik River system (CH2M Hill 1994e).

Although Pacific walrus are not expected to occur at the former Port Heiden site, there is the potential for them to occur in the nearshore marine waters. A major walrus haulout supporting between 100 and 1,000 individuals in the 1990s during April-December is approximately 7 miles to the east of the Port Heiden barge landing site (Fischbach et al. 2016) (Figure H-173).

H.33.10 Other Natural Resources Information

H.33.10.1 Subsistence

Due to cultural preferences and because of the expense of importing food, subsistence is a particularly important component of the Port Heiden community's economy. Participation in the subsistence harvest is nearly 100% and an integral part of intercommunity relations on the Alaska Peninsula. Port Heiden residents' subsistence harvests range from the Lower Cinder River in the north to the Ocean River drainage to the south. This area includes portions of the King Salmon River drainage and areas of the Cinder River drainage that overlap with harvest areas used by people from Pilot Point and Ugashik. Port Heiden residents also use areas on the Pacific Ocean side of the peninsula, including Aniakchak Bay and parts of the Chignik River system. Port Heiden has the least amount of resource area overlap of all communities in Southwest Alaska. The area of the former WACS site is used for berry picking and hunting of geese, caribou, porcupine, and hare (Braund and Associates 2004).

H.33.10.2 Outdoor Recreation

Outdoor recreational activities are limited due to the location of the Port Heiden site. Access is limited with aircraft providing the only year-round access. Residents of Port Heiden use roads associated with the site to traverse the area and access other nearby areas.

Figure H-173. Pacific Walrus Haulout within the Vicinity of the Former Port Heiden RRS
(*Source*: Fischbach et al. 2016)