Information Sheet on EAA Flyway Network Sites (SIS) – 2017 version

Available for download from http://www.eaaflyway.net/about/the-flyway/flyway-site-network/

Categories approved by Second Meeting of the Partners of the East Asian-Australasian Flyway Partnership in Beijing, China 13-14 November 2007 - Report (Minutes) Agenda Item 3.13

Notes for compilers:

1. The management body intending to nominate a site for inclusion in the East Asian - Australasian Flyway Site Network is requested to complete a Site Information Sheet. The Site Information Sheet will provide the basic information of the site and detail how the site meets the criteria for inclusion in the Flyway Site Network. When there is a new nomination or an SIS update, the following sections with an asterisk (*), from Questions 1-14 and Question 30, must be filled or updated at least so that it can justify the international importance of the habitat for migratory waterbirds.

2. The Site Information Sheet is based on the Ramsar Information Sheet. If the site proposed for the Flyway Site Network is an existing Ramsar site then the documentation process can be simplified.

3. Once completed, the Site Information Sheet (and accompanying map(s)) should be submitted to the Flyway Partnership Secretariat. Compilers should provide an electronic (MS Word) copy of the Information Sheet and, where possible, digital versions (e.g. shapefile) of all maps.

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2. Date this sheet was completed*:

11/30/2016 (Revision following technical reviews completed 12/27/2016)

3. Country*:

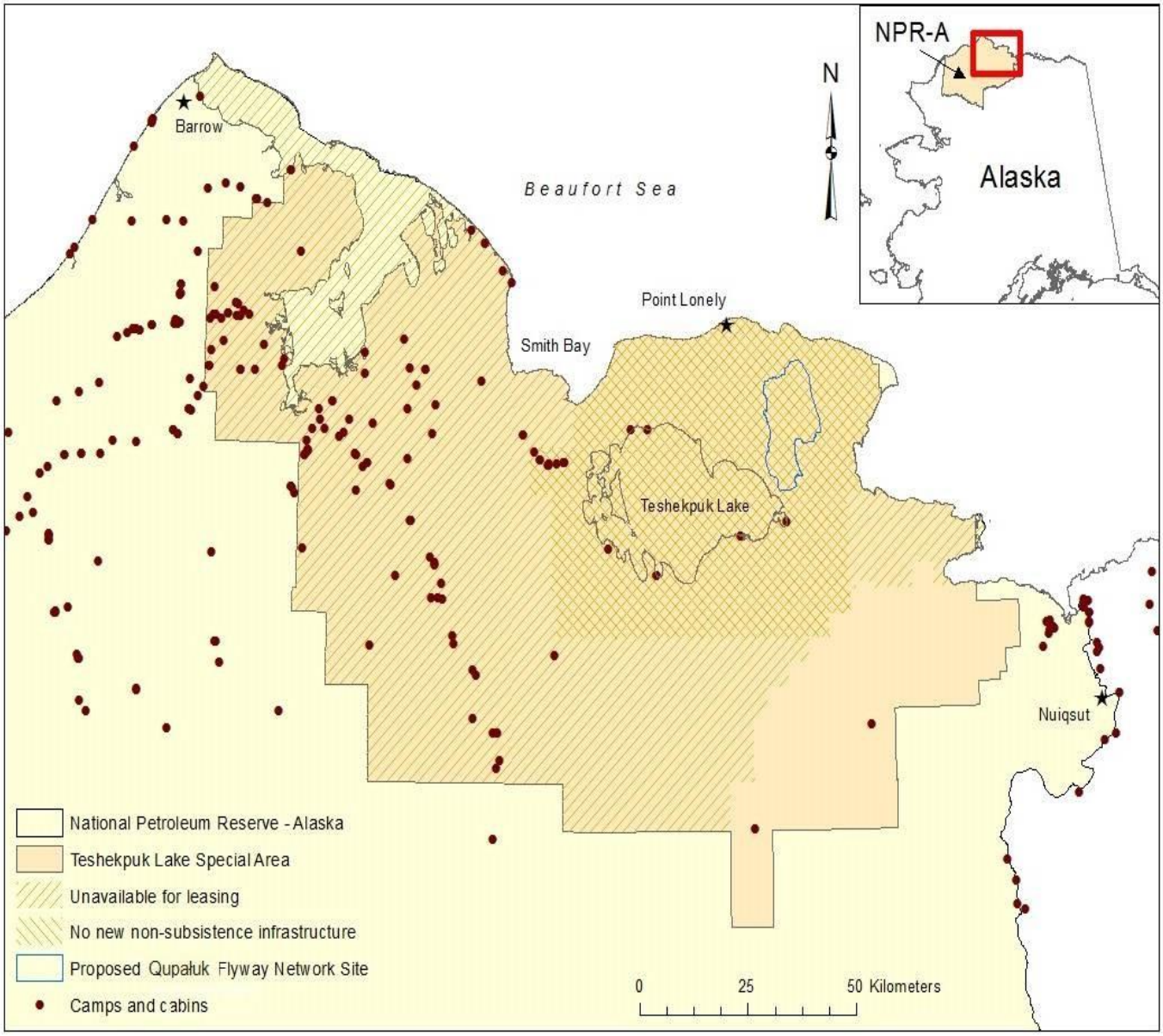
United State of America

4. Name of the Flyway Network Site*: Qupałuk

Qupałuk (coo-pa-luke) is the Iñupiat word for small shorebird.

5. Map of site*:

Location Map of Site



Aerial Photo of Site

6. Geographical coordinates* (latitude/longitude, in decimal degrees):
The site is bound by the following latitudes and longitudes:

North: 70°84.5332'N

South: 70°60.9450'N

West: -153°02.6704'W

East: -152°67.8952'W

The approximate center of the site is 70°72.0000'N, -152°85.0000'W.

7. Elevation*:
The maximum elevation is approximately 17 meters (55 feet). Most of the area is less than 5 meters (16 feet).

8. Area*:
21,100 hectares (52,139 acres)

9. General overview of the site*:

The site is located northeast of Teshekpuk Lake within the National Petroleum Reserve in Alaska (NPR-A) on the Arctic Coastal Plain of Alaska. The habitat is a matrix of low elevation tundra wetlands and thaw lakes interspersed with slightly higher and drier areas of tundra. The site is undisturbed and high quality breeding habitat for dozens of migratory birds, many of whom migrate along the East Asian-Australasian, the Central Pacific, various American (e.g., Pacific, Mississippi, Central, Atlantic), and the East Atlantic flyways. This site also provides essential post-breeding habitat for waterfowl that undergo a flightless molt and is important habitat for other non-avian wildlife species.

10. Justification of Flyway Network Site criteria*:

The site meets several criteria to be a Flyway Site Network, including:

Criterion 2: Supports Vulnerable, Endangered, or Critically Endangered migratory waterbirds

A small number of threatened Steller's Eiders (*Polysticta stelleri*) were observed in or near the flyway site (Table 1), although the majority breed near Utqiaġvik, formerly known as Barrow (Quakenbush et al. 2002). The Steller's Eider is a smallish sea duck that breeds in western and northern Alaska and portions of western and eastern Arctic Russia (Fredrickson 2001, Kear 2005). The species is divided into an Atlantic and Pacific population. The Pacific population is further divided into the much more abundant Russian and sparse Alaskan breeding populations. The Alaska breeding population of the Steller's Eider was listed as threatened on June 11, 1997 by the U.S. Fish and Wildlife Service (Federal Register 1997) due to apparent reductions in Alaska's breeding population and range, especially the Yukon-Kuskokwim Delta in western Alaska (Flint and Herzog 1999). The Utqiaġvik population is estimated at 576 birds (95 percent CI: 292-859; Stehn and Platte 2009). Steller's Eiders from Russia and Alaska winter along the Alaska Peninsula and some individuals travel back and forth between Russia and Alaska (Martin et al. 2015).

