Wetlands Delineation for the New Village of Newtok, Alaska

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INTRODUCTION

The village of Newtok is located on the Ninglik River in the Yukon-Kuskokwim Delta region of western Alaska. The banks of the river have been eroding for many years. At the current rate of erosion, it has been projected that the river will reach homes in Newtok within 5 years. The Newtok Traditional Council plans to move the village approximately 9 miles southeast of Newtok on the north shore of Nelson Island (sections 1, 2, 3, 4, 9, and 10, T. 8 N., R. 87 W. and sections 34, 35, and 36, T. N., R. 87 W., (USGS, Baird Inlet D-7) (Figure 1). Newtok has a marine climate. Summer temperatures range from 42 to 59 ºF and winter temperatures range from 2 to19 ºF. Average annual precipitation is 17 inches, with annual snowfall of 22 inches (ADCED 2002). The study area is within a discontinuous permafrost zone (Ferrians 1965).

As part of the environmental analysis and to assess permitting requirements, we performed both office research and fieldwork to determine the presence and location of wetland areas within the Newtok village relocation area. The study included classification and mapping of wetlands and vegetation using satellite imagery and aerial photography. An onsite wetland delineation was conducted in August of 2005 within a study area of about 3,182 acres.

This report includes a map of wetland and upland areas, a description and classification of wetlands and plant communities within the study area, photo documentation of sample sites (Appendix A), wetland determination data sheets (Appendix B), and a general wetlands functional assessment.

METHODS

Classification and mapping of wetland and vegetation types within the study area were determined in the field and office by using June 6, 2005, aerial photographs at a scale of 1:18,000 (1”=1500’) and 1:9,600 (1”=800’), satellite imagery, and 1:62,500 USGS quadrangle maps. Wetland and vegetation community boundaries were delineated based on plant canopy, surface relief, color signature, and hydrological characteristics. Preliminary vegetation types were identified using Level III classifications described in the Alaska Vegetation Classification (Viereck et al. 1992) and in Classification and Mapping of Tundra Near Hazen Bay (Tande & Jennings 1986). Wetland types were described according to the Classification of Wetlands and Deep Water Habitats of the United States (Cowardin et al. 1979). The wetland delineation was based on wetland sample point data, plant community verification points taken with GPS, and photo interpretation of orthomap and satellite images. The photo interpretation was done using ArcMap 9.0.

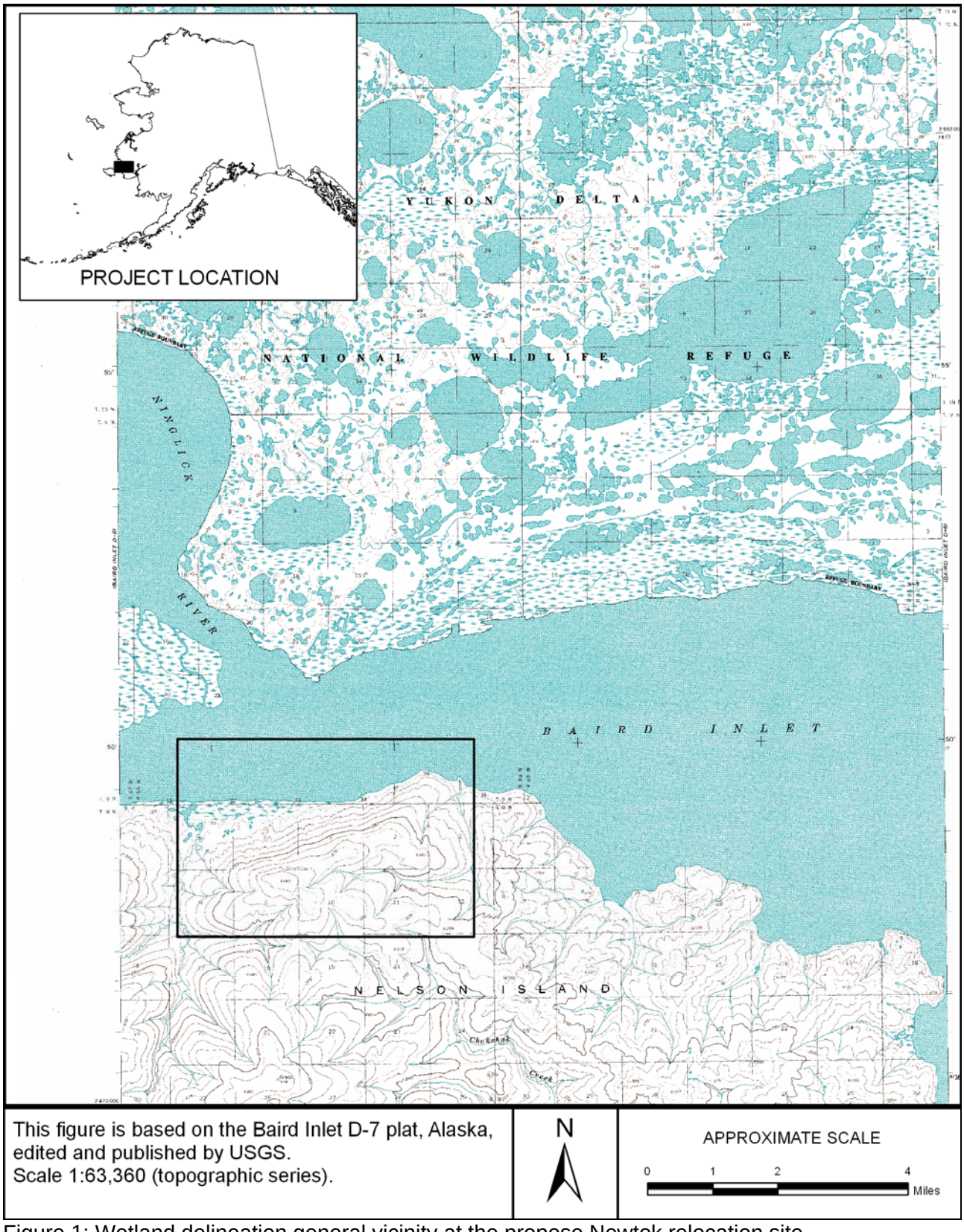

Figure 1: Wetland delineation general vicinity at the propose Newtok relocation site.

The field survey was conducted August 24-27, 2005. Prior to the field survey, with the use of satellite imagery (aerial photos were not yet available), we defined study boundaries and selected at least one sample point within different vegetation communities that could be defined within the image. Delineation sample points were established at 23 sites. Additional plant community verification points were collected at 31 sites. Delineation sample points and plant communities were recorded on GPS.