The flyway site also has small numbers of the threatened Spectacled Eider (*Somateria fischeri*, Table 1). The Spectacled Eider is a large sea duck whose breeding grounds include the Arctic Coastal Plain and the Yukon-Kuskokwim Delta, and northern Russia (Petersen et al. 2000). The species was listed as threatened throughout their range on May 10, 1993 by the U.S. Fish and Wildlife Service (Federal Register 1993). The Arctic Coastal Plain population is estimated to be less than 4,000, but over 140,000 occur in Russia (U.S. Fish and Wildlife Service 1996). Spectacled Eiders from Russia and Alaska winter together in polynyas located in the Bering Sea (Petersen et al. 1999), and males may move between breeding locations.

In years when eiders may use the site, they would occur between late May and early August for breeding (Petersen et al. 2000, Fredrickson 2001). If present, the birds would likely use ponds in the site that have emergent vegetation such as *Carex aqualitis* and *Arctophila fulva*, which are important for feeding and cover (Quakenbush and Cochrane 1993, Anderson et al. 1999). Male eiders are present for only May and early June before departing. Nesting females whose nests fail may leave in late June to early July. The birds tend to migrate along the Arctic Coast as they approach and depart the breeding areas.

Criterion 5: Includes >20,000 migratory waterbirds

The site is estimated to have nearly 30,000 breeding migratory waterbirds, composed primarily of shorebirds (mostly sandpipers), with small numbers of geese, ducks, loons, jaegers, and an

assortment of other bird species (Table 1). Only some of these species use the East Asian-Australasian Flyway (Table 1).

In addition, a few thousand molting geese use the site during July when they become flightless (Wilson et al. 2014). Across the entire Teshekpuk Lake Special Area, geese flocks vary in size and occur in different places on a yearly basis, including the Qupałuk site. Besides adults, these flocks frequently have young-of-the-year, nonflying geese. Predominant species include Greater White-fronted Goose (*Anser albifrons*), Pacific Black Brant (*Branta bernicla nigricans*), Snow Goose (*Chen caerulescens*), and Taverner's Cackling Goose (*Branta hutchinsii taverneri)* (Shults and Dau 2016). Black Brant have been documented moving outside the Teshekpuk Lake Special Area and shifting their molting distribution from large inland lakes to coastal estuaries likely via first time molting birds colonizing new habitats (Flint et al. 2008, 2014). Snow Geese have increased in prevalence between 1992 and 2011 (Larned et al. 2012), and there is concern that breeding colonies will enlarge, expand to new areas, and potentially negatively affect tundra habitats used by other waterbirds as they have in Canada (Jefferies et al. 2004).

Criterion 6: Supports >1 percent of the individuals in a population of one species or subspecies of migratory waterbird

The site is estimated to have about 6,500 breeding Dunlin (*Calidris alpina arcticola*), which is greater than 1 percent of the estimated 490,000 Dunlin that occur throughout the world (Table 1, Wetlands International 2016). This subspecies is listed as a priority species in Alaska by the Alaska Shorebird Conservation Plan (Alaska Shorebird Group 2008) and a species of high concern in the U.S. (U.S. Shorebird Conservation Plan Partnership 2016). The priority status of this species is due to a significant population decline documented near Prudhoe Bay, Alaska, and the many threats towards this species in East Asia (Barter 2003, Melville et al. 2016).

Dunlin breed throughout the circumpolar sub-Arctic and Arctic (Warnock and Gill 1996, Miller et al. 2015). The *arcticola* subspecies of Dunlin is found most commonly between Point Barrow and Prudhoe Bay (Warnock and Gill 1996). Dunlin are present on the Arctic Coastal Plain from May to September (Taylor et al. 2010), and use a wide range of habitat types, but are more abundant near the coast than inland (Derksen et al. 1981, Johnson and Herter 1989, Saalfeld et al. 2013). Dunlin nest in dry to moist dwarf shrub-graminoid tundra (Cunningham et al. 2016), often in areas with ponds, polygonal tundra, and strangmoor habitats (short, sinuous ridges that form perpendicular to the direction of the local hydrologic gradient). Dunlin are commonly found in recently formed landscapes such as drained thaw lakes (Warnock and Gill 1996). After hatching, brood-rearing shorebirds typically move to wetter areas to forage. Once young are fledged, both adults and juveniles migrate north to the coastal areas of the Arctic Coastal Plain where they stage for a few weeks to months (Taylor et al. 2010, 2011). Ground surveys of post-breeding birds found the greatest number of Dunlin at three coastal estuaries: Kasegaluk Lagoon, Colville Delta, and the Sagavanirktok Delta (Taylor et al. 2010). Telemetry surveys of post-breeding Dunlin indicated they move both east and west across coastal portions of the Arctic Coastal Plain. Such movements might be due to variable weather and intertidal conditions that influenced food availability and thus their ability to replace flight feathers while acquiring fat resources for southbound migration (Taylor et al. 2011). Ground-based research of habitat use at fall staging areas in the NPR-A showed that Dunlin selected for salt marsh habitat (Taylor et al. 2010). Departure from the Arctic Coastal Plain is age and sex dependent. Adults often migrate before juvenile birds, and juvenile shorebirds may not leave until late August or September (Johnson and Herter 1989).

Upon leaving the Arctic Coastal Plain, most Dunlin migrate to the Yukon-Kuskokwim where they may stage again for several weeks (Taylor et al. 2011, Gill et al. 2013) before flying to East Asia where they winter in Japan, Republic of Korea, Democratic People's Republic of Korea, and the People's Republic of China (Cao et al. 2009, Lanctot et al. 2009). Most *arcticola* Dunlin likely winter in the People's Republic of China (i.e., mainland China); here they can be found widely spread along the coast and in the Yangtze River floodplain (Cao et al. 2009). Dunlin preferred tidal flats, avoided agricultural croplands, and used aquaculture ponds in proportion to their availability on Chongming Dongtan Island, located on the coast near Shanghai (Choi et al. 2013).

TABLE 1. Estimated breeding season population of bird species found within the Qupałuk East Asian-Australasian Flyway Network Site.[1, 2] Highlighted rows represent factors that qualify the site as a Flyway Network Site (see criteria above).

Common Name	***Scientific Name***	**Use EAAF[3]**	**Estimate[4]**
American Golden-Plover	*Pluvialis dominica*	no	0
Arctic Tern	*Sterna paradisaea*	unknown	20
Baird's Sandpiper	*Calidris bairdii*	no	0
Black-bellied Plover	*Pluvialis squatarola*	no	362
Taverner's Canada Goose	*Branta hutchinsii taverneri*	no	38
Common Eider	*Somateria mollissima*	yes	<1
Common Raven	*Corvus corax*	no	1
Dunlin	*Calidris alpina arcticola*	yes	6,496
Glaucous Gull	*Larus hyperboreus*	yes	46
Greater White-fronted Goose	*Anser albifrons*	no	448
Green-winged Teal	*Anas crecca*	no	<1
Jaeger spp.	*Stercorarius* spp.	no	4
King Eider	*Somateria spectabilis*	yes	22
Long-billed Dowitcher	*Limodromus scolopaceus*	no	570
Long-tailed Duck	*Clangula hyemalis*	yes	42
Long-tailed Jaeger	*Stercorarius longicaudus*	no	5
Mallard	*Anas platyrhynchos*	yes	3
Northern Pintail	*Anas acuta*	yes	207
Northern Shoveler	*Anas clypeata*	no	1
Pacific Brant	*Branta bernicla nigricans*	no	106
Pacific Loon	*Gavia pacifica*	yes	40
Parasitic Jaeger	*Stercorarius parasiticus*	no	3
Pectoral Sandpiper	*Calidris melanotos*	yes	4,449
Pomarine Jaeger	*Stercorarius pomarinus*	no	2
Red Phalarope	*Phalaropus fulcarius*	no	9,790
Red-breasted Merganser	*Mergus serrator*	yes	2

Red-necked Grebe	*Podiceps grisegena*	no	<1
Red-necked Phalarope	*Phalaropus lobatus*	no	1,538
Red-throated Loon	*Gavia stellata*	yes	5
Sabine's Gull	*Xema sabini*	unknown	45
Scaup spp.	*Aythya* spp.	no	1
Semipalmated Sandpiper	*Calidris pusilla*	no	4,718
Sharp-tailed Sandpiper	*Calidris acuminata*	yes	0
Short-eared Owl	*Asio flammeus*	yes	1
Snow Goose	*Chen caerulescens*	yes	37
Snowy Owl	*Bubo scandiacus*	yes	24
Spectacled Eider	*Somateria fischeri*	yes	38
Steller's Eider	*Polysticta stelleri*	yes	1
Stilt Sandpiper	*Calidris himantopus*	no	0
Tundra Swan	*Cygnus columbianus*	no	34
White-rumped Sandpiper	*Calidris fuscicollis*	no	0
Willow Ptarmigan	*Lagopus lagopus*	no	<1
Yellow-billed Loon	*Gavia adamsii*	yes	3
TOTAL			29,106

[1] Estimates for shorebirds were based on a single ground survey at thirteen 0.16 km study plots (see plot locations in aerial photograph of the site above) visited between 2006 – 2008 following the Program for Regional and International Shorebird Monitoring Protocol (Andres et al. 2012). Ground counts were corrected to account for the likelihood a bird was breeding on the plots, for single birds whether it was paired (polygamous species were assumed to represent a single pair), and the probability of detecting a species (Bart et al. 2012). The breeding estimate was generated by extrapolating the average corrected values of the 13 study plots across the land area within the site.

[2] Estimates for non-shorebirds were based on 2013-2016 aerial survey data that covered a portion of the entire Arctic Coastal Plain (Wilson et al. in prep). Data from all four years were spatially interpolated from a regular-grid of points (10 km x10 km) and a generalized spline model to produce a prediction surface with locally-smoothed averages as outlined in Wilson et al. (in prep). These averages were then combined across the site to generate an estimated population size for each non-shorebird species.

[3] Presence in EAAF based on classification developed by Doug Watkins (pers. comm.).

[4] Zeros represent species whose ranges overlap the site but were not present during our survey years, and likely occur in very low numbers. <1 represent species where at least one individual bird was observed but the modeling approach reduced the estimate to below 1.

Other Information

In general, the site is part of a very expansive wetland area that falls within the Teshekpuk Lake Special Area, which is part of the NPR-A. At least 29 species of shorebirds breed in the NPR-A (Johnson et al. 2007); the most abundant are the American Golden-Plover, Semipalmated Sandpiper, Pectoral Sandpiper, Dunlin, Long-billed Dowitcher, and Red-necked and Red Phalaropes. Bart et al. (2013) estimated that over 4.5 million shorebirds, more than 665,000

waterfowl, loons, and grebes, and more than185,000 gulls, terns, and jaegers reside within the NPR-A (Bart et al. 2013). The NPR-A, especially Teshekpuk Lake Special Area, has significantly higher nesting densities of many species of aquatic birds relative to other regions of the Arctic Coastal Plain and the world (Andres et al. 2012, Bart et al. 2013). Because of these factors, Audubon Alaska designated the Teshekpuk Lake Area as an "Important Bird Area" (Source: http://www.audubon.org/important-bird-areas/teshekpuk-lake-e-dease-inlet).

11. Wetland types*:

With the exception of thaw bulbs under larger lakes and streams, permafrost is continuous under the NPR-A. Since permafrost forms an impenetrable barrier to water percolation, the soils of the active layer above it remain saturated during summer in all but a few cases. Even "moist tundra" over these saturated soils would be classified as wetlands (BLM 2002). Because of the high shrub component, the Dwarf and Low Shrub subclasses are separated from the Moist Tundra class. The Dwarf and Low Shrub subclasses also exist on saturated tundra (Kempka et al. 1995, Pacific Meridian Resources 1996) and much of the Dwarf Shrub subclass exists on areas of sedge tussocks. This indicates that more than 95 percent of the NPR-A would be classified as wetlands by at least one of the two sets of criteria.

Moist Tundra, Tussock Tundra, Dwarf Shrub, and Clear Water (Ice in winter) are the most common habitat types in the area.

Wetland/Upland Habitat Types:

1. Water
    a. Clear: Fresh or saline waters with little or no particulate matter. Clear water areas are typically deep (greater than 1 meter). The clear water class generally contains less than 15 percent cover of pendent grass and water sedge. Maximum water depth is less than 5 m (16 ft).
    b. Turbid: Shallow water (less than 1 meter) or water with particulate matter that typically occurs in shallow lake shelves, deltaic plumes and rivers and lakes with high sediment loads. Turbid water generally contains less than 15 percent cover of pendent grass and water sedge.
    c. Ice: May last into late summer on lakes and larger ponds. Ice is present year round on many larger lakes.
2. Aquatic
    a. Water sedge: Associated with lake or pond shorelines and composed of 50 to 80 percent clear or turbid water greater than 10 centimeters deep. The dominant species is water sedge. A small percentage of pendent grass, common mare's tail, marsh fivefinger, or marsh marigold may be present.
    b. Pendent grass: Associated with lake or pond shorelines and composed of 50 to 80 percent clear or turbid water greater than 10 centimeters (2.5 inches) deep. The dominant species is pendent grass. A small percentage of water sedge, common mare's tail, marsh fivefinger, or marsh marigold may be present.
3. Flooded Tundra
    a. Low Centered Polygons: Polygon features that retain water throughout the summer. This class is composed of 25 to 50 percent water. Water sedge is the dominant species in the permanently flooded areas. The drier ridges of the polygons are inhabited mostly by cottongrass species (*Eriophorum* spp.), sphagnum moss (*Sphagnum* spp.), willow

(*Salix* spp.), bearberry (*Arctostaphylos alpina* and *A. rubra*), Labrador tea (*Ledum palustre decumbens*) and dwarf birch (*Betula nana exilis*).

b. Non-patterned: Continuously flooded areas are composed of 25 to 50 percent water. Water sedge is the dominant species. Other species may include common mare's tail (*Hippuris vulgaris*), marsh fivefinger (*Potentilla palustris*), and marsh marigold (*Caltha palustris*). Nonpatterned is distinguished by the lack of polygons and associated shrub species.

4. Wet Tundra

a. Wet Tundra: Associated with areas of super saturated soils and standing water. Wet tundra often floods in early summer and usually drains excess water during dry periods, but remains saturated throughout the summer. It is composed of 10 to 25 percent water. Water sedge is the dominant species. Other species include cottongrass, other sedges, grasses and forbs.

5. Moist Tundra

a. Sedge/Grass Meadow: This class commonly consists of a continuous mat of sedges and grasses where water sedge is the dominant species. Other dominants include cottongrass, arctic bentgrass (*Agrostis aequivalvis*) and arctic bluegrass (*Poa artica*). Other species are Alaska bellheather (*Harrimanella stelleriana*), Labrador tea and blueberry (*Vaccinium uliginosum*).

b. Tussock tundra: This class is common throughout the foothills and may be found on well-drained soils. It is dominated by cottongrass tussocks (*Eriophorum vaginatum*) with moss as the most common inter-tussock growth form. Lichen, forbs and low shrubs in varying densities are also present.

c. Moss/ Lichen: Associated with low-lying lakeshores and dry sandy ridges dominated by moss and lichen species. As this type grades into the sedge type, grass-like plants such as water sedge may increase in cover forming an intermediate zone.

6. Shrub

a. Dwarf: Associated with ridges and well-drained soils and dominated by shrubs less than 1 meter tall. It is the most species-diverse class because of the relative dryness. Major species include willow, dwarf birch, Labrador tea, mountain avens (*Geum glaciale*), blueberries, bearberry, tussock cottongrass and water sedge. This class frequently occurs on a substrate of cottongrass tussocks, and is separated from the tussock tundra subclass by having a shrub canopy cover greater than 40 percent.

12. Jurisdiction*:

US Department of the Interior (DOI), Bureau of Land Management (BLM), Arctic Office, NPR-A

13. Management authority*:

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14. Bibliographical references*:

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15. Physical features of the site:

The NPR-A is characterized as a northern polar climate (also known as the Arctic Zone), dominated by a lack of sunlight in the winter and long days in the summer. Winters are therefore long and cold, and summers are short and cool. The area has relatively little precipitation. Monthly precipitation is fairly uniform, with slightly less in May and more in July and August. Streams and lakes are frozen for much of the year because of the long winter. Snow cover is common from October through May. Summers, while short and relatively cool near the coast, are longer and warmer inland.