Wetland determinations were made using the three-parameter approach outlined in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (1987 USACE). The USACE (Federal Register 1982) and the EPA (Federal Register 1980) jointly define wetlands as: those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands, in general, include swamps, marshes, bogs, and similar areas (USACE 1987).

At each delineation sample site, a USACE routine wetland determination data sheet from the 1987 manual was completed to characterize vegetation, soils, and hydrology. Digital photos of each sample site were recorded. Dominant plant species for each vegetation layer (tree, shrub, and/or herbaceous) were recorded. We visually estimated percent of live coverage within an approximate 30-foot radius of the soil pit. The wetland indicator status of the dominant species was determined by using the *National List of Plant Species that Occur in Wetlands: Alaska (Region A)* (Reed 1988).

Wetland hydrological indicators were assessed at each sample point, including the presence of standing water, soil saturation within 12 inches of the surface, and evidence of past inundation (watermarks, drift lines, etc.). At each soil pit of approximately 18 inches, hydric soil indicators were evaluated including low matrix chroma, mottling, concretions, and presence of thick organic layers. Soil colors were determined by using *Munsell Soil Color Charts* (2000).

Plant community verification points were determined based on plant species dominance. Locations of the delineation sample points and vegetation verification points were recorded using a handheld GPS – 12 Garmin and downloaded into a NAD 83 State Plane georeferenced orthomap purchased from Aeromap. Comparisons between field data and the orthomap were conducted to identify vegetation patterns in the map and to determine vegetation types. Vegetation types were then defined in polygon units using photo-interpretation techniques, wetland data forms, field notes, photographs, and GPS points. Photo interpretation was conducted according to grain, texture, and color patterns observed in the orthomap. In certain areas of the orthomap, patterns were difficult to determine and vegetation types hard to define. In such cases, a simple classification of the satellite image assisted in extrapolating from other vegetation types. A database was created to

include vegetation types, dominant habitat and species composition, and wetland types.

RESULTS

Wetland Delineation

Of the 3,182-acre study site, 2,961 acres were classified as wetlands and 221 acres (approximately 7% of total area) as uplands (Figure 2, Table 1). We identified six wetlands types, including ponds. The study area is predominantly composed of palustrine scrub-shrub wetlands (1,841 acres or 58% percent of the total area), followed by palustrine emergent/scrub-shrub wetlands (495 acres or 16%), and palustrine emergent wetlands (370 acres or 12%). Estuarine wetlands (marshes) represent 8% (250 acres) of the total 3,182 acres.

Palustrine scrub-shrub wetlands (1,841 acres)

The palustrine scrub-shrub wetlands represent about 58 % of the delineated area and were separated into the following subclasses depending on the habitat of the dominant species: palustrine scrub-shrub evergreen wetlands dominated by crowberry tundra and birch-ericaceous shrub communities (937 acres), palustrine scrub-shrub/moss peat wetlands where sphagnum and low growing shrubs are the main component of the vegetation community (580 acres), and palustrine scrub-shrub broad leaved-deciduous dominated by willow (Salix pulcha) (324 acres). Palustrine scrub-shrub evergreen wetlands were found within the proposed village townsite location. The palustrine scrub-shrub/moss peat wetlands are located at a slightly higher elevation, usually on mounds of about 1 foot in height. Palustrine scrub-shrub broad-leaved deciduous wetlands are well spread out in the general sampled area along several drainage ways and depressions.

Palustrine emergent persistent/scrub-shrub wetlands (495 acres)

Palustrine emergent persistent/scrub-shrub wetlands represent approximately 16% of the total delineated area. They were divided into two groups: palustrine emergent persistent/scrub-shrub evergreen/moss (255 acres) and palustrine emergent persistent/scrub-shrub broad-leaved deciduous (240 acres). Palustrine emergent persistent/scrub-shrub/moss are wetlands located at the foot hills, with a similar component of low growing evergreen species as the palustrine scrub-shrub evergreen wetlands (top plateau), but with a conspicuous cover of tussock cottongrass (Eriophorum vaginatum). These wetlands also have a large component of rust-color sphagnum, which gives this community a rusty color and a deep 16-foot peat layer. Palustrine emergent persistent/scrub-shrub deciduous wetlands are dominated by bluejoint grass, but have about 25% of willow cover. The vegetation community seems to be an intermediate state between willow-dominated communities and bluejoint grass meadows. They are found along drainage ways, depressions and slopes, and have a large component of wildflowers, herbs, and ferns.