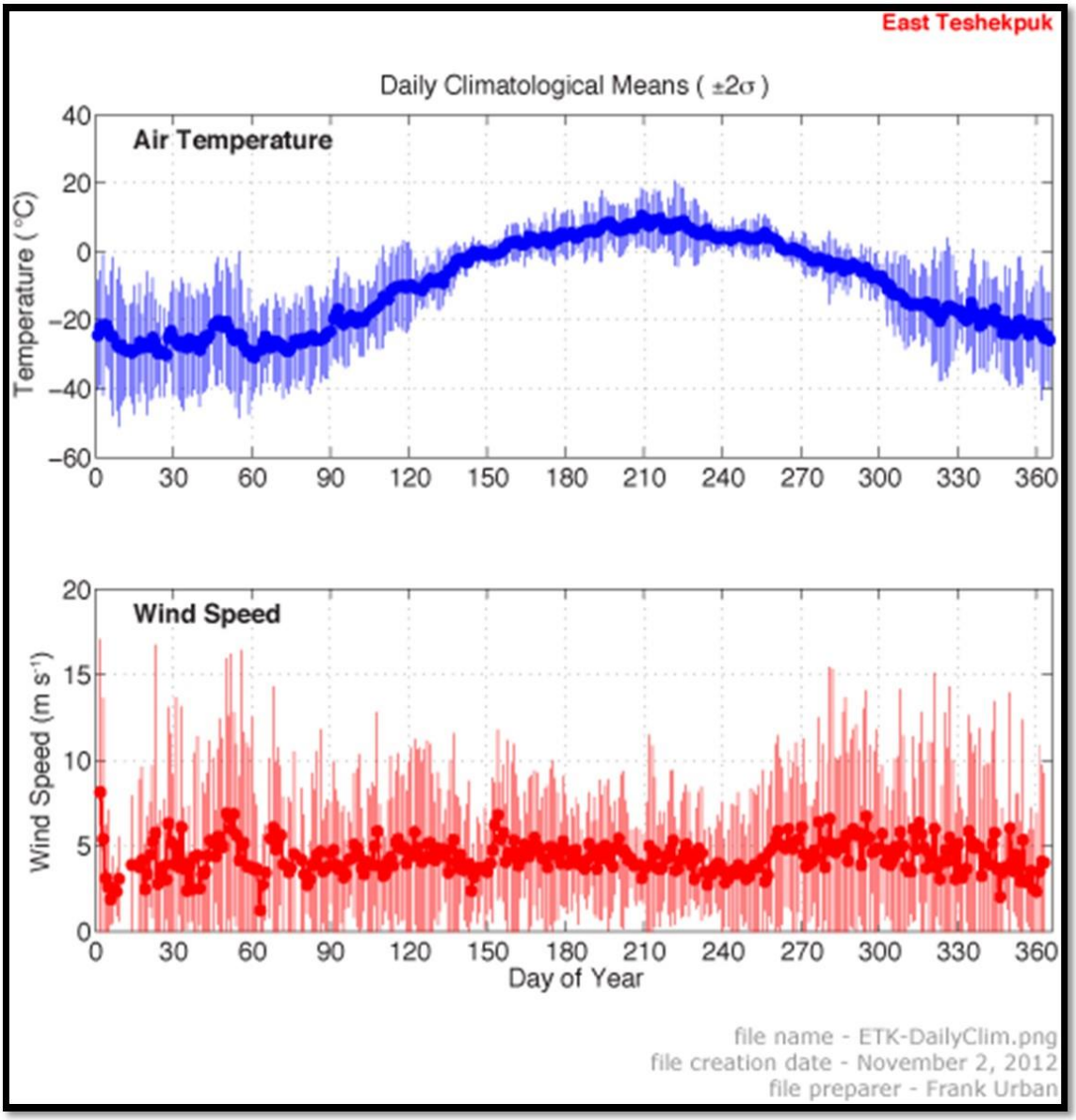

Figure 2. USGS Weather Station Data from East Teshekpuk Station (70° 34.111′N,152° 57.899′W) 1998-2011, A

Mean-daily air temperature (blue dots, upper panel) and wind speed (red dots, lower panel) calculated using the entire available data record from this station. Also shown is the range of daily variability (vertical lines). Mean-daily air temperatures and wind speeds fall within this range 95 percent of the time.

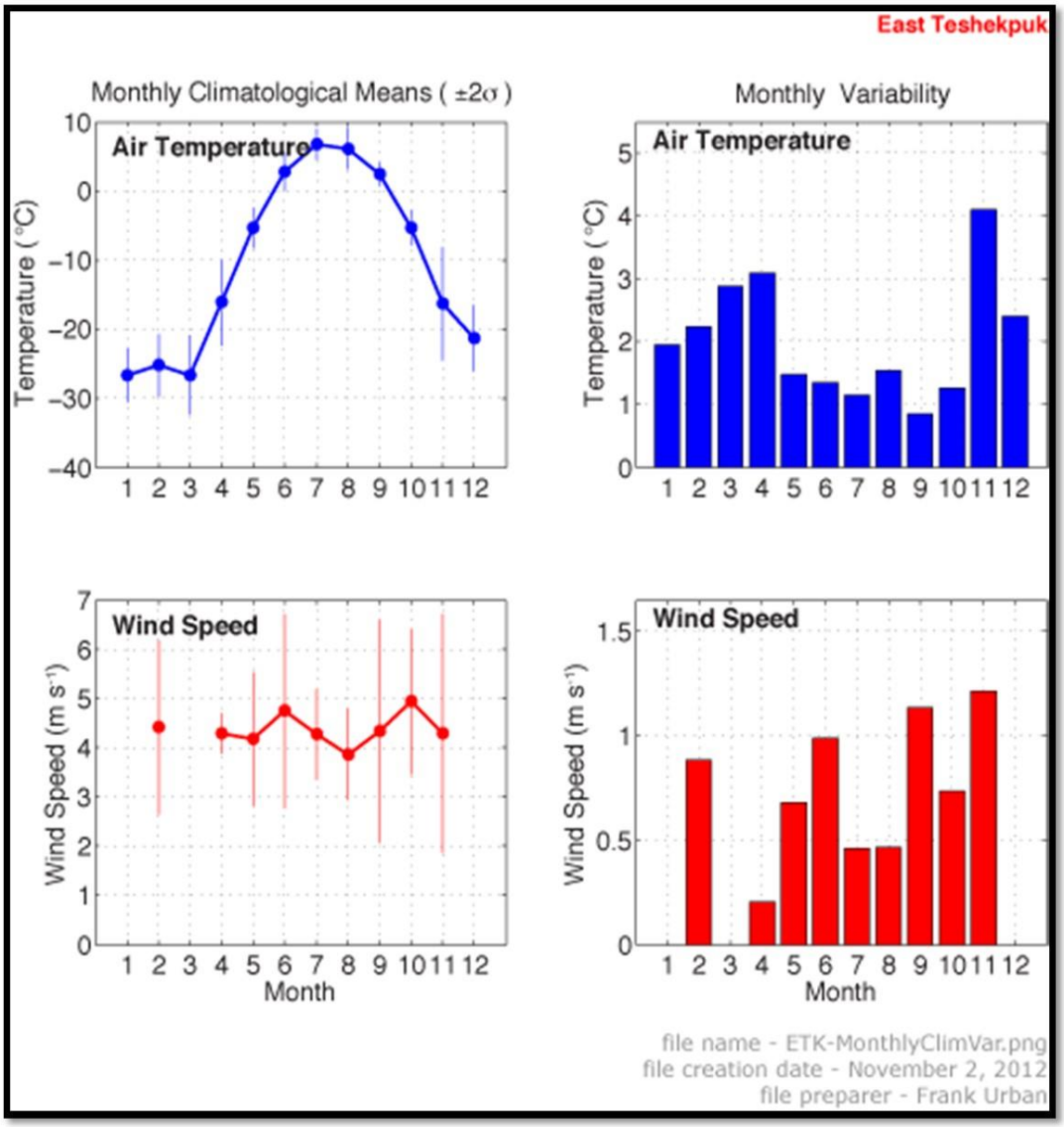

Figure 3. USGS Weather Station Data from East Teshekpuk Station (70° 34.111′N,152° 57.899′W) 1998-2011, B

East Teshekpuk: Mean-monthly air temperature (blue dots, upper left panel), and wind speed (red dots, lower left panel) calculated using the entire available data record from this station. Also shown is the range of monthly variability (vertical lines, left panels and vertical bars, right panels). Mean monthly air temperatures and wind speeds fall within this range 95 percent of the time (Source: http://pubs.usgs.gov/of/2013/1063/EastTeshekpuk/EastTeshekpuk.html).

Physiographically, the Arctic Coastal Plain Province covers the area. It is a smooth plain rising imperceptibly inland between roughly 24 to 160 kilometers (15 to 100 miles) from the coast of the Arctic Ocean (Wahrhaftig 1965). The coastline is irregular and contains many small bays, lagoons, spits, beaches, and barrier islands (National Research Council 2003). The Arctic Coastal Plain is dominated by periglacial features (e.g., thaw lakes, marshes, and polygonal patterned ground) that provide little topographic relief and poor drainage. Polygonal-patterned

ground forms from ice wedges that freeze within contraction cracks of the soil. Throughout the year, these cracks fill with water and snow, then freeze and expand. During the warmer months, the surface ice melts and water remains. This process repeats annually, resulting in a polygonal-patterned surface. The lowlands are a flat vast treeless area of tundra, meandering streams, drained and undrained lagoons, and thousands of shallow thaw lakes. Freshwater lakes cover approximately 20 percent of the Arctic Coastal Plain lying within the NPR-A. Throughout most of the NPR-A, lakes are oriented north-northwest due to the effects of predominant winds on the permafrost shorelines of thaw lakes (Gallant et al. 1996). The little topographic relief on the Arctic Coastal Plain is partially caused by large broad-based low hills or “pingos” created by permafrost (Walker et al. 1985). On the eastern side of the NPR-A, the lake-filled coastal plain fades into an area of large, rounded lakes and numerous very small lakes at an elevation of about 30 meters (100 feet) above mean sea level and about 40 miles inland. Northeast-trending sand dunes, 3 to 6 meters (9 to 18 feet) high, such as the Pik Dunes, occur between the Kuk and Colville Rivers (Gallant et al. 1996).

Soil Map Unit IQ6 (S9277) occupies most of the Arctic Coastal Plain, which abuts the ocean across the north and the Colville River along the eastern edges of the NPR-A. With few exceptions, the soils of this unit are shallow and constantly wet as they lie over the area's thick permafrost. Elevations range from sea level to about 120 meters (400 feet). Many small thaw (karst) lakes characterize this treeless area. Low terraces, broad shallow depressions, and floodplains are typical. It is common to find frost features, including polygons, hummocks, frost boils, and pingos. The dominant poorly drained soils have developed principally in deep loamy sediment under a thick cover of sedge tussocks, low shrubs, forbs, mosses, and lichens. Very poorly drained fibrous peat soils, commonly under a cover of sedges, occupy broad depressions, shallow drainage ways, and lake borders. These types of soils are cold and wet. The major soils are described as Typic Histoturbels, loamy, nearly level to rolling and Typic Fibristels, nearly level association.

Most freshwaters in the NPR-A are pristine and, like those of Teshekpuk Lake, are soft, dilute calcium-bicarbonate waters. Near the coast, sodium chloride (salt) concentrations predominate over bicarbonate concentrations (USDOI BLM NPR-A Task Force 1978a, Prentki et al. 1980). The freeze/thaw cycle in the Arctic plays a controlling role in water quality. In winter, surface waters less than 2 meters (6 feet) deep will freeze solid (Hobbie 1984). In such waters, major ions and other “impurities” are excluded from downward-freezing ice in autumn and forced into the underlying sediment. Most of the ions remain trapped in the sediment after the next spring’s meltout, giving these waters a very low dissolved matter concentration. During the summer, dissolved matter concentrations slowly increase as ice in the bottom sediment melts and the sediments compress (Miller et al. 1980).

Most NPR-A freshwater areas have low turbidity and suspended-solid concentrations. The exceptions are the larger rivers, possibly shallow floodplain lakes, and waters from thermokarst erosional features. Thermokarst is an altering of the terrain caused by melting permafrost that results in subsidence and water pooling.

In the Arctic Coastal Plain, freshwaters are weakly buffered (USDOI BLM 1978a, Prentki et al. 1980, Hershey et al. 1995, O’Brien et al. 1995). Lake alkalinities also are low, approximately 0.5 milliequivalents/liter (meq/l). Alkalinities in individual NPR-A coastal rivers are higher, ranging from about 0.3 to 1.6 meq/1 in summer, with higher values at lower flow rates. In ponds, pH values are often depressed to below a pH of 7.0 due to snowmelt runoff. After snowmelt, their pH

values usually increase to between pH 7.0 and 7.5 (Prentki et al. 1980). The initial low pH is due to acidity of snow on the Arctic Coastal Plain, which has a median pH of 4.9 (Sloan 1987). This low pH, lower than the pH of 5.5 expected for uncontaminated precipitation, is thought to be a result of sulfate fallout from industrially contaminated Arctic air masses. In lakes, pH values are near neutral (O'Brien et al. 1995).

The concentration of dissolved oxygen in Arctic waters tends to be higher than in other waters because the solubility of oxygen increases with decreasing water temperature. In deeper coastal plain lakes, waters remaining beneath the ice may become supersaturated with oxygen in winter (USDOI BLM 1978a, Prentki et al. 1980, O'Brien et al. 1995). During ice formation, dissolved oxygen is excluded from the ice into the water column. Exclusion adds more oxygen than underwater respiration removes. In shallower lakes, dissolved oxygen measurements taken below ice do not show consistent results from year to year and do not generally remain saturated. Lakes sampled in the Nuiqsut area during winter were found to be stratified within the water column and levels were often no more than 1 to 2 milligram per liter within the bottom 0.3 to 0.6 meters (1 to 2 feet) of the water column (Hinzman et al. 2006). Consumption of dissolved oxygen is mostly due to bacterial respiration and chemical oxidation at the sediment/water interface and fish in the water column only contribute minimally to the depletion (Stefan 1992).

Many more up to date publications for this Section and Section 17 can be found at:
http://ine.uaf.edu/werc/projects/arp-fishcreek/pubs.html.

16. Physical features of the catchment area:

See 15. above.

17. Hydrological values:

Arctic wetlands provide many useful functions. The various ponds, lakes, and drainages of the Arctic Coastal Plain regulate runoff through storage in the active layer, slowly releasing water to streams over extended periods. Arctic wetlands generally are not areas of discharge or recharge for subpermafrost aquifers, but supra-permafrost groundwater can influence wetland communities in ways comparable to aquifer discharge in temperate regions (Post 1990).

Arctic wetlands retain or distribute sediments, nutrients, and toxicants. At breakup, streams flood adjacent tundra creating extensive wetland complexes that provide areas for suspended solids to settle, and sediment is trapped by riparian wetlands along large Arctic rivers with mountain headwaters. Microbes and plants contribute to nutrient and contaminant retention or transformation in tundra wetlands since Arctic-tundra species are adapted to low temperatures and are biologically active even under harsh conditions (Post 1990).

18. General ecological features:

Net primary production, nutrient export, and food-chain support are important functions of Arctic wetlands. Tundra production is remarkably high—approximately one-half that of temperate grasslands—and supplies the energy (plant biomass) on which animals exist. Nutrient export is an important function of Arctic wetlands. Arctic-tundra wetland supports food chains, both through the herbivore-based trophic system (from living plant tissues to rodents and ungulates and their predators) and through the detritus-based trophic system (from dead plant tissue to invertebrate to shorebirds and their predators) (Post 1990). Alaska's Arctic Coastal Plain is largely wetland and supports both herbivore-based and detritus-based trophic systems (Batzli et

al. 1980, Hobbie 1984). Waterfowl, lemming, and caribou are major primary consumers on the Arctic Coastal Plain (White et al. 1981).

All other ecological features are covered in the Wetlands Types section above.