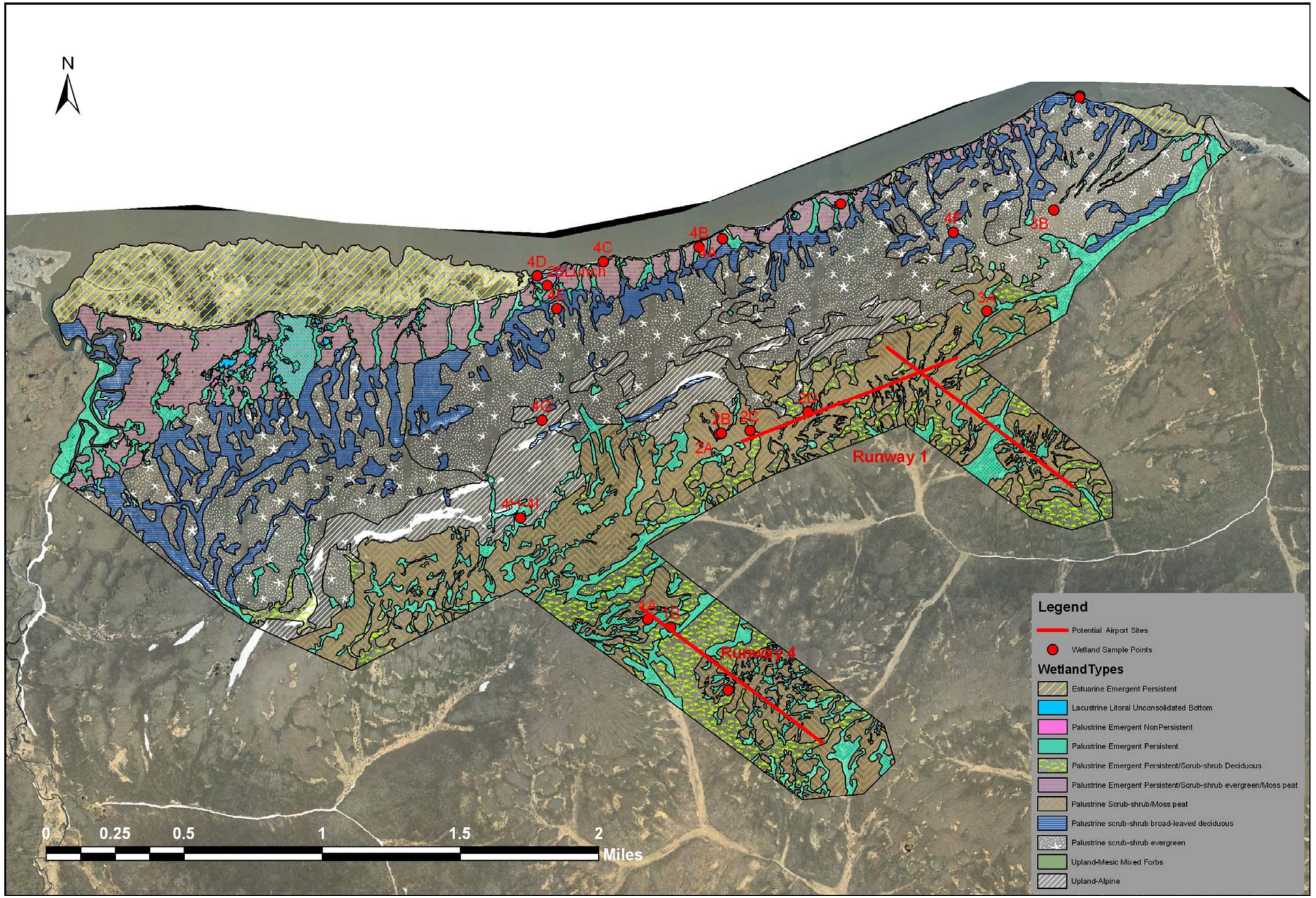

Figure 2: Wetland Types in the Newtok Relocation Site.

Palustrine emergent persistent wetlands (370) acres

Palustrine emergent persistent wetlands represent about 12% of the total delineated area. They are usually located in drainage ways and in depressions where snow persists until late spring. The communities are typically dominated by bluejoint grass with few herbs and almost no willows. Herbs within these communities include *Petasites frigidus*, *Equisetum sp*., *Athyrium filix-femina*, dwarf dogwood (*cornus suecica*), and *Angelica lucida*. They are well-distributed within the delineated area but are usually common near willow thickets. Palustrine emergent persistent wetlands also include wet sedge meadow tundra dominated by *Carex aquatilis*, *Potentilla palustris*, and green sphagnum. Wet sedge meadow tundra is usually found in areas with standing water along drainages that cross the bottom hills, lake fringes, and crisscross the top plateau tundra.

Estuarine emergent persistent wetlands (250) acres

Estuarine emergent persistent wetlands represent approximately 8% of the total delineated area. They are found in tidally influenced mudflats. Dominant species are tolerant to brackish water conditions, forming monotypic stands of Lyngby's sedge (*Carex lyngbyei*) communities or forming patches between tidally deposited mineral silts and clays as in the case of *Puccinellia phryganodes* and *Plantago maritima*. Bluejoint grass and beachrye grass (*Elymus arenarious*) are found at the inland fringes of these estuarine wetlands. About 236 acres are at the mouth of the Tackichak River and 14 acres at the mouth of the east drainage area in the vicinity of the proposed barge site.

Lacustrine littoral unconsolidated bottom wetlands (5 acres)

Lacustrine littoral unconsolidated bottom wetlands represent less than 1% of the total delineated area. These standing water habitats are usually at the bottom hills and, to a lesser degree, at the top plateau. They are formed in topographic depressions where snow pack and rainfall permanently accumulate, forming shallow fresh water ponds. With silty organic unconsolidated bottoms, these ponds only provide habitat for aquatic vegetation at their fringes, where light penetrates deep enough.

Palustrine emergent non-persistent wetlands (0.42 acres)

Palustrine emergent non-persistent wetlands represent less than 1% of the total delineated area. These wetlands are usually found in small areas but are common along the fringes of small ponds, so they are difficult to delineate on a large scale map. The dominant submerged species is common marestail (*Hippuris vulgaris*).

Uplands (221 acres)

Uplands represent about 7% of the total delineated area. They are mainly located on the windswept north facing slopes and at the sloped outskirts of the bottom hills. At the upper slopes, the prostate vegetation is characterized by the presence of alpine species (arctic willow, dwarf azalea, alpine smartweed, net-vein willow, etc.) and a thick root mat. Bearberry is abundant as well. Soils are shallow and gravelly with an abundance of basalt outcrops. Lichens such as *Cetraria cucullata,*

Cladonia rangifera, Cladonia sp., Thamnolia vermicularis, and fruticose lichens dominate most of the ground cover, and crustose lichens are abundant in the basalt outcrops. The outskirts of the lower hills were also considered uplands because they did not meet hydric soil indicators.

Table 1. Wetland and upland acreage and their percentage of study area at the proposed Newtok relocation site (Figure 2).

Wetland Type	**Subclass**	**Acres**	**% of Study Area**
Palustrine Scrub-Shrub	Broad-leaved Evergreen (PSS3) Moss (PSS3/PML1) Broad-leaved Deciduous (PSS1)	937 580 324 **1,841**	**57.85**
Palustrine Emergent Persistent /Scrub-Shrub	Scrub Shrub Evergreen/Moss (PEM1/PSS3/PML1) Scrub Shrub Broad-lvd Deciduous (PEM1/PSS1)	255 240 **495**	**15.55**
Palustrine Emergent Persistent	(PEM1)	**370**	**11.63**
Estuarine Emergent Persistent	(E2EM1)	**250**	**7.86**
Lacustrine Littoral Unconsolidated Bottom	(L2UB)	**5**	**0.16**
Palustrine Emergent Non-Persistent	(PEM2)	**0.42**	**0.01**
Upland	Alpine (UPL) Mesic Mixed Forbs	207 14 **221**	**6.94**
Total Area		**3,182.42**	

Vegetation Types

Based on species dominance and comparisons with the Alaska vegetation classification (Viereck et al. 1992) and the tundra vegetation study conducted near Hazen Bay (Tande & Jennings 1986), the vegetation at the Newtok relocation site was grouped into 12 vegetation types (Figure 3, Table 2).