19. Noteworthy flora:

Sabine grass (*Pleuropogon sabinei*), an aquatic grass, has been found between the pendent grass and sedge zones in lakes and ponds. It is secure globally, but critically imperiled in Alaska. It is known in Alaska from only a few locations north and northeast of Teshekpuk Lake. Sabine grass is may be found on the site.

20. Noteworthy fauna:

Noteworthy fauna of the site include caribou (*Rangifer tarandus granti*) and polar bear (*Ursus maritimus*). Caribou are common seasonally throughout the site, while polar bears are rare, but possibly increasing (Rode et al 2015, Atwood et al. 2016).

The Teshekpuk Caribou Herd was recognized as a separate herd from the Western Arctic Herd and Central Arctic Herd in the mid-1970s (Davis and Valkenburg 1978). The primary range of the Teshekpuk Caribou Herd is the Arctic Coastal Plain west of the Colville River, with the peripheral range sometimes extending as far south of the Brooks Range as the Nulato Hills and as far east as the Arctic National Wildlife Refuge. Most of the herd's annual use is in the northern portion of the NPR-A. During spring and fall migrations, some satellite-collared Teshekpuk Caribou Herd animals have moved through the southern NPR-A. Even more have traveled during fall migration along the Chukchi Sea coast through the NPR-A and on to the south. Winter ranges of some Teshekpuk Caribou Herd animals extend east to the Dalton Highway and south to the Seward Peninsula.

Calving takes place in the spring, generally from late May to late June (Hemming 1971). The calving grounds of the Teshekpuk Caribou Herd are primarily in the northeastern portion of the NPR-A near Teshekpuk Lake. Calving grounds may shift gradually over years or change abruptly because of environmental conditions. If snowmelt occurs in late spring, more caribou calve south of the lake than when snowmelt occurs in early spring (Carroll et al. 2005). The Teshekpuk Caribou Herd summer range is between Utqiaġvik and the Colville River. In early July, Teshekpuk Caribou Herd caribou generally aggregate to the north and southeast of Teshekpuk Lake for insect (mosquito) relief (Prichard et al. 2001, Prichard and Murphy 2004). During fall (August−September), many Teshekpuk Caribou Herd caribou have been observed around Teshekpuk Lake and east to Fish Creek. In fall migration, some Teshekpuk Caribou Herd caribou again use the narrow corridors east and northwest of the lake.

Polar bears have circumpolar distribution in the northern hemisphere, with two populations occurring in Alaska—the Chukchi/Bering Sea population and the Southern Beaufort Sea population. The two populations overlap in the western Beaufort Sea and the eastern Chukchi Sea from Point Hope to Point Barrow, but they have been distinguished based upon information about contaminants and movement data from satellite collars (Amstrup et al. 2004, Amstrup et al. 2005). The polar bear's principal habitat is the annual ice over the continental shelf and inter-island archipelagos that encircle the polar basin (Derocher et al. 2004). The coast, barrier islands, and shorefast ice edge provide an important corridor for polar bears traveling and feeding during fall, winter, and spring months. The Beaufort Sea coastline, creek and river drainages, and bluffs along lakes throughout NPR-A provide important areas for polar bear resting, feeding, denning,

and seasonal movements. In northern Alaska, pregnant polar bears enter maternity dens by late November and emerge as late as April. Maternity dens are located in snowdrifts in coastal areas, on stable parts of the offshore pack ice, or on landfast ice (Amstrup and Garner 1994).

21. Social, economic and cultural values:

a) Describe if the site has any general social, economic and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

For Alaska Natives, the continued viability of the subsistence way of life is of the greatest importance. Subsistence hunting and other features of the subsistence way of life embody cultural, social, and spiritual values, constituting the essence of Alaska Native culture (Bryner 1995, Alaska Department of Natural Resources 1997). For the North Slope Iñupiat who compose the primary subsistence users of the North Slope, subsistence resources are nutritionally critical because they constitute a mainstay of the diet and are commonly fresher and healthier than store-bought food. They are also economically critical because high transportation costs and relatively small market sizes mean that commercially available food is much more expensive in northern Alaska communities than in Alaska's major urban population centers. Subsistence systems, therefore, provide food security and can be classified as economic systems, but they are also important social and cultural systems (Okada 2010).

Because subsistence encompasses all phases of harvesting, processing, sharing, and consumption of food, it is inextricably intertwined with social interactions and cannot be separated from other aspects of Alaska Native life. Subsistence resources are highly valued and central to Iñupiaq customs and traditions, which encompass sharing and distribution networks, cooperative hunting, fishing, and ceremonial activities.

Many birds and mammals are open to both subsistence and sport harvest on the site. Subsistence harvest regulations are posted each year in the US Federal Register and vary depending on the status of the species. Regulations may be changed by submitting proposals to the Alaska Migratory Bird Co-Management Council (AMBCC), which regulates the subsistence harvest. A list of birds open to subsistence harvest is available on the AMBCC's website (https://www.fws.gov/alaska/ambcc/Regs%20-%2004%20pages/04%20Regs%20Birdlist.htm).

The BLM is responsible for administering the Federal Subsistence Program on BLM public lands, including data collection and analysis, and implementing and enforcing regulations. The overall objective is to provide for rural subsistence use, while maintaining healthy populations of subsistence resources within the bounds of recognized fish and wildlife management principles.

Subsistence resources are often harvested while users stay at specific camps where multiple resource harvest opportunities are available in each season. Generally, communities harvest resources nearest to them, but harvest activities may occur anywhere in the NPR-A, including the flyway site. Harvests tend to be concentrated near communities, along rivers, and the coastline at particularly productive areas. The distribution, migration, and the seasonal and more extended cyclical variation of animal populations make determining what, where, and when a subsistence resource will be harvested a complex activity. Areas might be used infrequently, but they can be quite important harvest areas when they are used (USDOI BLM 1978b).

Waterfowl harvested by the Iñupiat of Nuiqsut, the community closest to the flyway site, occupy two habitats in the greater Nuiqsut area. Ducks and geese molt and nest in the wet tundra around Nuiqsut. Eiders nest in the sandy areas of the Colville River Delta and the barrier islands. Both groups of waterfowl raise their young in the area until fall, when they migrate south. Nuiqsut hunters harvest waterfowl during the migration in May and June using snowmachines and boats. The hunters harvest the migrating birds from snow blinds built to the south. Once the river breaks up, hunters look for birds by boat, and start to look for eiders in the Colville River Delta and in Harrison Bay at the ice edge as summer approaches. Hunters end the waterfowl harvest when the birds are on their nests (Steven R. Braund and Associates 2003b). There is an additional subsistence harvest period beginning in mid-July.

In earlier times, Iñupiaq resource users harvested flightless molting birds by cooperatively "herding" them into creeks, then dividing the harvest between the work group members. One resident remembered doing this as recently as the late 1940s at Oliktok Point. Nuiqsut residents in the past gathered and stored eggs from waterfowl nests on the tundra. According to the Steven R. Braund and Associates 2003 interviews, eggs are no longer gathered, and certain species of waterfowl are not harvested for various reasons. Some residents indicated that they do not eat certain varieties of ducks (e.g., Long-tailed Duck, Northern Pintail), while many chose to avoid harvesting Black Brant and Spectacled Eider because they are species of concern. Nearly all interviewed resource users harvest geese in May, and most harvest some eiders when breakup allows boat travel on the river and in Harrison Bay (Steven R. Braund and Associates 2003b).

Dunlin, which this site is recognized for, are open to legal subsistence harvest. Other legal shorebirds that may be harvested include Bar-tailed Godwit, Ruddy Turnstone, Semipalmated Sandpiper, Western Sandpiper, Baird's Sandpiper, Sharp-tailed Sandpiper, Long-billed Dowitcher, Red and Red-necked Phalarope. Subsistence harvest is also open to various species of eiders, geese, waterfowl, and seabirds. The subsistence harvest season is typically open from 2 April to 29 June and again from 30 July to 31 August for seabirds; and from 2 April to 19 June and again from 20 July to 31 August for all other birds. Subsistence harvest is limited to local residents, Alaska Native and non-native. Harvest rates are monitored annually by the Alaska Department of Fish and Game partnering with Native organizations under contract from the U.S. Fish and Wildlife Service. Harvest rates of shorebirds are generally very low (less than 1 percent of the total harvest statewide), with harvest focused mostly on the larger waterfowl and geese populations (Naves 2016). Of all annual harvest of birds and eggs from the North Slope between 2005-2009, only 0.17 percent were shorebirds (from ADFG Data: http://www.adfg.alaska.gov/index.cfm?adfg=subsistence.migratorybird_cmc).

Sport harvest of waterfowl is also allowed under regulation by the U.S. Fish and Wildlife Service. Sport harvest season begins 1 September and ends 16 December. Similar to the subsistence harvest, there is an extensive process in place to regulate which species, what times, and how many individuals may be harvested each year. However, sport harvest in the site is very low because when the season opens in September most birds have left the area.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

The area is considered one of the best areas of migratory bird habitat in the entire Arctic (Bart et al. 2013).

If yes, tick the box ❑ and describe this importance under one or more of the following categories:

I. Sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
II. Sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
III. Sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
IV. Sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

22. Land tenure/ownership:

a) Within the Flyway Network site: BLM
b) In the surrounding area: Primarily BLM, with some Alaska Native held lands and state lands nearby.

23. Current land (including water) use:

a) Within the Flyway Network site: Natural Area
b) In the surroundings/catchment: Natural Area

24. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) Within the Flyway Network site: None currently, but future potential access and pipelines through the site with development of Smith Bay or other nearby oil and gas production areas.
b) In the surrounding area: Very little human impact, although oil and gas development is occurring in coastal areas to the east and west. Potential future access and pipelines through the area with development of Smith Bay or other nearby oil and gas production areas.

25. Conservation measures taken:

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Flyway Network site:

This site lies within the Teshekpuk Lake Special area within NPR-A managed by the DOI BLM.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate, see Annex 3):

Ia ☐; Ib ☐; II ☐; III ☐; IV ☐; V ☐; VI ☐; N/A ☐

c) Does an officially approved management plan exist; and is it being implemented?: Yes, NPR-A Integrated Activity Plan (IAP).

If yes, is it being implemented?: If no, is one being planned?
Yes.

d) Describe any other current management practices:
None.

26. Conservation measures proposed but not yet implemented:

None.

27. Current scientific research and facilities:

A variety of wildlife and habitat-related field work currently is conducted within the Qupałuk Flyway Site. The U.S. Fish and Wildlife Service conducts aerial surveys for waterfowl as part of a larger Arctic Coastal Plain Aerial Survey. This information was used to determine use by waterbirds (aside from shorebirds) presented in Table 1. Further, The U.S. Fish and Wildlife Service has traditionally done a post-breeding waterfowl survey focusing on documenting the numbers of molting geese (Shults and Dau 2016).

The U.S. Geological Survey (USGS) continues research in the northeastern NPR-A area to inform ecosystem change, wildlife response and natural resource use and land management by other Department of Interior agencies. Currently, the USGS is conducting research through the Changing Arctic Ecosystems Initiative, in which scientists are quantifying the response of wildlife to the rapid environmental changes in the NPR-A. This work involves research on coastal erosion, permafrost, water quality, lake freeze and thaw patterns, migratory birds (loons, geese, and shorebirds), habitats, hydrology, polar bear movements on land and in the adjacent marine areas, and potential disturbance to wildlife by industry and researchers. USGS has captured and banded molting Black Brant and White-fronted Geese on lakes within the Qupałuk site (see Flint et al. 2014) to study patterns of fidelity and dispersal during molt. USGS has no research facilities at the site but will conduct additional research in the general area in the near future.

28. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

There were no education or awareness activities related to this specific area prior to the outreach on the potential for a site nomination. The outreach for the flyway site concept occurred during five events in the summer of 2016, four of which were held with groups representing the Arctic Coastal Plain communities and government. Following the nomination, targeted outreach and presentations are continuing to occur. Outreach and education will continue following the acceptance of the flyway site into the network.

29. Current recreation and tourism:

The NPR-A is a vast Arctic region with outstanding recreation opportunities. With its small resident population, costly access, lack of facilities, and few visitors, the area currently is minimally used and could support additional recreation in the future. Recreational use of the NPR-A represents only about 1 percent of total statewide outdoor recreation activities. The demand for outdoor recreation due to population growth in the lower 48 states and Alaska is expected to increase on public lands. While research has not been conducted specific to the NPR-A, backpacking, hiking, boating, and sightseeing along with bird and wildlife viewing are among the prevailing types of recreation in NPR-A.

30. Threats*:

Climate change is a significant long-term threat to the site. The shallow wetland and lake systems depend on snowmelt as their primary source of water, with rainfall gains often negated by evapotranspiration during the summer. Evaporation from these shallow waterbodies is very likely to increase as the ice-free season lengthens. Hence, the water budget of most lake, pond, and wetland systems is likely to depend more heavily on the supply of spring meltwater from winter precipitation to produce a positive annual water balance, and these systems are more likely to dry out during the summer (Arctic Climate Impact Assessment 2004). The permafrost active layer within the coastal plain may increase by 3 centimeters (1 inch) by the 2040s and 13 centimeters (5 inches) by the end of the century (Scenario Network for Alaska Planning 2010). In other areas, warming of the surface permafrost could increase the formation of ponds, wetlands, and drainage networks, especially in areas with heavy concentrations of ground ice. Such thawing could also lead to large increases in sediment being deposited in rivers, lakes, and coastal marine environments, potentially impacting aquatic organisms.

Climate change could alter species composition, increasing the prevalence of deciduous shrubs and decreasing the prevalence of wetland sedges and grasses, and could greatly influence wetlands through hydrological changes. Chapin et al. (1995) suggested that climate change might be altering the species composition of the Alaskan Arctic tundra. Warmer soil temperatures are likely to increase thermokarst and increases in sea level may inundate low-lying tundra areas increasing aquatic and wet tundra vegetation types and increase erosion of coastal bluffs (Arctic Climate Impact Assessment 2004). Such impacts of climate change could accelerate or exacerbate changes in soil thermal regimes that occur with oil and gas development potentially leading to greater and/or cumulative impacts (Walker et al. 1987) to wetlands from changes associated with thermokarst.

A number of hydrologic shifts related to climate change will affect lakes, rivers and floodplains, including seasonal flow patterns, ice-cover thickness and duration, and the frequency and severity of extreme flood events. The greatest ice-related ecological impacts of climate change on arctic river systems are likely to result from changes in breakup timing and intensity (Arctic Climate Impact Assessment 2004). As well as favoring earlier breakup, higher spring air temperatures can affect breakup severity (Prowse and Beltaos 2002). For regions that experience a more “thermal” or less dynamic ice breakup (Gray and Prowse 1993), the magnitude of the annual spring flood will very probably be reduced. For the many northern communities that historically located near river floodplains for ease of transportation access, reductions in spring ice-jam flooding would be a benefit. In contrast, however, reductions in the frequency and severity of ice-jam flooding would have a serious impact on river ecology since the physical disturbances associated with breakup scouring and flooding are very important to nutrient and organic matter dynamics, spring water chemistry, and the abundance and diversity of river biota (Cunjak et al. 1998, Prowse and Culp 2003, Scrimgeour et al. 1994).

The effect of climate change on shorebirds breeding in the NPR-A is uncertain but likely to be negative over the long-term. The earlier and warmer summers may create a mismatch between when invertebrates emerge and shorebird young hatch (McKinnon et al. 2012, Saalfeld and Lanctot, in review). This mismatch in timing could significantly impact shorebird reproductive success across the Arctic unless shorebird species are able to speed up their arrival times to the breeding grounds (Tulp and Schekkerman 2008, Saalfeld and Lanctot, in review). Climate change is also likely to alter the appropriate areas within the Arctic that are suitable for breeding shorebirds. Climate-suitable conditions are likely to spread north and eastward (Wauchope et al. 2016), ice-wedge degradation may lead to polygon degradation and drying of the landscape

(Liljedah et al. 2016), and tundra areas are being invaded by more shrubs and trees (Meltofte et al. 2007). All of these factors will likely reduce the suitability of the habitat for breeding shorebirds.