Tussock tundra

Tussock tundra comprises 835 acres of the total delineated area (26%). Dominant species include *eriophorum vaginatum*, *Betula nana*, *ledum decumbens*, *vaccinium uliginosum*, *rubus chamaemorus*, *salix arctica*, *empeturn nigrum*, *cladonia sp*., *arctostaphylos alpina*, and *sphagnum lenense*. At the bottom hills, tussock tundra vegetation has a large component of tufted cottongrass (*Eriophorum vaginatum*), which forms cottongrass tussocks. Low growing evergreen shrubs like Labrador

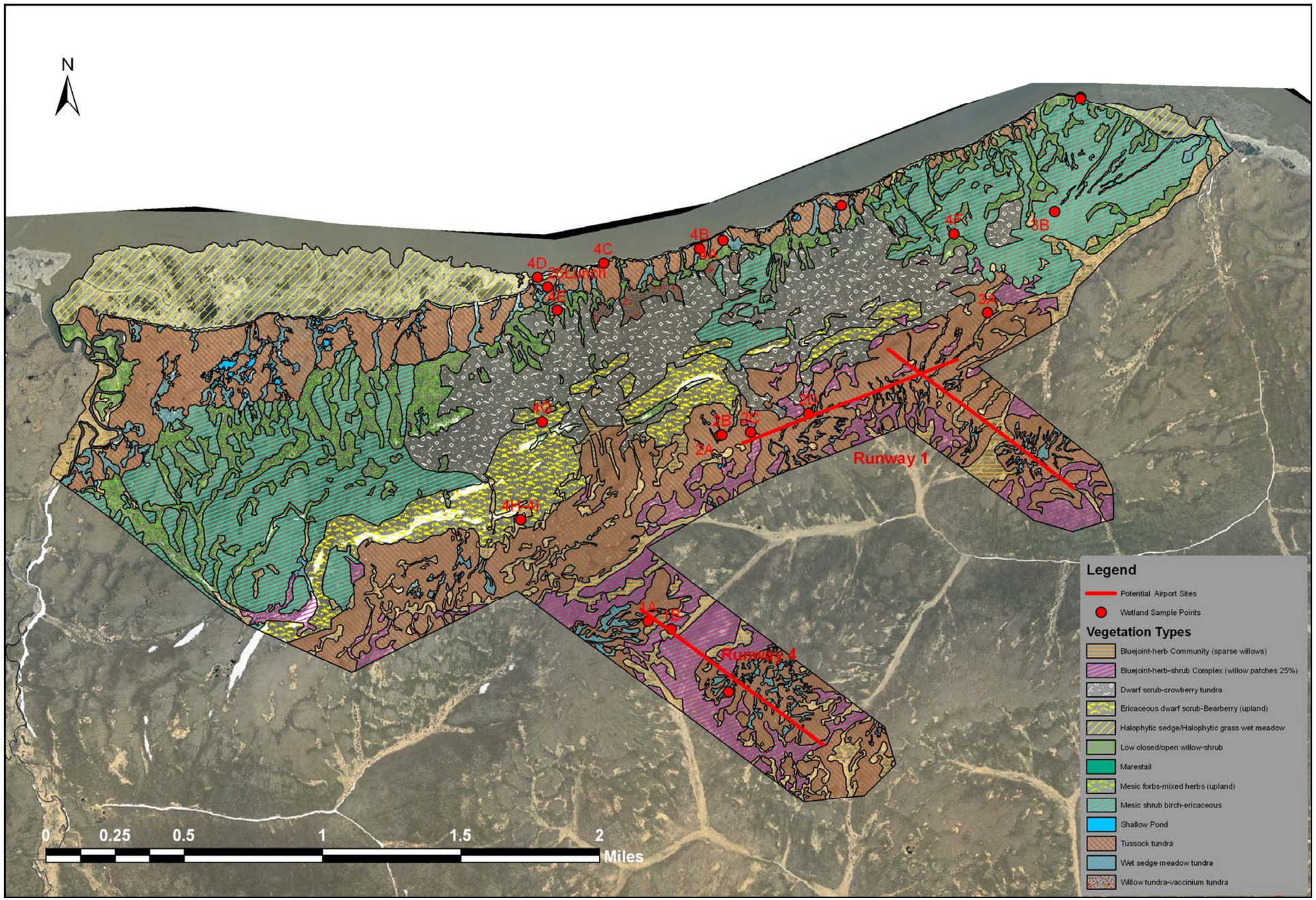

Figure 3: Vegetation Types in the Newtok Relocation Site.

tea (*Ledum decumbens*), crowberry (*Empetrum nigrum*), lowbush cranberry (*Vaccinium vitis-ideae*), and dwarf birch (*Betula nana*) are usually found growing in hollows between the cottongrass tussocks. Tussock tundra vegetation at the top hill plateau is found on mounds of about 1 foot in height. Tussock cottongrass is replaced by sedges like *Carex bigelowii* and *Eriophorum angusti,* or folium (rhyzomatous species), but they do not have much cover when compared with the low growing shrubs. Mosses like *sphagnum lenense* (brownish-orange) and *Cladonia sp*. lichens can comprise more than 30% of the ground cover in localized areas. The abundance of mosses, lichens, and a thick root mat favors the formation of a deep peat layer of about 16 inches. Soils are usually saturated due to the presence of sphagnum that acts as a huge "sponge," and because of shallow permafrost conditions. The abundance of *sphangnum lenense* and evergreens is an indicator of the acidic, low nutrient, and excessive moisture conditions found in this vegetation type.

Mesic shrub birch-ericaceous

Open low mesic shrub birch-ericaceous shrub comprises 546 acres of the total delineated area (17%). Dominant species are dwarf shrubs like *betula nana*, *empetrum nigrum*, *vaccinium uliginosum*, *vaccinium vitis-idaea*, *ledum decumbens*, *Carex bigelowii*, *Festuca sp*., *equisetum sp*., *Rubus chamaemorus*, *Eriphorum vaginatum*, and Carex aquatilis. As in tussock tundra, this vegetation type is usually found in slopes averaging 12%, with a shallow permafrost or frozen soil at least during part of the growing season. Soils are usually poorly drained with a layer of gleyed silt between 16 inches and 2 feet deep, but without a deep sphagnum layer.

Dwarf scrub-crowberry tundra

Dwarf scrub-crowberry tundra comprises 391 acres of the total delineated area (12%). This vegetation community is dominated by *Empetrum nigrum* (70% cover), which is a low shrub that produce extensive blackberries. Co-dominant species are narrow-leaf Labrador tea, mountain cranberry, and dwarf birch. Other species present are lousewort (*Pedicularis langsdorffii*), sedges, arctic willow (*Salix arctica*), stiff clubmoss, stair-step moss (*Hylocomium splendens*), and sphagnum. In areas where strangmoors developed perpendicular to drainages, dwarf scrub-crowberry tundra typically covers the strangmoor ridges, and sphagnum and lichens cover strangmoor hollows. This vegetation type is usually found in slopes averaging 12%, but with shallow permafrost at least during part of the growing season. Soils are usually poorly drained with a layer of gleyed silt between 16 inches and 2 feet deep, but without a deep sphagnum layer.

Low closed/open willow-shrub

Low closed/open willow shrub comprises 310 acres of the total delineated area (10%). Dominant species include willows in the canopy (*Salix pulchra*, *Salix alaxensis*), with grasses dominating the undercanopy (*Calamagrostis canadensis* and *Festuca sp*.). A large diversity of forbs and small shrubs are part of the undercanopy, including *Cornus suecica*, *Spirea beauberdiana*, *Equisetum sp.*,

Athyrium filix-femina, *Polemonium sp*., wild iris (*Iris setosa*), wild cucumber (*Streptopus amplexifolius*), burnet (*Sangisorba officinalis*), blue Jacob's ladder (*Polemonium boreale*), twin flower (*Linnaea borealis*), nagoonberry (*Rubus arcticus*), *Pyrola sp*., and fiddlehead ferns. Stiff club moss (*Lycopodium annotinum*) and several other mosses were also abundant, forming a continuous mat cover below the forb layer. Willow thickets grow along temporary drainages and in the lower reaches of the Tackitchak River. These communities usually prefer areas where snow accumulates until late in the spring or the floodplain. Willows form close-canopy communities of about 5 feet high along bottom hill drainages to stunted willow patches toward the upper slopes; alders are absent. Soils usually range from poorly to moderately drained in these areas.

Halophytic sedge/halophytic grass wet meadow

Halophytic sedge/halophytic grass wet meadow comprises 250 acres of the total delineated area (8%). Dominant species are tolerant to brackish waters with Lyngby's sedge (*Carex lyngbyaei*) forming dense monotypic stands of about 100% cover and halophytic herbs such as *Plantago maritima* and *Puccinellia phryganodes* forming patches between tidally deposited mineral silts and clays. Monotypic stands of Lyngby's sedge are found seaward, with bluejoint grass and beachrye grass (*Elymus arenarious*), growing more towards the inland.

Bluejoint-herb-shrub complex

Bluejoint-herb-shrub complex comprises 240 acres of the total delineated area (8%). The dominant species is bluejoint grass (*Calamagrostis canadensis*) with approximately 50 to 60% cover. Similar to the bluejoint-herb community, co-dominant species include *Equisetum silvaticum*, *Athyrium filix-femina*, dwarf dogwood (*Cornus suecica*), *Angelica lucida*, *Viola Landorfii*, *Pyrola sp*., *Fritillaria camschatcensis*, *Spiraea beauverdiana*, *Polemonium sp*., *Betula nana*, *Artemisia sp*., *Epilobium angustifolium*, *Sanguisorba stipulata*, and *Heracleum lanatum*. This community has also a shrub component, formed mainly by willow patches, that reaches approximately 25% canopy cover. This vegetation community seems to be an intermediate stage between bluejoint-herb communities and willow communities. This community is usually found along drainages, topographic depressions, as well as in areas with moderate drainage conditions. Soils can vary from well to poorly drained; therefore, this complex seems to range from mesic to hydric soil conditions.

Bluejoint-herb community (sparse willows)

This vegetation type comprises 224 acres of the total delineated area (7%). The dominant species is bluejoint grass (*Calamagrostis canadensis*) with about 60% cover, forming almost pure grass meadows, but with a codominant herb/forb component. These species include *Equisetum silvaticum*, *Athyrium filix-femina*, *Cornus secica*, *Epilobium angustifolium*, *Sanguisorba stipulata*, and *Heracleum lanatum*. Sometimes a few stunted willow trees are found in the mix, but they do not seem to reach canopy covers above 10%. This community is usually found

along drainages and topographic depressions where snow accumulation continues into the spring. Soils vary from moderate to poorly drained.

Ericaceous dwarf scrub-bearberry (upland)

This plant community comprises 207 acres of the total delineated area (7%). Dominant dwarf shrubs include bearberry (10%), narrow-leaf Labrador tea (10%), *Salix arctica*, 3%, *Diapensia lapponica*, *Loiseleuria procumbens*, mountain cranberry, anemone (*Anemone Drummonddii*) and lousewort. Lichens such as *Cetraria cucullata, Cladonia rangifera, Cladonia sp., Thamnolia vermicularis,* and fruticose lichens dominate most of the ground cover.

Wet sedge meadow tundra

Wet sedge meadow tundra comprises 146 acres of the total delineated area (5%). Dominant species are water sedge, *Calamagrostis deschampsioides*, *Eriophoroum russeolum* (abundant on the top plateau wet sedge meadows), and green sphagnum (*Spagnum squarrosum*). Green sphagnum covers about 75% of the ground with *Vaccinium oxycoccos* commonly growing on top of the sphagnum cover.

Willow tundra-vaccinium tundra

Willow tundra-vaccinium tundra comprises 14 acres of the total delineated area (less than 1%). Dominant species within this low growing community are *Salix pulchra* and *Vaccinium uliginosum*. This is a rather uncommon community and is usually found near taller willow thickets at the bottom hills. Crowberry, Labrador tea, lycopodium, step moss, and other mosses and lichens are usually ground covers.

Mesic forbs-mixed herbs (upland)

This vegetation type comprises 14 acres of the total delineated area (less than 1%). Dominant species includes *Spiraea beauverdiana*, *Epilobium angustifolium*, *Cornus suecica*, *Athirium filix-femina*, *Polemonium acutiflorum*, *Senecio congestus*, *Achillea borealis*, *Dryopteris dilatata*, and feather mosses. This diverse vegetation community is dominated by a mix of grasses, herbs, shrubs, and scattered willow patches, and is usually found at the outskirts of the bottom hills facing the inlet on moderate to steep slopes. The landscape has undergone a process of erosion and deposition that has led to the remixing and rejuvenation of the soil, which is loamy and well to moderately-well drained.

Shallow Pond

Shallow ponds comprise only 5 acres of the total delineated area (less than 1%). They are characterized by fresh water inputs from rainfall and snowmelt, as well as mucky/silty bottoms.

Marestail

Units of this vegetation type are so small that, even when observed in the field, it was difficult to differentiate during the photo-interpretation. Dominant species is common marestail (*Hippuris vulgaris*), which occurs in monotypic, usually small

stands on fringes of shallow ponds located at the foothills. Usually these communities can not be mapped and merge into wet sedge meadow communities.

Table 2. Vegetation types located within the 3,182 acre study site.

Vegetation Types	**Acres**	**Coverage**	**Vegetation Similarities to Viereck et al. 1992 and Tande & Jennings, 1986**
Tussock tundra	835	26%	III.A.2.d.
Mesic shrub birch-ericaceous	546	17%	II.C.2.c.
Dwarf scrub-crowberry tundra	391	12%	II.D.2.c.
Low closed/open willow-shrub	310	10%	II.C.1.b., II.C.2.g.
Halophytic sedge/Halophytic grass wet meadow	250	8%	III.A.3.i. III.A.3.h.
Bluejoint-herb-shrub Complex (willow patches 25%)	240	8%	II.C.1.b., II.C.2.g., III.A.2.c., III.A.2.b.
Bluejoint-herb Community)	224	7%	III.A.2.b.
Ericaceous dwarf scrub-Bearberry (upland)	207	7%	II.D.2.a., II.D.3.a.
Wet sedge meadow tundra	146	5%	III.A.3.a.
Willow tundra-vaccinium tundra	14	0.4%	II.C.2.g., II.D.2.b.
Mesic forbs-mixed herbs (upland)	14	0.4%	III.B.2.a.
Shallow Pond	5	0.2%	
Marestail	0.42	0.01%	III.D.I.b.
Total Area	**3182.42**		

WETLAND FUNCTIONAL ASSESSMENT

The wetland function and value analysis conducted for the Newtok relocation site is based on bird, fish, and vegetation data collected in the field by U.S. Fish and Wildlife Service and Army Corps of Engineers biologists during the summer of 2005 (USACE 2005a, USACE 2005b, USFWS 2005). This is not a detailed analysis following a specific method, but rather a general assessment of the resource based on literature review (USACE 1995) and field data.

Palustrine scrub-shrub broad-leaved evergreen (PSS3)

Functions[1]: These wetlands, consisting of dwarf scrub-crowberry tundra and mesic shrub-birch-ericaceous vegetation, have an important insulating function that protects the discontinuous permafrost from severe thermokarsting (surface depression). Frost heaving processes (lifting surface by the formation of ice as lenses) and frost boils formation can be aggravated by increased freeze/thaw or wet/dry cycles in areas with discontinuous permafrost where vegetation cover has been removed. Frost heaving can cause tilting of telephone poles, fence posts, and bent tree trunks. These wetlands also provide nesting habitat for parasitic and long-tail jaeger. The abundance of crowberry provides feeding habitat for Canada geese, emperor geese, willow ptarmigan, Lapland longspurs, and other bird species.

Values: permafrost protection, erosion protection, wildlife habitat.

Palustrine scrub-shrub broad-leaved evergreen/moss peat (PSS3/PML1)

Functions: This wetland type is typically located at the top hill plateau and consists of tussock tundra vegetation with a thick sphagnum layer that has a high capacity to store water from rainfall and melting snow. The "sponge" effect and large water holding capacity provided by these wetlands constitute an important value for long-term water storage and groundwater recharge. These wetlands are likely the main source of flow inputs to the stream located at the base of the hills of the proposed Newtok relocation site. This stream is fed by a continuous groundwater supply and maintains a free-of-ice flow throughout the year. These wetlands also provide feeding grounds to several bird species including waterfowl. A muskoxen herd of (306 animals documented in 2001), has been established in Nelson Island since 1967-1968 (ADFG 2003). In winter, muskoxen feeding grounds are circumscribed to areas with shallow snow accumulations. These wetlands found at the top plateau are exposed to western winds, removing the snow from mosses, lichens and sedges and may provide winter grazing habitat for musk oxen.

Values: water storage, regulation, and recharge; water quality; bird and mammal habitat.

[1] Functions are physical, chemical, and biological processes occurring in an ecosystem. Processes include movement of water through wetlands into streams or ocean; decay of organic matter; release of nitrogen, sulfur, and carbon into the atmosphere; removal of nutrients, sediment and organic matter from water moving into wetlands; and growth and development of all the organisms that require wetlands for life. Values are an estimate, usually subjective, of worth, merit, quality, or importance. Wetland "values" may derive from outputs that can be consumed directly, such as food, recreation, or timber; indirect uses that arise from the functions occurring within the ecosystem, such as water quality, flood control, biodiversity or conserved habitats; and from the knowledge that such habitats or species exist (known as existence value) (NCSU 1994).

Palustrine emergent persistent (PEM1)

Functions: These wetlands include bluejoint herb meadow and wet sedge meadow tundra. Bluejoint herb meadow is found in seasonally flooded drainage ways and depressions, whereas wet sedge meadow tundra is found in foothill drainages and at the top plateau forming channels that crisscross the tussock tundra mounds. These wetlands provide forage to muskoxen, especially in spring when it is most palatable and succulent. Bluejoint grass is an excellent permafrost protector as it often produces a thick "mulch" of litter that insulates the ground and maintains low soil temperatures. Foothill wet sedge wetlands provide feeding habitat for voles, muskoxen, and waterfowl. These wetlands also allow for spring snow melt runoff to move slowly along hill gradients.

Values: water storage and regulation, flood control, permafrost protection, bird and mammal habitat.

Palustrine scrub-shrub broad-leaved deciduous (PSS1)

Functions: These wetlands are represented mainly by willow thickets and willow-blueberry communities growing along seasonally flooded drainages, foothills, and depressions with large snow accumulation and in the lower reaches of the Takikchak River floodplain. Several bird species, including passerines and willow ptarmigan, use these wetlands as resting and breeding habitat. Willow communities at the foothills and close to fresh water ponds provide excellent cover and bird nesting habitat. A diverse understory layer with an abundance of forbs, grasses, and sedges provide seeds, insects, and pollen to passerine birds, willow ptarmigan, and insects. In winter, willow ptarmigan forage on buds and twigs of diamond-leaf willows. Willows, as the larger plants at the site, have larger transpiration rates that reduce water in the soil, allowing it to absorb additional precipitation and surface water flows.

Values: wildlife habitat, recharge groundwater, flood control, water quality.

Palustrine emergent persistent/scrub-shrub broad-leaved evergreen/moss peat (PEM1/PSS3/PML1)

Functions: These wetlands are typically found in foothill tussock tundra developed on low nutrient-acidic soils and shallow permafrost. The characteristic thick root mat and a sphagnum layer in these wetlands have a high capacity to store rainfall and may function in reducing peak water flows and slowing water discharges into Baird Inlet during the summer season (when the active layer is deeper). Flower buds of tufted cottongrass, an abundant species in these wetlands, are an excellent food source to willow ptarmigan and its root bulbs are a food source to voles. Black bellied plover and western sandpiper, among other shorebirds, use these wetlands as nesting grounds.

Values: water storage and regulation, erosion control, bird feeding and breeding habitat.

Estuarine emergent persistent (brackish marsh) (E2EM1)

Functions: Located at the mouth of the Takikchak River and the entrance of a seasonally flooded stream at the east side of the proposed relocation site, these wetlands function as fish rearing habitat, resting areas for migratory birds, and provide refuge from predators to wildlife and fish. Geese and shorebirds graze pure stands of Lyngby's sedge leaves early in the spring; seeds also provide a food source to birds. Another ecological function of these wetlands is the constant supply of organic matter at various degrees of decomposition into adjacent tidal mudflats. It is this large source of organic matter that sustains the rich assemblages of detritus filter feeders found within these mudflats. These rich assemblages provide food to birds (waterfowl and shorebirds) and fish, including anadromous species spawning in the Takikchak River. These wetlands also provide shoreline erosion protection by dissipating the tidal energy. The nature of Lyngby's sedge as a pioneer colonizer supports the stability of the wetlands.

Values: fish and wildlife habitat, detritus output for aquatic organisms, food chain support, and shoreline erosion protection.

Palustrine emergent persistent/scrub-shrub broad-leaved deciduous (PEM1/PSS1)

Functions: These wetlands are a complex of bluejoint-herb communities and willow communities found in slopes ranging from mesic to hydric conditions. Like wetlands dominated by pure stands of bluejoint grass, these wetlands also provide excellent insulating cover to soils. These wetlands are more diverse with a large variety of forbs, ferns, and mosses that provide feeding and nesting grounds for passerine birds and small mammals. They also provide spring feeding grounds to muskoxen when the grass is most palatable and succulent.

Values: Permafrost control, flood control, wildlife habitat.

Lacustrine littoral unconsolidated bottom/palustrine emergent non-persistent (L2UB)/(PEM2)

Functions: Both lacustrine littoral unconsolidated bottom and palustrine emergent non-persistent wetlands are found in depressions fed by large snow meltdowns as the main precipitation source. Waterfowl usually prefer nesting in tundra tussock vegetation located near these wetlands, because of the easy access to freshwater and freshwater invertebrates as food sources. Dabbling ducks usually feed on aquatic plants growing in the fringes of these freshwater ponds.

Values: water storage and regulation, food chain support, detritus output for aquatic organisms, wildlife habitat, groundwater recharge.

Although wetlands and vegetation in general have an important role in preventing permafrost subsidence and erosion, and maintaining water quality, higher value wetlands that may require greater protection within the Newtok Village relocation site include:

● Palustrine wetlands adjacent to the spring fed stream, which is proposed as the alternative source of water for the village during winter, and hydrologically connected wetlands above this stream (Figure 4). The hydrological connections to the wetlands above this stream have not been thoroughly identified.

● Palustrine wetlands in the vicinity of the Takikchak River floodplain and two small tributaries in the lower reaches of the river. The protection of these wetlands will help maintain water quality for the village's main water source and provide protection to important fish and wildlife habitat (Figure 4).

● Estuarine wetlands at the mouth of the Takikchak River. The protection of these wetlands will maintain habitat for several waterfowl, shorebird, and fish species and provide erosion protection (Figure 4).

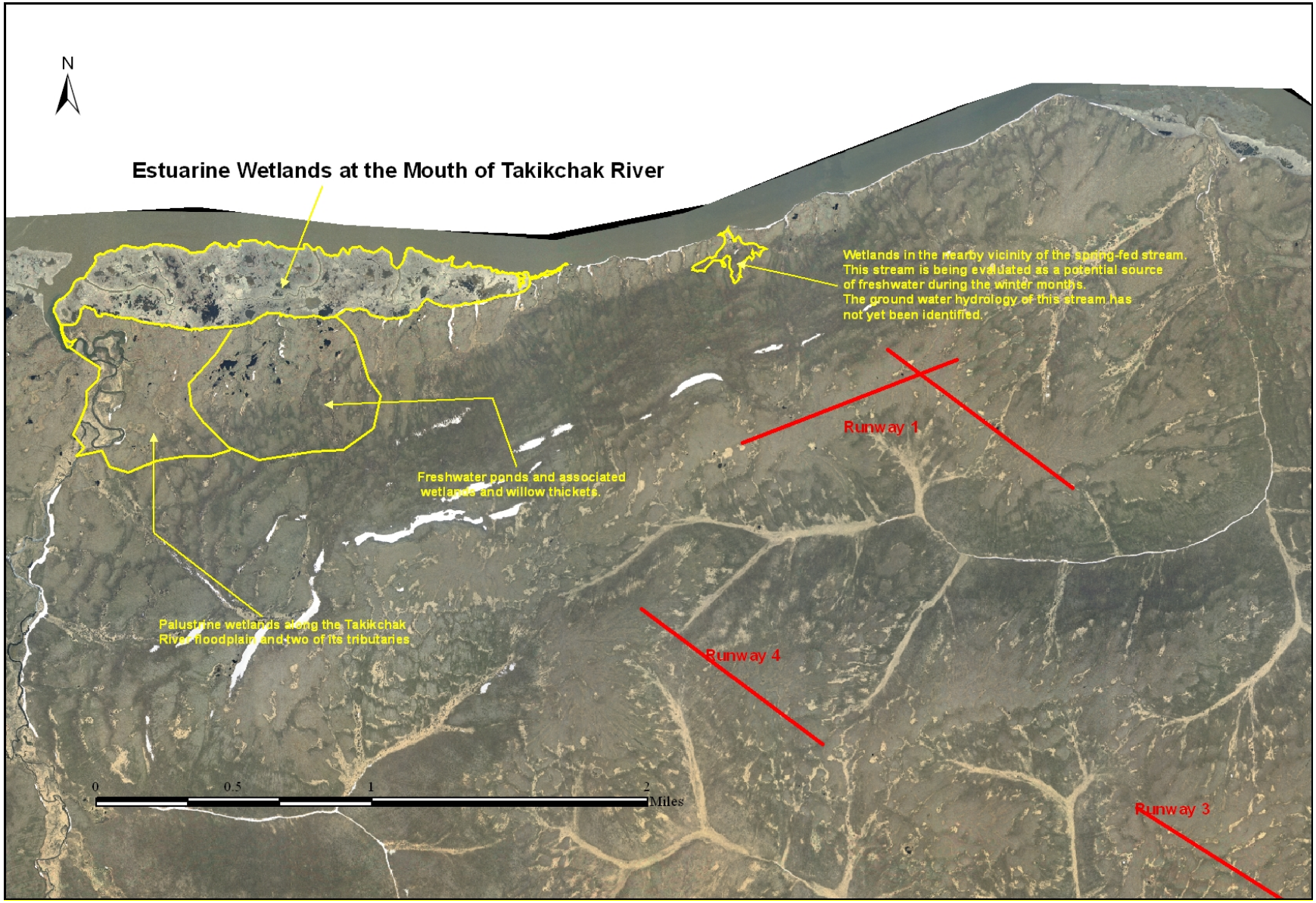

Figure 4: Higher Value Wetland Areas within the Newtok Village Relocation Site.

● Fresh water ponds and associated wetlands and willow thickets south of the estuarine wetlands. These areas provide important sources of freshwater and wildlife food sources such as aquatic algae and invertebrates and provide nesting habitat to waterfowl and other birds (Figure 4).

PERMITTING REQUIREMENTS

Most of the area in the proposed Newtok Village relocation site, including the proposed village townsite and airport alternatives, is within waters of the U.S., which include wetlands. Portions of the proposed barge landing facility are within wetlands and navigable waters of the U.S. Depending on the type of activity proposed, a Department of the Army (DA) permit may be required for many of the relocation projects.

Section 404 of the Clean Water Act requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands (33 U.S.C. 1344). This jurisdiction includes placement of fill resulting from land clearing operations involving vegetation removal in wetlands with mechanized equipment and other soil disturbances.

Section 10 of the Rivers and Harbors Act of 1899 requires that a DA permit be obtained for structures or work in or affecting navigable waters of the U.S. (33 U.S.C. 403). Section 10 waters are those waters subject to the ebb and flow of the tide shoreward to the mean high water mark, and/or other waters identified by the Alaska District. Baird Inlet is a tidally influenced navigable water of the U.S. As funding becomes available for relocation projects in the Village of Newtok and plans become more finalized, the project managers will need to contact the Alaska District U.S. Army Corps of Engineers, Regulatory Branch, to determine if a permit is needed and if so, what type of permit the project will require. The Corps evaluates projects using the least extensive and time consuming review process, while still providing protection for the aquatic environment.

Preliminary information that the Corps needs from the applicant to begin the permit evaluation process includes a project description, defining project location on a vicinity map (such as a USGS quad), type and amount of fill required for the project, location of the material source, project dimensions, and project plans that include a plan view and cross section view. More information may be required depending on the project scope.

Types of Permits

Nationwide Permits

Nationwide Permits (NWPs) are a form of General Permit issued by Corps Headquarters nationally. NWPs authorize specific activities in areas under Corps

Regulatory jurisdiction. These activities are minor in scope and must result in no more than minimal adverse impacts both individually and cumulatively. Individuals wishing to perform work under these NWPs must ensure that their project meets all applicable terms and conditions, including the regional conditions specific to Alaska.

Regional General Permits

Regional permits are issued by the Alaska District Engineer for a general category of activities when:

- the activities are similar in nature and cause minimal environmental impact (both individually and cumulatively), and
- the regional permit reduces duplication of regulatory control by State and Federal agencies.

The processing time for Nationwide and Regional General Permits is shorter than for Individual Permits. Examples of General Permits applicable to projects for the village relocation include GP 89-3N Residential and Other Community Projects and GP 96-07 Village Bulk Fuel Storage Facilities. If an activity is covered by a General Permit, an application for a DA permit is not required.

Individual Permits

Individual permits may be issued following a full public interest review (usually 30 days) of an individual application for a DA permit. A public notice is distributed to all known interested persons. A final decision on the application is made after evaluating all comments and information received.

The permit decision is generally based on the outcome of a public interest balancing process where the benefits of the project are balanced against the detriments. A permit will be granted unless the proposal is found to be contrary to the public interest. Processing time usually takes 60 to 120 days unless a public hearing is required or an Environmental Impact Statement must be prepared.
To apply for an individual permit, an application form must be completed. This application is available at the Alaska District, U.S. Army Corps of Engineers Regulatory Website: http://www.poa.usace.army.mil/reg or from any Regulatory office.

Abbreviated Permitting Process

This permitting procedure allows applications to be processed in a timely manner (15 days), allowing for a faster permitting timeline and enabling the applicant to start construction sooner. The Abbreviated or Alternative Permit Process (APP) that could apply to the Newtok relocation site is (APP) 93-1, which is a permitting process for the construction of sanitary sewage facilities within the State of Alaska.

References

Alaska Department of Community and Economic Development. 2002. Community Database Online. Website visited June 30, 2006. http://www.dced.state.ak.us/dca/commdb/CF_COMDB.htm

Alaska Department of Fish and Game. 2003. Muskox management report of survey inventory activities, 1 July 2002-30 June 2002. C. Healy, editor. Project 16.0. Juneau, Alaska.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildl. Serv., Office of Biol. Serv., Washington, D.C. 103 pp.

Ferrians, O.J. 1965. Permafrost Map of Alaska. U.S. Geological Survey. Miscellaneous Geological Investigations Map 1-445.

Reed, Jr. P.B. 1988. National list of plant species that occur in wetlands: Alaska (Region A). U.S. Fish and Wildl. Serv. Biol. Rep. 88 (26.11). 86 pp.

Munsell Soil Color Charts. 2000. Revised Edition. Kollmorgen Instruments Corporation, Baltimore, MD.

North Carolina State University. 1994. NCSU Website. Water Quality Group Nonpoint Source Library. http://www.water.ncsu.edu/watersheds

Tande G. and T.W. Jennings. 1986. Classification and mapping of tundra near Hazen Bay, Yukon Delta National Wildlife Refuge, Alaska. U.S. Fish and Wildl. Serv. Alaska Wetlands and Marine Ecology Branch. Anchorage. Alaska.

U.S. Army Corps of Engineers. 1987. Corps of Engineers wetlands delineation manual. Dep. of the Army, Waterways Experiment Station, Vicksburg, MS. Tech. Rep. Y-87-1. 100 pp. + appendices.

U.S. Army Corps of Engineers. 1995. An approach for assessing wetland functions using hydrogeomorphic classification, referenced wetlands, and functional indices. Technical Report WRP-DE-9.

U.S. Army Corps of Engineers. 2005a. Newtok relocation site survey of Nelson Island, CEPOA-EN-CW-ER Files, Memorandum for Record, June 1-8 2005. Anchorage, Alaska.

U.S. Army Corps of Engineers. 2005b. Takikchak River fish habitat survey, CEPOA-EN-CW-ER Files, Memorandum for Record, August 29-September 2, 2005. Anchorage, Alaska.

U.S. Fish and Wildlife Service. 2005. Field reconnaissance of Takikchak, preferred town site for the relocation of Newtok Village - Report to the Army Corps of Engineers. Anchorage, Alaska.

Viereck L.A., C.T. Dyrness, A.R. Batten, and K.J. Wenzlick. 1992. The Alaska vegetation classification. U.S. Dept. of Agric. Forest Serv. Pacific Northwest Research Station. Portland, OR. Gen. Tech. Rep. PNW-GTR 286. 278 pp.