Steller's and Spectacled Eiders may also be impacted by climate change in many of the same ways shorebirds are impacted. Changes in water budget and permafrost may alter the location of suitable foraging habitat. Trophic mismatch could alter the timing, abundance and quality of preferred foods. Coastal erosion, saltwater intrusion from sea level rise, and increases in shrubs could make eider habitat less extensive and lower quality.

Which of the following threats is present historically – when the threat stopped but the effects are still there (H), currently (C) or potentially (P)?

	Historically	Currently	Potentially
Residential and commercial development			
housing and urban areas	☐	☐	☐
commercial and industrial areas	☐	☐	☐
tourism and recreation areas	☐	☐	☐
Agriculture and aquaculture			
annual and perennial non-timber crops	☐	☐	☐
wood and pulp plantations	☐	☐	☐
livestock farming and ranching	☐	☐	☐
marine and freshwater aquaculture	☐	☐	☐
Energy production and mining			
oil and gas drilling	☐	☐	☒
mining and quarrying	☐	☐	☐
renewable energy	☐	☐	☐
Transportation and service corridors			
roads and railroads	☐	☐	☒
utility and service lines	☐	☐	☒
shipping lanes	☐	☐	☐
flight paths	☐	☐	☒
Biological resource use			
hunting and collecting terrestrial animals	☒	☒	☐

gathering terrestrial plants	☐	☐	☐
logging and wood harvesting	☐	☐	☐
fishing and harvesting aquatic resources	☐	☐	☐
Human intrusions and disturbance			
recreational activities	☐	☒	☐
war, civil unrest and military exercises	☐	☐	☐
work and other activities	☒	☒	☐
Natural system modifications			
fire and fire suppression	☐	☐	☐
dams and water management/use	☐	☐	☐
other ecosystem modifications	☒	☒	☐
Invasive and other problematic species and genes			
invasive non-native/alien species	☐	☐	☐
problematic native species	☐	☐	☐
introduced genetic material	☐	☐	☐
Pollution			
household sewage and urban waste water	☐	☐	☐
industrial and military effluents	☐	☐	☐
agricultural and forestry effluents	☐	☐	☐
garbage and solid waste	☐	☐	☐
air-borne pollutants	☐	☐	☐
excess energy	☐	☐	☐
Geological events			
volcanoes	☐	☐	☐
earthquakes/tsunamis	☐	☐	☐
avalanches/landslides	☐	☐	☐
Climate change and severe weather			

habitat shifting and alteration	☒	☒	☒
droughts	☐	☐	☐
temperature extremes	☒	☒	☒
storms and flooding	☒	☒	☒

Please write here any additional threats and comments/queries you have on the threats.

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Annex 1: Criteria for the inclusion of sites in the Flyway Site Network

(From the Partnership Text)

To be considered for inclusion in the Flyway Site Network, this Partnership adopts the following criteria:

a. Convention on Wetlands (Ramsar, Iran, 1971) criteria for internationally important sites for migratory waterbirds. That is:
   - Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
   - Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.
   - Criterion 6: A wetland should be considered internationally important if it regularly supports 1 percent of the individuals in a population of one species or subspecies of waterbird.

b. The staging criteria as applied under the Asia - Pacific Migratory Waterbird Conservation Strategy. That is:
   i. A staging site should be considered internationally important if it regularly supports 0.25 percent of individuals in a population of one species or subspecies of waterbirds on migration.
   ii. A staging site should be considered internationally important if it regularly supports 5,000 or more waterbirds at one time during migration.

c. Under exceptional circumstances a site can be nominated if it supports migratory waterbirds at a level or stage of their life cycle important to the maintenance of flyway populations. Justification of such nominations will be considered by the Partnership on a case by case basis.

Annex 2: Ramsar Classification System for Wetland Type

The codes are based upon the Ramsar Classification System for Wetland Type as approved by Recommendation 4.7 and amended by Resolutions VI.5 and VII.11 of the Conference of the Contracting Parties. The categories listed herein are intended to provide only a very broad framework to aid rapid identification of the main wetland habitats represented at each site.

To assist in identification of the correct Wetland Types to list in section 19 of the RIS, the Secretariat has provided below tabulations for Marine/Coastal Wetlands and Inland Wetlands of some of the characteristics of each Wetland Type.

Marine/Coastal Wetlands

A -- **Permanent shallow marine waters** in most cases less than six metres deep at low tide; includes sea bays and straits.
B -- **Marine subtidal aquatic beds**; includes kelp beds, sea-grass beds, tropical marine meadows.
C -- **Coral reefs**.
D -- **Rocky marine shores**; includes rocky offshore islands, sea cliffs.
E -- **Sand, shingle or pebble shores**; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.
F -- **Estuarine waters**; permanent water of estuaries and estuarine systems of deltas.
G -- **Intertidal mud, sand or salt flats**.
H -- **Intertidal marshes**; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.

I -- **Intertidal forested wetlands**; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.
J -- **Coastal brackish/saline lagoons**; brackish to saline lagoons with at least one relatively narrow connection to the sea.
K -- **Coastal freshwater lagoons**; includes freshwater delta lagoons.
Zk(a) – **Karst and other subterranean hydrological systems**, marine/coastal

Inland Wetlands

L -- **Permanent inland deltas**.
M -- **Permanent rivers/streams/creeks**; includes waterfalls.
N -- **Seasonal/intermittent/irregular rivers/streams/creeks**.
O -- **Permanent freshwater lakes** (over 8 ha); includes large oxbow lakes.
P -- **Seasonal/intermittent freshwater lakes** (over 8 ha); includes floodplain lakes.
Q -- **Permanent saline/brackish/alkaline lakes**.
R -- **Seasonal/intermittent saline/brackish/alkaline lakes and flats**.
Sp -- **Permanent saline/brackish/alkaline marshes/pools**.
Ss -- **Seasonal/intermittent saline/brackish/alkaline marshes/pools**.
Tp -- **Permanent freshwater marshes/pools**; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.
Ts -- **Seasonal/intermittent freshwater marshes/pools on inorganic soils**; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
U -- **Non-forested peatlands**; includes shrub or open bogs, swamps, fens.
Va -- **Alpine wetlands**; includes alpine meadows, temporary waters from snowmelt.
Vt -- **Tundra wetlands**; includes tundra pools, temporary waters from snowmelt.
W -- **Shrub-dominated wetlands**; shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.
Xf -- **Freshwater, tree-dominated wetlands**; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.
Xp -- **Forested peatlands**; peatswamp forests.
Y -- **Freshwater springs; oases**.
Zg -- **Geothermal wetlands**
Zk(b) – **Karst and other subterranean hydrological systems**, inland

Note: "**floodplain**" is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forests. Floodplain wetlands are not listed as a specific wetland type herein.

Human-made wetlands

1 -- **Aquaculture** (e.g., fish/shrimp) **ponds**
2 -- **Ponds**; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).
3 -- **Irrigated land**; includes irrigation channels and rice fields.
4 -- **Seasonally flooded agricultural land** (including intensively managed or grazed wet meadow or pasture).
5 -- **Salt exploitation sites**; salt pans, salines, etc.
6 -- **Water storage areas**; reservoirs/barrages/dams/impoundments (generally over 8 ha).
7 -- **Excavations**; gravel/brick/clay pits; borrow pits, mining pools.
8 -- **Wastewater treatment areas**; sewage farms, settling ponds, oxidation basins, etc.
9 -- **Canals and drainage channels, ditches.**
Zk(c) -- **Karst and other subterranean hydrological systems**, human-made

Annex 3: IUCN Protected Areas Categories System

IUCN protected area management categories classify protected areas according to their management objectives. The categories are recognized by international bodies such as the United Nations and by many national governments as the global standard for defining and recording protected areas and as such are increasingly being incorporated into government legislation.

Ia Strict Nature Reserve

Category Ia are strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphical features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values.

Ib Wilderness Area

Category Ib protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.

II National Park

Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.

III Natural Monument or Feature

Category III protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.

IV Habitat/Species Management Area

Category IV protected areas aim to protect particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.

V Protected Landscape/ Seascape

A protected area where the interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.

VI Protected area with sustainable use of natural resources

Category VI protected areas conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems.