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Wetlands and Waters Delineation Report

Nenana Totchaket Road

July 25, 2022

Prepared for:

Alaska Department of Transportation and Public Facilities

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WETLANDS AND WATERS DELINEATION REPORT

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Executive Summary

The Alaska Department of Transportation and Public Facilities required professional services to develop a Wetland and Waters Delineation Report for the Nenana Totchaket Road project.

This 2022 report presents the findings of the baseline (current existing conditions) fieldwork for a 21-mile, 500-foot corridor for new road construction, and work around culverts and bridges along the existing 12-mile road. This includes the extent of vegetation cover and Wetlands and Waters within the study area. Wetlands and Waters include wetlands, streams, and ponds.

The study area is located west of Nenana, Alaska across the Nenana River in the Interior Alaska Lowlands Major Land Resource Area. All streams in the study area are tributaries to the Kantishna River, Nenana River, or the Tanana River. The Kantishna and Nenana Rivers are tributaries of the Tanana River. The Nenana and Tanana Rivers are traditional navigable waters.

The 2022 study area mapping is based on the criteria in the U.S. Army Corps of Engineers *Wetland Delineation Manual* (USACE 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0)* (USACE 2007), and the *2020 National Wetland Plant List* (USACE 2020a).

Study Area Wetlands and Waters

Status	Acres	Percent of Study Area
Wetlands	331.16	24.8
Waters	6.04	0.5
Total Wetlands and Waters	**337.21**	**25.2**
Uplands	998.59	74.8
Total	**1,335.79**	**100.0**

*Apparent inconsistencies in sums are the results of rounding.

Wetlands account for 331.16 acres (24.8 percent) of the study area. The majority of wetlands were classified in the Cowardin system (Cowardin et al. 1979) as Deciduous Shrub (76.6 percent of Wetlands and Waters). Flat and Riverine Hydrogeomorphic (HGM) wetlands were the dominant HGM types.

Ponds and streams accounted for 6.04 acres (0.5 percent) of the study area.

The study area includes six streams. Four of the streams are crossed by the existing Totchaket Road on the east side of the project. The other two streams are along a proposed material site access corridor. The total stream length within the study area is 2,317 feet, or 0.44 miles, and the total area covered by streams is 1.89 acres

Abbreviations

2007 Supplement	*Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region, 2007 Supplement Version 2.0*
ADEC	Alaska Department of Environmental Conservation
AICC	Alaska Interagency Coordination Center
AKEPIC	Alaska Exotic Plants Information Clearinghouse
APT	Antecedent Precipitation Tool
DOT&PF	Alaska Department of Transportation & Public Facilities
EPA	Environmental Protection Agency
FVP	Field Verification Point
GPS	Global Positioning System
HGM	Hydrogeomorphic Classification
HUC	Hydrologic Unit Code
MLRA	Major Land Resource Area
MP	Milepost
NHD	National Hydrography Dataset
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resource Conservation Service
NWI	National Wetland Inventory
NWPL	National Wetland Plant List
OBSF	Open Black Spruce Forests
RPW	Relatively Permanent Waters
SC	Stream Crossing
SPN	Special Public Notice
Stantec	Stantec Consulting Services Inc.
TNW	Traditionally Navigable Waters
U.S.	United States
USACE	U.S. Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WB	Waterbody
WD	Wetland Determination

1.0 INTRODUCTION

The Alaska Department of Transportation & Public Facilities (DOT&PF) is proposing to improve the existing 12-mile Totchaket Road and build new roadway west an additional 16-21 miles. Baseline (current existing conditions) fieldwork for a 500-foot corridor and material site locations was conducted in 2022 to determine the extent of Wetlands and Waters.

Field data were collected in June 2022 by Stantec Consulting Services Inc. (Stantec). The field data collected was used in conjunction with topographical base maps, aerial photography, and other data sources to produce the figures and findings presented in this report.

Stantec verifies the evaluation and collection of field data, wetland determinations, and the resulting digital maps and figures were performed in accordance with guidance provided in the U.S. Corps of Engineers (USACE) *Wetland Delineation 1987 Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region, 2007 Supplement Version 2.0* [2007 Supplement] (USACE 2007). The report and figures meet the standards prescribed in *USACE Special Public Notice (SPN) 2020-00399: Corps of Engineers Regulatory Program Consultant-Supplied Jurisdictional Determination Reports* (USACE 2020b). All field data analysis was reported using the *2020 National Wetlands Plant List* (USACE 2020a).

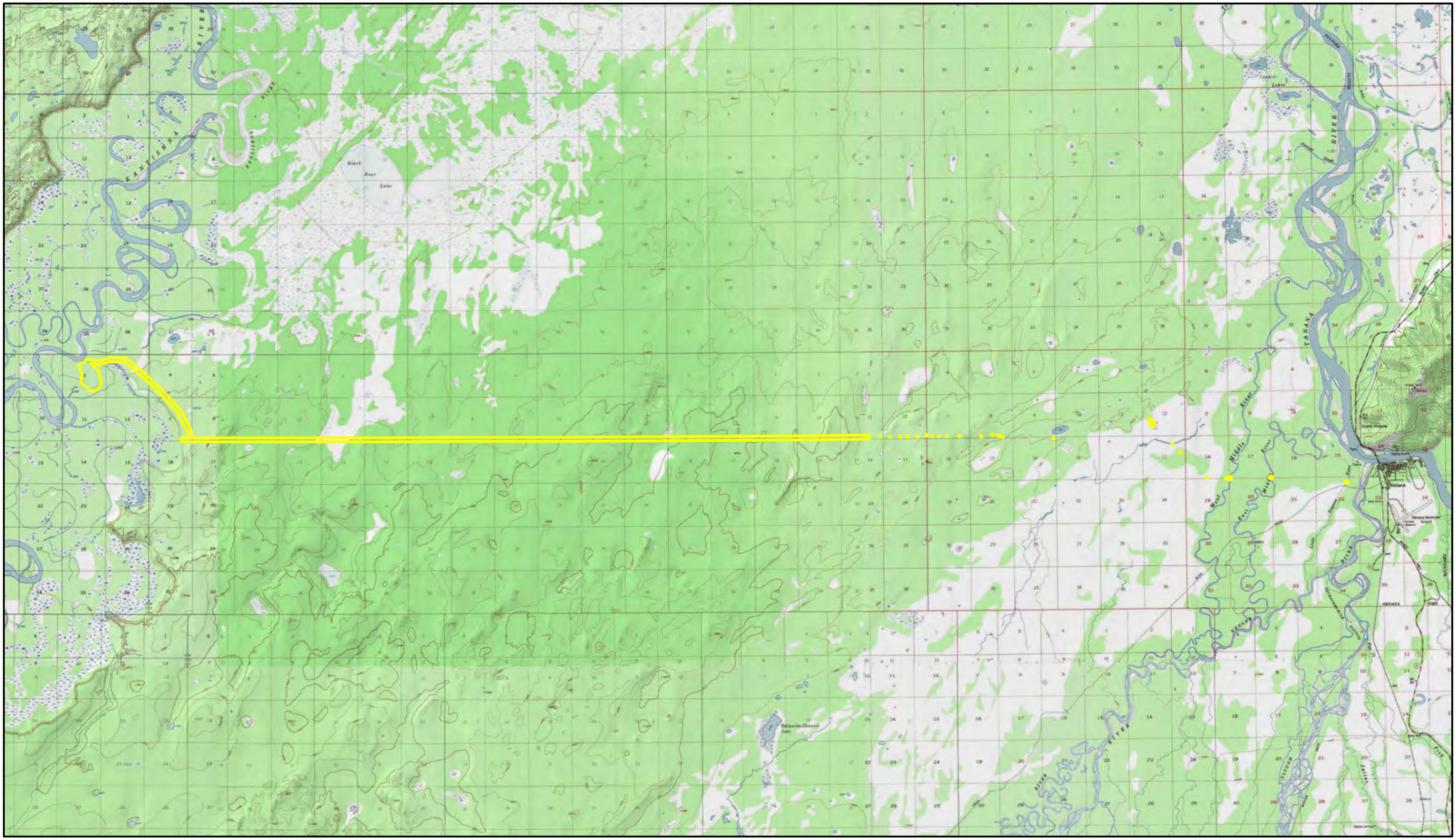
1.1 STUDY AREA LOCATION

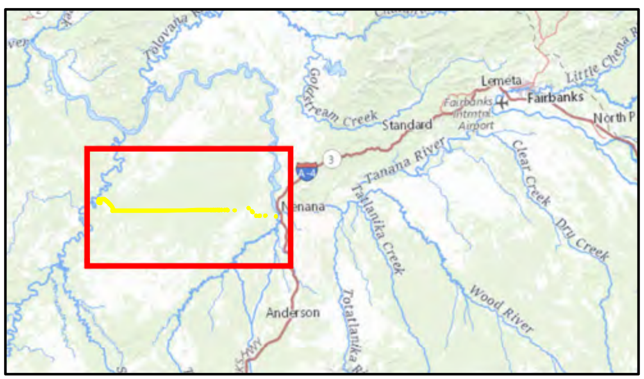
The study area is located west of Nenana, across the Nenana River. DOT&PF plans improvements to the existing 12 miles of roadway, 16 miles of new road to a bluff above the floodplain of the Kantishna River, and a potential material site within the Kantishna River floodplain including an access road (Figure 1). The westernmost boundary of the study area is latitude 64.6000 N longitude 150.1104 W, the easternmost boundary is latitude 64.5585 N longitude 149.1253 W (decimal degrees, NAD83).

The study area cross through two 1:250,000 U.S. Geological Survey (USGS) quadrangle maps; Kantishna River and Fairbanks, within the Kantishna C-1, Fairbanks C-5 and C-6 1:63,360 quadrangle maps. The project is within the Fairbanks Meridian and crosses 51 Public Land Survey System sections. The complete Township, Range, and Section list is shown in Table 1.

Table 1 Study Area Location

Meridian	Township	Range	Sections
Fairbanks	4S	8W	16-22
		9W	7, 8, 12, 13, 16, 17
		10W	7-12, 14-18
		11W	7-18
		12W	6-18
		13W	1, 2





Study Area

0 8,000 16,000 24,000 Feet

(At original document size of 8.5x11)

1:200,000 1 inch = 16,666.67 feet

N W E S

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Project

Nenana Totchaket Road

Figure

Location

Figure Number

1

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2.0 EXISTING DATA AND METHODOLOGY

2.1 EXISTING DATA

Sources of existing data used in developing baseline environmental data include: the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) data, U.S. Department of Agriculture (USDA) ecoregion and soil survey information, USGS National Hydrography Dataset project watersheds and stream data, local climate data, and USFWS fish and wildlife data.

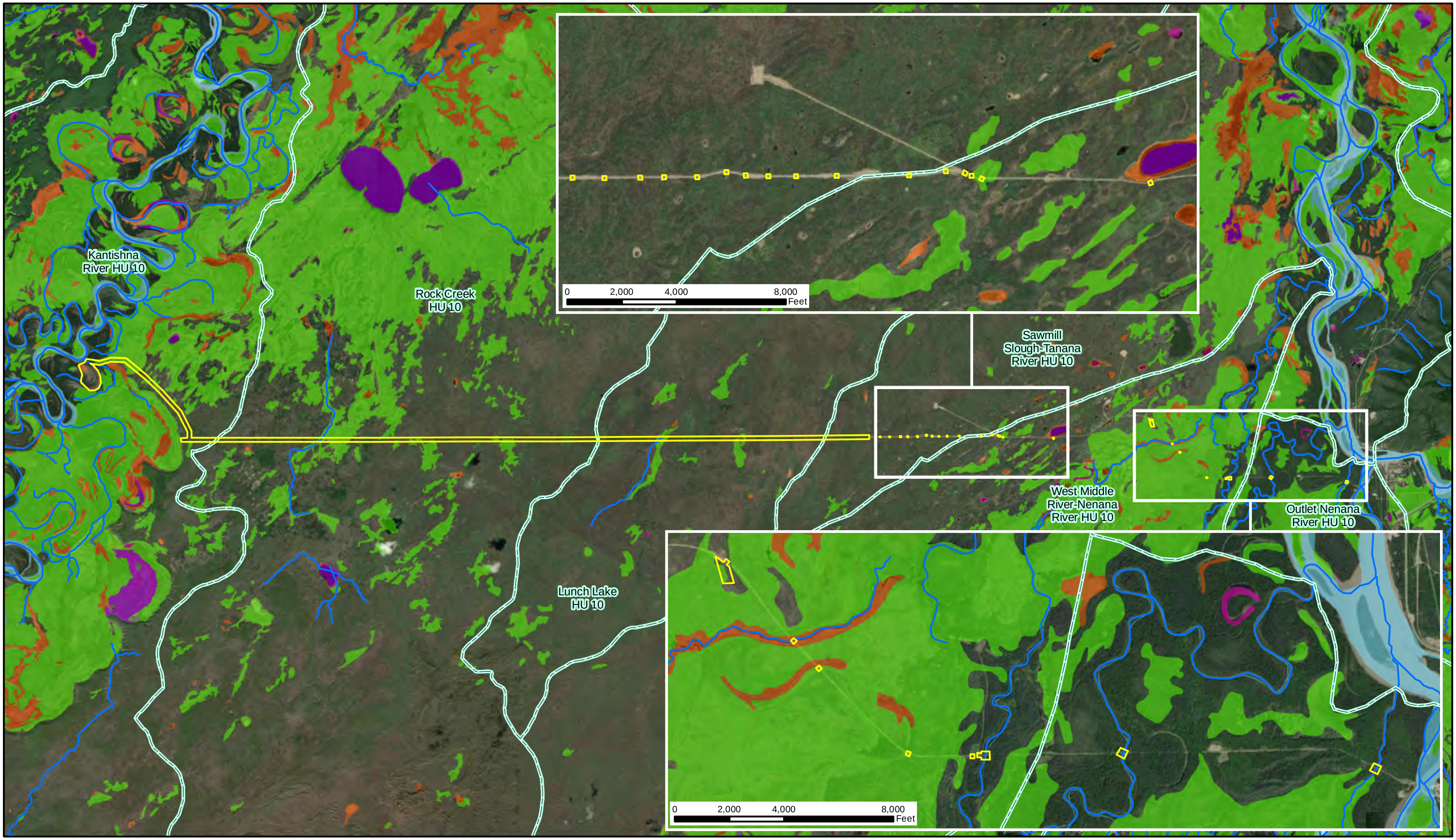
2.1.1 National Wetland Inventory

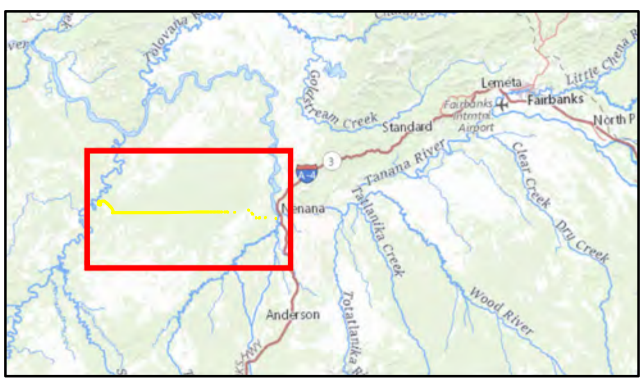
The NWI on-line Wetlands Mapper shows the study area is covered by digital NWI data (USFWS 2022a). The area was mapped using 1978/1979 Color Infrared imagery at a scale of 1:60,000. The NWI mapped wetlands occupying low-lying swales crossed by the study area, as well as large portions of the Kantishna River floodplain crossed by the study area. Wetlands and Waters types include emergent wetlands, forested/shrub wetlands, and streams, and total 15.33 percent of the study area. Table 2 summarizes NWI wetlands and waters mapped in the study area. Figure 2 shows the NWI coverage of the study area.

Table 2 National Wetland Inventory Mapping

NWI Group	NWI Code	Acres	Percent Study Area
Wetlands			
Freshwater Emergent	PEM1	31.15	2.33
Freshwater Forested/Shrub	PFO1/4	1.66	0.12
	PFO4	69.95	5.24
	PFO4/1	0.51	0.04
	PFO4/2	2.51	0.19
	PSS1	38.80	2.90
	PSS1/4	1.17	0.09
	PSS1/EM1	57.52	4.31
Wetlands Total		**203.26**	**15.22**
Waters			
Riverine	R5UB	1.46	0.11
Waters Total		**1.46**	**0.11**
Wetlands and Waters Total		**204.72**	**15.33**
Uplands	U	1,131.07	84.67
Total		**1,335.79**	**100.00**

*Apparent inconsistencies in sums are the results of rounding.





Study Area
HU 10 Watershed
NHD Flowline

NWI Mapping by Wetland Type

Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine (Stream/River)

0 8,000 16,000 24,000
Feet
(At original document size of 8.5x11)
1:200,000 1 inch = 16,666.67 feet

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Figure
NWI and NHD Mapping

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2

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2.1.2 Major Land Resource Area

The study area is located within the 23-million-acre Interior Alaska Lowlands Major Land Resource Area (MLRA; USDA 2006). This MLRA includes broad floodplains, terraces, and outwash plains, with scattered hills and low to moderate relief mountains.

The study area within the MLRA is drained by the Yukon River and is considered a zone of discontinuous permafrost. Permafrost is commonly close to the surface on gently sloping footslopes and hills. Silty micaceous loess originating from the unvegetated gravel bars and floodplains of the Tanana River covers much of the surface in this part of the MLRA, providing a significant content of mica in the soils (USDA 2006).

Upland deciduous, coniferous, and mixed forest are found on well drained soils. Black spruce, birch, and tamarack are found on permafrost affected flats (USDA 2006).

2.1.3 Watersheds

The study area crosses five USGS hydrologic unit code (HUC) 10 watersheds. The area of each watershed intersecting the study area is shown in Table 3. The study area watersheds are shown in Figure 2. Waters from these watersheds ultimately flow to the Tanana River.

Table 3 Watersheds

HUC 10 Watershed	Acres
Kantishna River	400.56
Lunch Lake	316.37
Outlet Nenana River	4.30
Rock Creek	531.95
Sawmill Slough - Tanana River	66.82
West Middle River – Nenana River	15.79

2.1.4 Rivers and Streams

USACE *Special Public Notice* (SPN) *2020-00339 Corps of Engineers Regulatory Program Consultant-Supplied Jurisdictional Determination Reports* (USACE 2020b) superseded 2010 guidance (USACE 2010). However, in 2021 the Environmental Protection Agency (EPA) published guidance directing use of pre-2015 Waters of the U.S. instructions (EPA 2022a). Therefore, to classify study area streams, this report refers to SPN 2010-45 (USACE 2010).

In the Alaska District SPN 2010-45, USACE asks for data (optional) describing the various tributaries (streams) flowing from or through the project study area, and their connections to traditionally navigable waters downstream. The USACE is responsible for determining the jurisdiction of Waters of the U.S.

(wetlands, streams, rivers, lakes), by reviewing connections to downstream navigable waters (USACE 2010).

Traditionally Navigable Waters

Traditionally Navigable Waters (TNW) are defined in SPN 2010-45 as those "…waters which are currently used or were used in the past or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide."

The USACE Alaska District lists the Navigable Waters in Alaska (USACE 1995). The Nenana River to the east of the study area flows into the Tanana River; both are designated as TNW.

Relatively Permanent Waters

In addition to identifying TNWs in the project area, non-navigable streams (Relatively Permanent Waters [RPW]) also need to be identified. Non-navigable streams are classified by USACE (2010) in three ways:

<u>Relatively Permanent Non-Navigable Tributaries of Traditional Navigable Waters (Perennial RPW):</u> Non-navigable waters typically flowing year-round or waters having a continuous flow at least seasonally (typically three months). Perennial RPW do not include ephemeral tributaries which flow only in response to precipitation and intermittent streams which do not typically flow year-round or have continuous flow at least seasonally.

<u>Seasonal Relatively Permanent Waters (Seasonal RPW):</u> Non-navigable, seasonal RPW—intermittent streams which do not typically flow year-round or have continuous flow at least seasonally.

<u>Non-Relatively Permanent Waters (Non-RPW):</u> Non-navigable tributaries that do not typically flow year-round or do not have continuous flow at least seasonally.

National Hydrography Dataset

The USGS National Hydrography Dataset (NHD; USGS 2022) catalogs numerous abandoned and active channels of the Kantishna River flowing through the western end of the study area and two perennial streams flowing through the middle (Figure 2).

At the eastern end, four perennial streams flow under or through bridges and culverts of the existing roadway. These include a tributary to, and the West Middle River, the East Middle River, and the Little Nenana River. Each is a direct tributary to the Tanana River (Figure 2).

2.1.5 Soil Survey

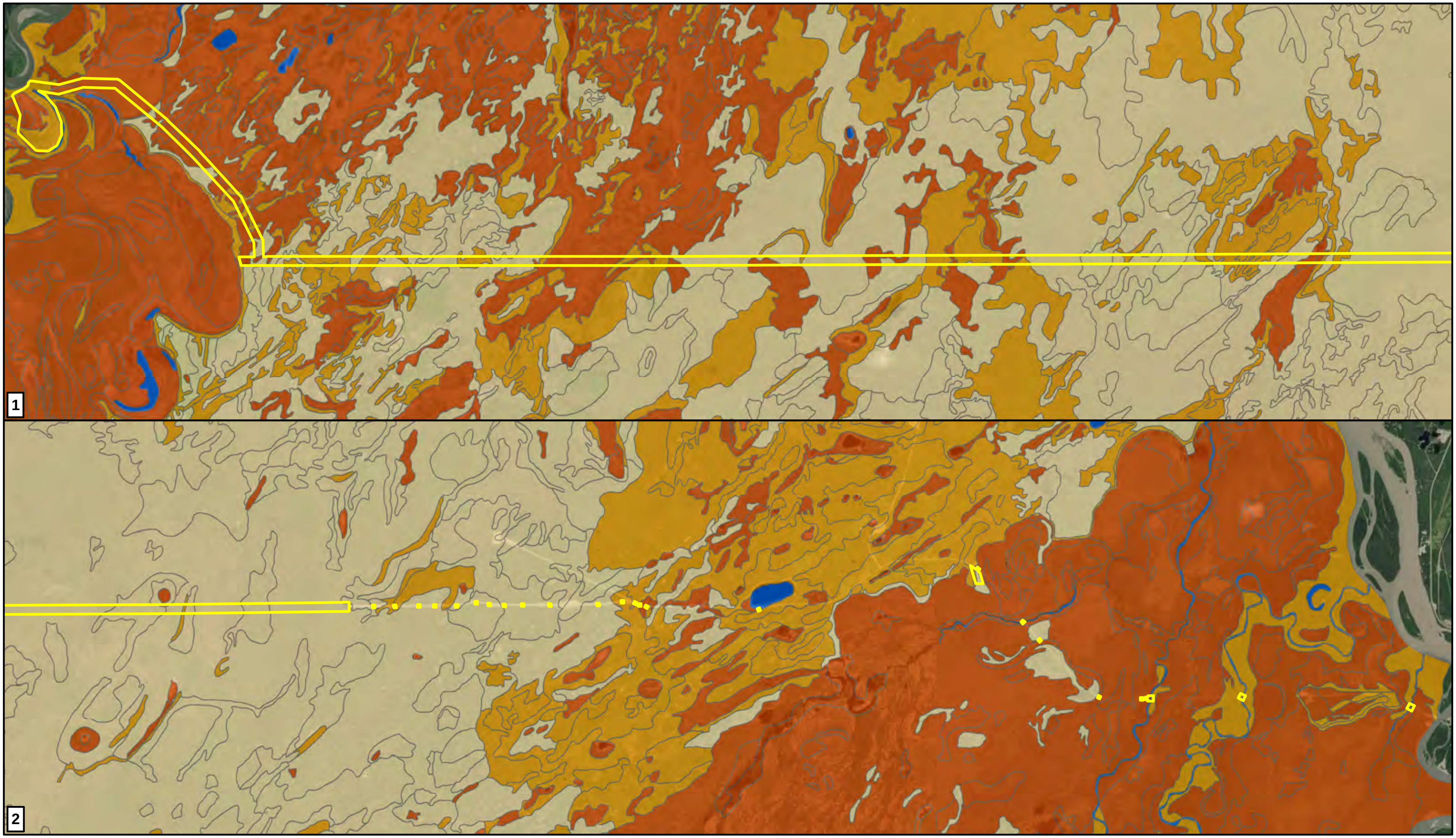
The *Soil Survey of Totchaket Area, Alaska* (USDA 1980) covers 579,790 acres, extending west from Nenana to the Kantishna River and north to the Tanana River. In 2014, the hydric soils from the Totchaket soil survey were classified (USDA 2014). The Alaska Division of Agricultural has contracted the USDA to update soils data in 34,769 acres to the west of Nenana (USDA 2020) which will continue into 2022. The majority of soils in this updated area are considered to be Class 4 soils; an acidic sandy loam (http://dnr.alaska.gov/ag/nentot/#soils).

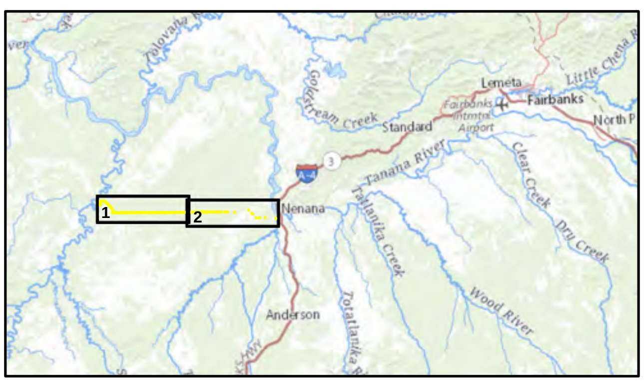
Table 4 lists the map units in the study area and their estimated hydric soils percentage. Seven soil map units within the study area have 85 percent or higher components with hydric soils (Table 4). These map units generally align with the NWI wetland areas and NHD streams within the study area. Figure 3 shows the soil map units within and around the study area.

Table 4 Soil Survey

Map Unit Name	Map Unit	Acres	Percent of Study Area	Percent Hydric Soils
Beales silt loam, nearly level	1	15.14	1.13%	8
Beales silt loam, undulating	2	98.60	7.38%	8
Bradway very fine sandy loam	4	43.47	3.25%	92
Dotlake silt loam	5	71.45	5.35%	89
Tanacross silt loam	9	181.91	13.62%	97
Kantishna peat	10	0.28	0.02%	97
Koyukuk silt loam, undulating	12	3.24	0.24%	3
Koyukuk silt loam, rolling	13	4.39	0.33%	0
Nenana silt loam, shallow, nearly level	17	147.96	11.08%	0
Nenana silt loam, shallow, undulating	18	388.67	29.10%	0
Nenana silt loam, shallow, rolling	19	77.26	5.78%	0
Nenana silt loam, shallow, hilly	20	5.89	0.44%	0
Richardson silt loam	21	0.62	0.05%	8
Salchaket very fine sandy loam	22	103.13	7.72%	15
Tanana silt loam	23	24.64	1.84%	95
Teklanika loamy fine sand, rolling	24	72.44	5.42%	5
Teklanika loamy fine sand, hilly	25	24.18	1.81%	5
Teklanika loamy fine sand, very steep	27	5.20	0.39%	5
Toklat silt loam	28	10.01	0.75%	85
Toklat-Bolio complex	29	8.81	0.66%	95
Volkmar silt loam	30	40.08	3.00%	0
Water	W	8.41	0.63%	N/A
	Total	**1,335.79**	**100.0**	

*Apparent inconsistencies in sums are the results of rounding





Study Area

Soil Map Units by Percent Hydric

- 85-100% Hydric Components
- 3-15% Hydric Components
- 0% Hydric Components
- Water

0 4,000 8,000 12,000 Feet

(At original document size of 8.5x11)

1:90,000 1 inch = 7,500 feet

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Figure

Soil Mapping

Figure Number

3

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2.1.6 Climate Data

The growing season for this area begins on May 2 and ends on October 4 (USACE 2007).

Precipitation data leading to 2022 field work is listed in Table 5. The weather conditions preceding the field investigations were considered during onsite determinations. Normal precipitation is based on 1991-2020 records for Nenana Municipal Airport, Alaska (NOAA 2022). Field work was conducted May 31 through June 7, 2022. Precipitation for all months of the water year, starting October 2021, were within or above climate normals. Precipitation for October-December 2021, and February and May 2022 was above climate normals. Precipitation for the water year through the end of May was three times normal precipitation (Table 5).

Table 5 2022 Water Year WETS Precipitation for Nenana, Alaska

Month	Total Monthly Accumulated Precipitation (Inches)	Average Monthly Accumulated Precipitation 1991-2020 (Inches)	Percent of Average Precipitation	30% Chance Precipitation	
				Less Than (In.)	More Than (In.)
October 2021	1.75	0.87	201	0.40	0.91
November 2021	4.49	0.79	568	0.29	0.95
December 2021	M5.28	0.57	926	0.29	0.70
January 2022	0.23	0.58	40	0.20	0.62
February 2022	M1.54	0.44	350	0.18	0.51
March 2022	0.33	0.36	92	0.12	0.38
April 2022	0.21	0.29	72	0.08	0.30
May 2022	0.91	0.62	147	0.28	0.66
Total	**14.74**	**4.52**	**326**	**1.84**	**5.03**

M = Month includes days with missing data

These data suggest that conditions during field work were wetter than normal.

The Antecedent Precipitation Tool (APT, EPA 2022b) was also run for the study area. All dates field work was conducted, the APT returned values of "Normal Conditions" or "Wetter than Normal." It also showed that the study area was considered to be in the Dry Season during field work. The APT output is shown in Appendix A.

2.1.7 Fire History

The 1987 Manual and 2007 Supplement consider disturbance by fire an atypical situation when determining wetland status. Investigators must determine whether change from fire disturbance is the new normal condition for each previously burned area. Because fire is a natural event and a normal occurrence in interior forests, wetland conditions in the field in areas burned in previous years were considered to be the new normal condition. In areas burned in years prior to the fieldwork, vegetation, soils, and hydrology are assumed to have stabilized and represent the current condition. Fires most likely created a mosaic of burned and unburned areas within the fire boundaries. In many burned areas, trees were killed while understory shrub communities were not as severely impacted.

Lightning-caused fires in the Interior Alaska Lowlands MLRA are common, with willow and other deciduous shrubs and sapling establishing post fire (USDA 2006). The Alaska Department of Environmental Conservation (ADEC) Technical Report WRP-DE-1999 (ADEC 1999) presents a broader discussion of the effects of fire on wetlands in Interior Alaska and the numerous vegetation community successional pathways.

The Alaska Department of Natural Resources, Division of Forestry, in cooperation with other Federal, State, and local agencies track fire history in Alaska through the Alaska Interagency Coordination Center (AICC 2022).

The 2009 Minto Flats South fire boundary covers much of the project study area. The Kantishna River floodplains to the west, and the eastern 3.7 miles of the existing road are not within the fire perimeter. Although there are unburned mosaics within the study area, over half of the area has burned, with standing and downed dead wood throughout the study area and vegetative regrowth occurring (Photo 1).

Photo 1: Vegetative Regrowth in Previously Burned Forest

2.1.8 Sensitive and Rare Species

There are no threatened or endangered State or Federally listed species within the study area (USFWS 2022b).

2.1.9 Non-Native Species

The Alaska Exotic Plants Information Clearinghouse (AKEPIC) tracks non-native plant species in Alaska and provides biographies and risk assessments, to include an invasiveness ranking—the higher the number, the higher the conservation concern. The AKEPIC database and mapping applications show no information for the area west of the Nenana River.

2.2 METHODOLOGY

2.2.1 Field Data Collection

During the 2022 wetland field evaluations, Global Positioning System (GPS) locations and detailed information on one-tenth acre plots (1/10) were recorded in representative project vegetation types. Additional field data, notes, and photographs were used to evaluate mapping areas with similar characteristics.

Field data was collected and recorded using four types of plots:

1. Wetland Determination (WD) Plots. At these sites, investigators recorded detailed descriptions of vegetation, hydrology, and soils on field data forms. Wetland status for this plot type was determined based on the presence or absence of hydrophytic vegetation, hydrology, and hydric soils.

2. Field Verification Points (FVP). Photographs and GPS locations were taken for vegetation communities and landscape positions that were clearly wetlands or upland based on WD results in nearby similarly situated areas with similar site-specific information. Project Vegetation Type, Hydrogeomorphic (HGM), and Cowardin classifications were recorded.

3. Stream Crossing (SC) Points. Photographs and GPS locations were taken when streams were encountered. Information on the stream status as a seasonal or perennial Relatively Permanent Waters (USACE 2010) and additional stream data were collected.

4. Waterbody (WB) Points. Photographs and GPS locations were taken when ponds were encountered.

Generally, the information collected at each representative wetland determination field plot included:

- percent coverage of all plant species (tree, shrub, and herbaceous species) and their wetland indicator status according to the *2020 National Wetland Plant List* (NWPL, USACE 2020a);

- vegetation type;
- soil characteristics;
- visible or readily apparent hydrologic characteristics;
- physical characteristics including aspect, elevation, landform, and topography;
- location information including latitude and longitude (in NAD83 2011, decimal degrees);
- wetland descriptors including HGM and Cowardin classifications;
- indications of prior disturbance and whether current conditions represent the ‘new normal’; and
- direct wildlife observations, as well as indirect observations such as trails, scat, dens, or heavy browse.

Plant Data

Alaska plant indicator statuses follow the Alaska 2020 NWPL (USACE 2020a). Alaska is divided into subregions, where plant indicator statuses may differ from the rest of the State. The study area is within the 2020 NWPL subregion Interior Alaska Lowlands. Modifications to plant indicator statuses include *Viola palustris* and *Carex canescens* from Facultative Wetland to Facultative, *Rubus arcticus* from Facultative to Facultative Upland, and *Andromeda polifolia* from Facultative Wetland to Obligate Wetland. Plant indicator statuses are listed in Appendix B.

Numerous taxonomic references including those listed below were used to identify tree, shrub, and herbaceous species over the course of the field surveys:

- *Flora of Alaska and Neighboring Territories: A Manual of Vascular Plants* (Hultén 1968); and
- *Willows of Interior Alaska* (Collet 2004).

The presence of hydrophytic vegetation was determined using the prevalence index and the dominance test (USACE 2007).

Hydric Soils Assessment

Field indicators of hydric soils and determination of hydric soil status was based on USDA National Resource Conservation Service (NRCS) guidance (USDA 2018) and the Alaska 2007 Supplement (USACE 2007). The 2007 Supplement contains a subset of hydric soil indicators found in the U.S. as determined by the National Technical Committee for Hydric Soils (USACE 2007). Additional soil characteristics recorded within the soil horizons were based on NRCS guidance (Schoeneberger et al. 2012).

Hydrology

The 2007 Supplement lists numerous primary and secondary hydrology indicators. All indicators found in the sampling area were recorded in the data form.

Field Data

Field plot data were collected at 162 sites by throughout the study area, but primarily focused on areas where both NWI and NHD mapping (Sections 2.1.1 and 2.1.4, Figure 2), or landscape position showed potential for wetlands and waters. Field site locations were determined using aerial photographs and GPS. All field data were entered into a project database where the data were reviewed; queries were generated from the database to provide the information needed for mapping and results analyses.

Field data were collected June 1-4 and June 9 by Stantec Professional Wetland Scientist Steve Reidsma, and May 31-June 7 by HDR Professional Wetland Scientist Zach Halstead. Field plots collected are shown in Table 6. Field forms and photos for all WD plots, and photos of FVP, SC, and WB plots are presented in Appendix C.

Table 6 Field Plots

Field Plot Type	Wetlands and Waters	Uplands	Total Plots
Wetland Determination (WD)	22	40	62
Field Verification Point (FVP)	29	66	95
Stream Crossing (SC)	5	0	5
Total	**56**	**106**	**162**

2.2.2 Mapping

Final mapping (wetland boundaries, HGM classification, Cowardin code, and Vegetation Type) was completed using digital, true color orthoimagery (collected August and September 2020) that maintains a resolution of 0.5-feet in ESRI's ArcMap GIS (10.8) environment.

Field data were used to identify the characteristics of the vegetation and wetlands or non-wetlands community at a specific location. The information gathered from one site was used for calibration to extrapolate to similar unvisited sites within the mapping environment. In addition to imagery interpretations, ancillary data including field notes, general landscape position, slope, aspect, landform and proximity to other vegetation community types and land cover types were utilized to assist in the mapping process.

Mapping polygons were drawn to delineate differences among the four classification systems used to attribute each polygon. Polygons were drawn around all features. When stream boundaries were not visible due to overhanging vegetation, polyline features were drawn to indicate location. Water features were delineated at a scale of 1:400 (one inch equals 33 feet), while delineation of vegetation boundaries occurred at a scale of 1:1,200 (one inch equals 100 feet).

3.0 RESULTS

3.1 WETLANDS AND WATERS

The field verified wetland and waters totals are shown in Table 7. Figure 4 shows an overview of the Wetlands and Waters in the study area. Detailed figures for the study area are provided in Appendix D.

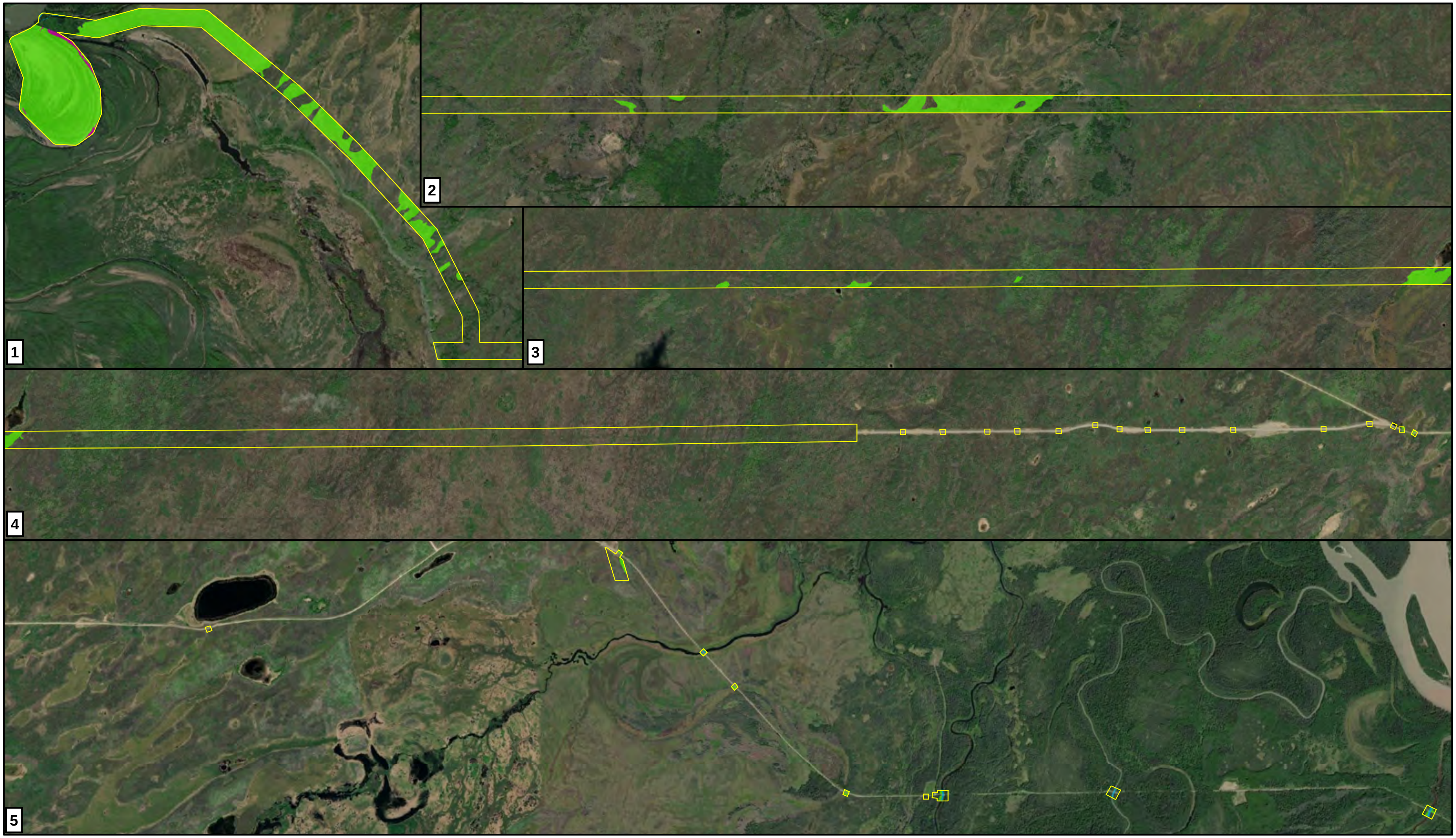
Table 7 Wetlands and Waters

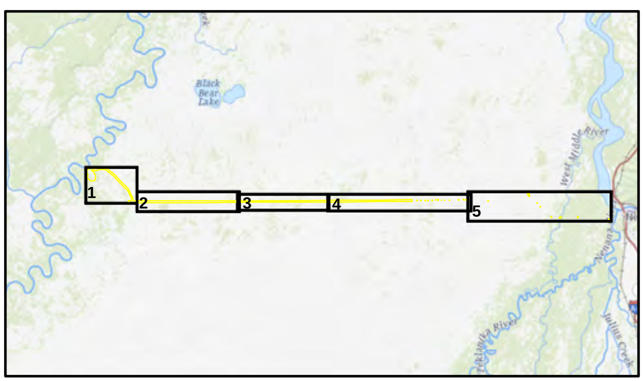
Status	Acres	Percent of Study Area
Wetlands	331.16	24.8
Waters	6.04	0.5
Total Wetlands and Waters	**337.21**	**25.2**
Uplands	998.59	74.8
Total	**1,335.79**	**100.0**

*Apparent inconsistencies in sums are the results of rounding

Along the existing Totchaket road, wetlands were found where the road crossed stream channels, and in several depressions associated with historic floodplains. The proposed alignment crossed two large low-elevation areas containing wetlands, as well as several smaller depressions. The proposed Kantishna floodplain material site is comprised entirely of wetlands and waters, and a large portion of the proposed access route closest to the material site is wetlands.

The largest difference between the NWI mapping (Figure 2) and the field verified mapping occurs within the proposed material site. The NWI mapped this area as mostly upland, however, helicopter flyovers and field work showed this area as mostly wetlands.





Study Area
Wetland
Pond
Stream/River

0 2,000 4,000 6,000 Feet

(At original document size of 8.5x11)

1:48,000 1 inch = 4,000 feet

N
W E
S

Client

AK Dept. of Transportation & Public Facilities

Project

Nenana Totchaket Road

Figure

Aquatic Resources Overview

Figure Number

4

Stantec

3.1.1 Cowardin Classification

As part of the wetlands mapping, Wetlands and Waters were classified according to the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979).

The majority of mapped wetlands were classified as Deciduous Shrub (76.6 percent of Wetlands and Waters) dominated by ericaceous shrub bogs and tundra, and post-burn regrowth. The next largest category was Coniferous Forest (18.0 percent of Wetlands and Waters) dominated by black spruce. Herbaceous wetlands comprised 3.5 percent of Wetlands and Waters, while Ponds and Streams totaled 1.8 percent. Wetlands and Waters polygons are labeled by Cowardin Classification on the Wetlands and Waters Detail figures presented in Appendix D. All classifications are shown in Table 8.

Table 8 Cowardin Classifications for the Study Area

Cowardin Group	NWI Code	Wetland Acres	Percent of Study Area	Percent of Wetlands and Waters
Wetlands				
Coniferous Forest	PFO4/SS1	59.95	4.5	17.8
	PSS1/FO4	0.83	0.1	0.2
	Total Coniferous Forest	**60.78**	**4.5**	**18.0**
Deciduous Shrub	PSS1	72.14	5.4	21.4
	PSS1/EM1	121.33	9.1	36.0
	PEM1/SS1	64.97	4.9	19.3
	Total Deciduous Shrub	**258.45**	**19.3**	**76.6**
Herbaceous	PEM1	11.94	0.9	3.5
	Total Herbaceous	**11.94**	**0.9**	**3.5**
	Total Wetlands	**331.16**	**24.8**	**98.2**
Waters				
Pond	PUB	4.16	0.3	1.2
	Total Pond	**4.16**	**0.3**	**1.2**
Stream	R2UB	1.54	**0.1**	0.5
	R3UB	0.34	**<0.1**	0.1
	Total Stream	**1.89**	**0.1**	**0.6**
	Total Waters	**6.04**	**0.5**	**1.8**
	Total Wetlands and Waters	**337.21**	**25.2**	**100.0**
	Total Uplands	**998.59**	**74.8**	
	Total Study Area*	**1,335.79**	**100.0**	

*Apparent inconsistencies in sums are the results of rounding.

3.1.2 Project Hydrogeomorphic Classification

Wetland functional capacity was assessed using an HGM-based rapid assessment procedure. This procedure is based on the essential elements of the Hydrogeomorphic approach described by the USACE in Brinson (1993) and Smith et al. (1995) to identify groups of wetlands that function similarly.

The HGM classification is based on a wetland's: (1) position in the landscape or geomorphic setting, (2) dominant source of water, and (3) hydrodynamics of the water in the wetland (Brinson 1993). The purpose of the HGM classification is to provide a mechanism to account for the natural variation inherent to wetlands, particularly when wetland functions are being assessed. For example, a riverine wetland will generally have a much higher opportunity to export organic carbon than an isolated depressional wetland due to the riverine wetland's landscape position and hydrodynamics. Table 9 provides a summary of the acres of each HGM type as currently classified within the study area.

Table 9 Hydrogeomorphic Classification

HGM Classification	Acres	Percent of Study Area
Wetlands		
Depressional	6.76	0.5
Flat	177.37	13.3
Riverine	147.04	11.0
Total Wetlands	**331.16**	**24.8**
Waters		
Riverine	4.16	0.3
Riverine Channel	1.89	0.1
Total Waters	**6.04**	**0.5**
Total Wetlands and Waters	**337.21**	**25.2**
Total Uplands	**998.59**	**74.8**
Total Study Area	**1,335.79**	**100.0**

*Apparent inconsistencies in sums are the results of rounding.

The HGM classes identified in the study area are shown on the detailed figures in Appendix D and discussed in the following section. The HGM descriptions are taken from ADEC Technical Report WRP-DE-1999 (ADEC 1999), an application of the HGM approach for precipitation driven wetlands on discontinuous permafrost in Interior Alaska.

Flat Wetlands

The water source of flat wetlands is dominated by precipitation. Flat wetlands are most common on interfluves, extensive relic lake bottoms, and abandoned floodplain terraces above the zone of river flooding. They receive virtually no groundwater discharge, which distinguishes them from depressions and slopes. Flat wetlands usually have a mineral soil, but similar wetlands may be characterized by vertical accretion of organic matter. Dominant hydrodynamics are vertical fluctuations. They lose water by evapotranspiration, overland flow, and seepage to underlying groundwater. Flat wetlands are characterized by low lateral drainage, usually due to low hydraulic gradients (ADEC 1999).

Photo 2: Tussock Tundra Flat HGM Wetland

In Alaska, flat wetlands cover vast areas where shallow permafrost tables perch precipitation at or near the surface. These “flats” may occur on sloping terrain such as the millions of acres of tussock tundra dominated by tussock cotton-grass (*Eriphorum vaginatum*) on the low, rolling hills of the North Slope region. Black spruce dominated hillside forests and woodlands in Interior Alaska are generally considered to be flat wetlands if permafrost occurs at a shallow depth (ADEC 1999).

Flat wetlands in the study area occur in shallow gradient, lower elevation swales and lowlands, mostly with permafrost. Flat wetlands, typically areas with burned stunted black spruce (*Picea mariana*) and shrub covered tussock tundra, were found in the larger wetland valleys (Photo 2).

Depressional Wetlands

Depressional wetlands occur in topographic depressions on a variety of geomorphic surfaces. Dominant water sources are precipitation, groundwater discharge, and surface flow and interflow from adjacent uplands. The direction of flow is normally from surrounding non-wetland areas toward the center of the depression. Elevation contours are closed, allowing for the accumulation of surface water. Depressional wetlands may have any combination of inlets and outlets or lack them completely. Dominant hydrodynamics are vertical fluctuations, primarily on a seasonal basis. Depressional wetlands lose water through intermittent or perennial flow from an outlet, evapotranspiration, or contribution to groundwater (ADEC 1999).

Depressional wetlands in the study area occur in small concave kettles in the western study area and as old oxbow ponds along the existing road corridor (Photo 3).

Photo 3: Depressional Oxbow HGM Wetland

Riverine Wetlands

Riverine wetlands are found within active floodplains and riparian corridors associated with river and stream channels. Dominant water sources are subsurface hydraulic connections or overbank flow from nearby river and stream channels and wetlands. Groundwater discharge from surficial aquifers, overland flow from neighboring uplands and small tributaries, and precipitation may contribute additional inputs. Riverine wetlands lose surface water by flow returning to the channel after flooding or precipitation events.

Subsurface water loss generally occurs through discharge to nearby active channels, evapotranspiration, and vertical migration to deeper groundwater (ADEC 1999).

Riverine wetlands in the study area occur as floodplains along the larger streams/rivers crossing the existing roadway in the east and near the Kantishna River to the west. The large tributary to the West Middle River has a wide wetland floodplain (Photo 4).

Photo 4: Riverine HGM Wet Herbaceous Wetlands

Riverine Channel Waters

Streams and rivers classified as RPW are classified as Riverine Channel in the project HGM system. This class includes the stream bed below ordinary high water, bare sands and gravels in seasonal streams, gravel bars in larger stream systems, and partially vegetated islands that are seasonally flooded.

The six perennial streams crossed by the study area are considered Riverine Channel HGM. The large slow-moving tributary to the West Middle River is a Perennial RPW and is shown in Photo 4. No streams crossed the proposed new road corridor to the western bluff. The material site access road has one stream crossing near the Kantishna River and material site.

3.1.3 Streams

One perennial TNW stream and five perennial RPW streams were found within the study area. Along the western edge of the proposed floodplain material site and associated access corridor is the Kantishna River, a TNW. Within this area an unnamed perennial RPW crosses the study area and flows into the Kantishna River. On the eastern end of the study area, the existing Totchaket Road crosses four perennial RPW streams that are tributaries to the Tanana River. Streams found in the study area are listed in Table 10. The total length of streams within the study area was 2,317 linear feet. All streams within the study area connect downstream to the Tanana River, a TNW.

Table 10 Streams

Stream Name	Stream Description	Cowardin Classification	Length (linear feet)	Area (acres)
Kantishna River	Perennial TNW	R2UBH	287	0.21
Unnamed tributary Kantishna River	Perennial RPW	R3UBH	929	0.31
Unnamed tributary Tanana River	Perennial RPW	R2UBH	166	0.17
West Middle River	Perennial RPW	R2UBH	314	0.39
East Middle River	Perennial RPW	R2UBH	312	0.31
Little Nenana River	Perennial RPW	R2UBH	308	0.47
		Total	2,317	1.89

*Apparent inconsistencies in sums are the results of rounding.

3.1.4 Jurisdictional Status of Wetlands and Waters

For projects that run along road corridors, it is sometime difficult to determine connectivity of Wetlands and Waters to RPWs that ultimately flow to TNWs. Figure 2 shows the NHD perennial streams that flow through or are downstream of the study area. The field work verified these rivers and streams were perennial RPWs and continue as perennial RPWs, ultimately to the Tanana River. The larger wetland swales also appear to connect to the stream systems, although this was not field verified.

As seen in Figure 4 and the detailed Figures in Appendix D, most of the Wetlands and Waters within the study area likely have abutting or adjacent downstream connection through RPWs to various rivers which flow to the Tanana River, a TNW.

There is at least one small depressional kettle wetland (0.67 acres) in the study area that may not have connectivity to other wetlands or streams that flow to the Tanana River.

The jurisdictional status of the Waters of the U.S. is ultimately determined by USACE.

3.2 VEGETATION

3.2.1 Project Vegetation Types

The study area project vegetation types are listed in Table 11 and shown in Appendix E. The plant community descriptions provided in the *Alaska Vegetation Classification System* (Viereck et al. 1992) formed the basis for the Project Vegetation Types.

Shrub vegetation types made up the majority of the study area (81.7 percent of the study area). The Deciduous Shrub and Sapling Regeneration (DSSR) vegetation type was the largest portion of the shrub category (64.1 percent of the study area). Most of this vegetation type was in burn regrowth areas. It also occurred along the shoulder of maintained roadways. Only three percent of the DSSR vegetation type was wetland. The remainder of the shrub vegetation types included alder-, willow-, and ericaceous shrub-dominated types, and were all mostly wetland communities.

Coniferous forest vegetation types made up 8.3 percent of the study area, and included Closed and Open Black Spruce Forest, Black Spruce Woodland, and Open White Spruce Forest. No portion of the Open White Spruce Forest or Closed Black Spruce Forest vegetation types were wetland. Open Black Spruce Forests were 56.4 percent wetland, and Black Spruce Woodlands were 41.5 percent wetland.

Mixed Forest vegetation types made up 5.8 percent of the study area and Deciduous Forest vegetation types made up 2.4 percent of the study area. No Mixed or Deciduous Forests were classified as wetlands.

Herbaceous vegetation types included Mesic Herbaceous (<0.1 percent of the study area, 0 percent wetland), and Wet Herbaceous (0.9 percent of the study area, 100 percent wetland).

The Barren vegetation type made up 0.4 percent of the study area and represents the roadway, side roads, and non-vegetated areas along roadways and in developed material sites.

The Open Water vegetation type included ponds and streams, and made-up 0.5 percent of the study area.

Table 11 Vegetation Classification

Vegetation Group	Vegetation Type	Vegetation Code	Wetlands and Waters Acres	Total Acres	Percent Wetlands and Waters	Percent Study Area
Coniferous Forest	Closed Black Spruce Forest	CBSF	-	3.05	-	0.2
	Open Black Spruce Forest	OBSF	59.95	106.31	56.4	8.0
	Open White Spruce Forest	OWSF	-	0.04	-	<0.1
	Black Spruce Woodland	BSW	0.83	2.00	41.5	0.1
	Total Coniferous Forest		**60.78**	**111.40**	**54.6**	**8.3**
Deciduous Forest	Closed Deciduous Forest	CDF	-	2.03	-	0.2
	Open Deciduous Forest	ODF	-	28.43	-	2.1
	Woodland Deciduous Forest	WDF	-	1.59	-	0.1
	Total Deciduous Forest		**-**	**32.05**	**-**	**2.4**

Vegetation Group	Vegetation Type	Vegetation Code	Wetlands and Waters Acres	Total Acres	Percent Wetlands and Waters	Percent Study Area
Mixed Forest	Open Mixed Forest	OMF	-	66.60	-	5.0
	Woodland Mixed Forest	WMF	-	10.87	-	0.8
	Total Mixed Forest		**-**	**77.47**	**-**	**5.8**
Shrub	Open Low Willow Shrub	OLWS	1.71	1.71	100.0	0.1
	Open Tall Willow Shrub	OTWS	9.27	9.27	100.0	0.7
	Open Tall Alder Shrub	OTAS	0.61	1.02	59.9	0.1
	Open Tall Alder Willow Shrub	OTAWS	0.72	0.72	100.0	0.1
	Deciduous Shrub and Sapling Regrowth	DSSR	25.38	856.06	3.0	64.1
	Low Shrub Tundra	LST	36.96	39.34	94.0	2.9
	Open Mixed Sedge-Shrub Tundra	OMSST	136.32	136.32	100.0	10.2
	Ericaceous Shrub Bog	ESB	47.47	47.47	100.0	3.6
	Total Shrub		**258.45**	**1,091.92**	**23.7**	**81.7**
Herbaceous	Mesic Herbaceous	MH	-	0.25	-	<0.1
	Wet Herbaceous	WH	11.94	11.94	100.0	0.9
	Total Herbaceous		**11.94**	**12.19**	**98.0**	**0.9**
Land Cover	Barren	BARE	-	4.73	-	0.4
	Total Land Cover		**-**	**4.73**	**-**	**0.4**
Water	Open Water	OW	6.04	6.04	100.0	0.5
	Total Water Cover		**6.04**	**6.04**	**100.0**	**0.5**
Total Study Area				**1,335.79**	**25.2**	**100.0%**

3.2.2 Plant Species

Sixty-one vascular plant species were recorded at WD plots in the study area. No recorded species were threatened or endangered. Although non-native plant species were observed in the road shoulder along the 12 miles of existing roadway - these areas were uplands within the fill prism of the roadway and not sampled during the field effort. No non-native species were recorded in WD plots. The full list of plant species recorded in the field is presented in Appendix B.

4.0 REFERENCES

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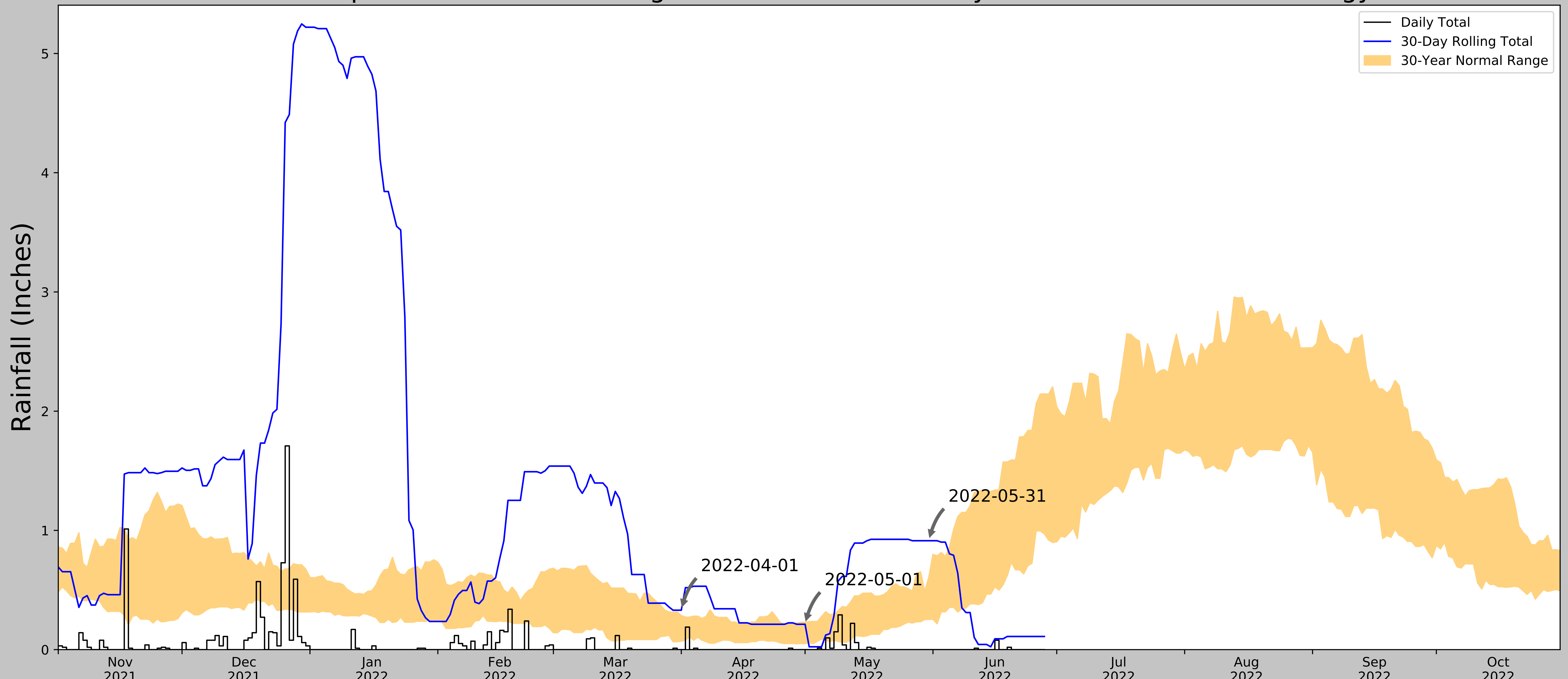
APPENDICES

Appendix A ANTECEDENT PRECIPITATION TOOL

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	64.575, -149.496
Observation Date	2022-05-31
Elevation (ft)	445.82
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

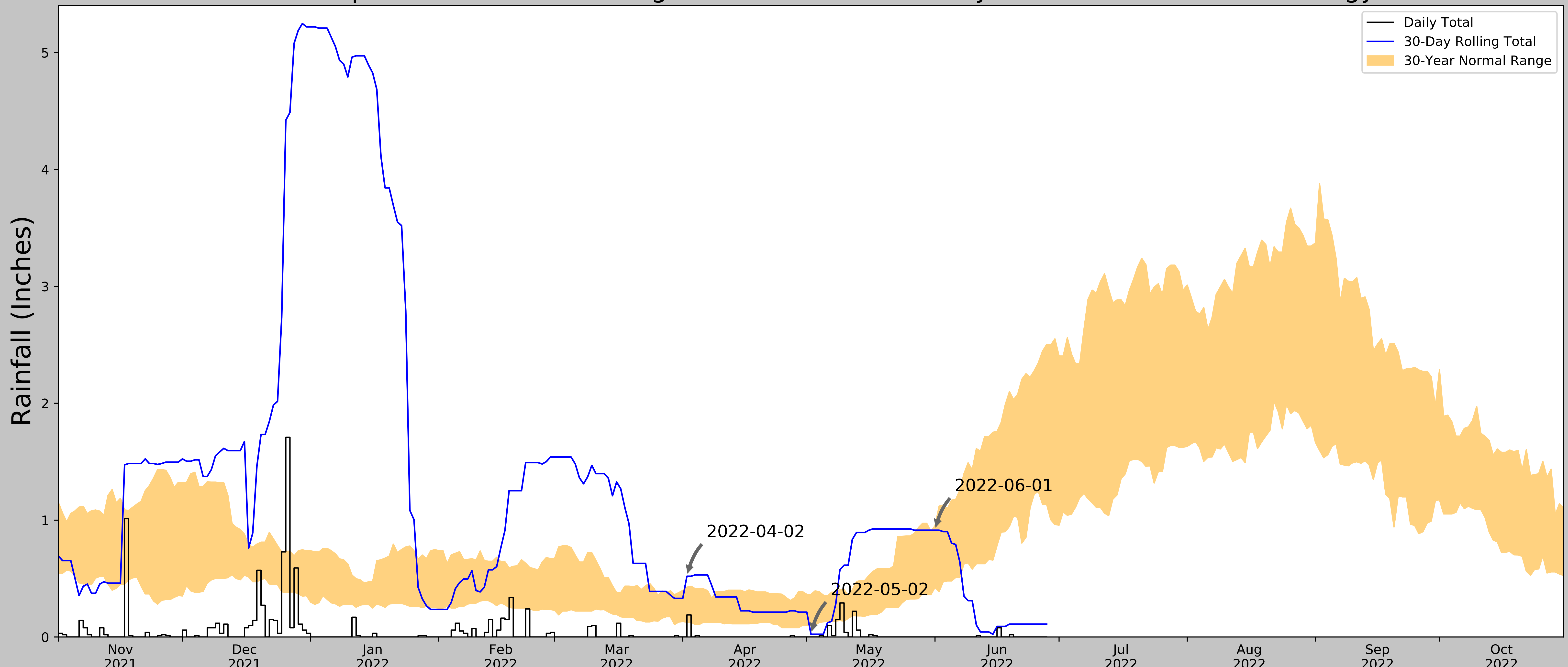
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-05-31	0.254724	0.609449	0.913386	Wet	3	3	9
2022-05-01	0.051181	0.229134	0.212598	Normal	2	2	4
2022-04-01	0.070866	0.28622	0.330709	Wet	3	1	3
Result							Wetter than Normal - 16

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
NENANA MUNI AP	64.55, -149.0717	359.908	12.71	85.912	6.811	10948	90
CLEAR 4 N	64.3547, -149.0436	495.079	13.52	135.171	7.912	31	0
ANDERSON	64.3458, -149.1947	509.843	14.577	149.935	8.745	51	0
CLEAR SKY	64.2453, -149.1828	645.997	21.312	286.089	15.688	43	0
FAIRBANKS INTL AP	64.8039, -147.8761	432.087	39.448	72.179	20.599	280	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	64.575, -149.496
Observation Date	2022-06-01
Elevation (ft)	445.82
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

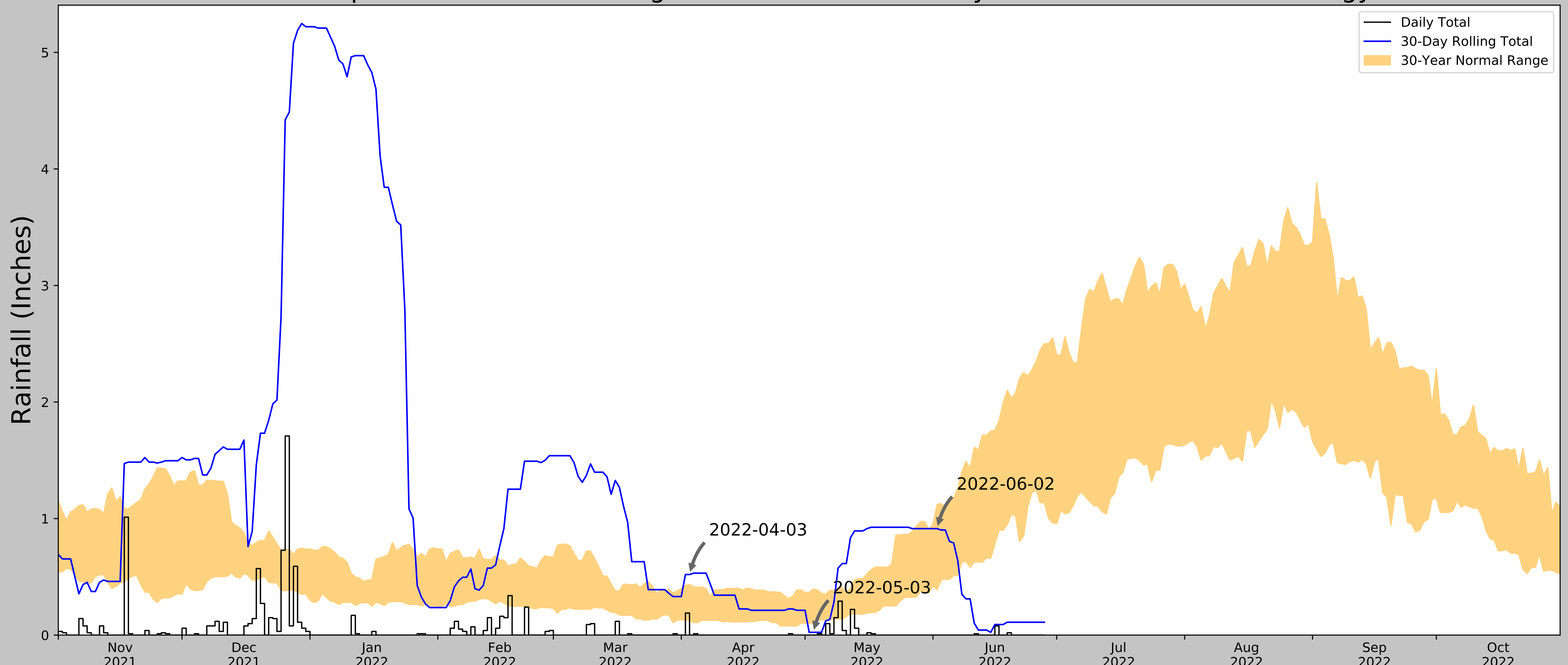
30 Days Ending	30th %ile (in)	70th %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-01	0.424016	0.951969	0.913386	Normal	2	3	6
2022-05-02	0.101969	0.364961	0.023622	Dry	1	2	2
2022-04-02	0.126378	0.425984	0.519685	Wet	3	1	3
Result							Normal Conditions - 11

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
ANDERSON	64.3458, -149.1947	509.843	18.203	64.023	9.357	1291	0
CLEAR 4 N	64.3547, -149.0436	495.079	20.328	49.259	10.149	315	0
CLEAR SKY	64.2453, -149.1828	645.997	24.623	200.177	16.009	3962	0
KOBE HILL	64.1942, -149.4314	799.869	26.381	354.049	21.212	2898	0
NENANA MUNI AP	64.55, -149.0717	359.908	12.71	85.912	6.811	2657	90
FAIRBANKS 5.7 N	64.9186, -147.6304	996.063	59.894	550.243	59.909	3	0
CRESTLINE	64.9239, -147.665	1120.079	59.103	674.259	66.447	119	0
COLLEGE 5 NW	64.925, -147.8803	978.018	53.406	532.198	52.455	108	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	64.575, -149.496
Observation Date	2022-06-02
Elevation (ft)	445.82
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

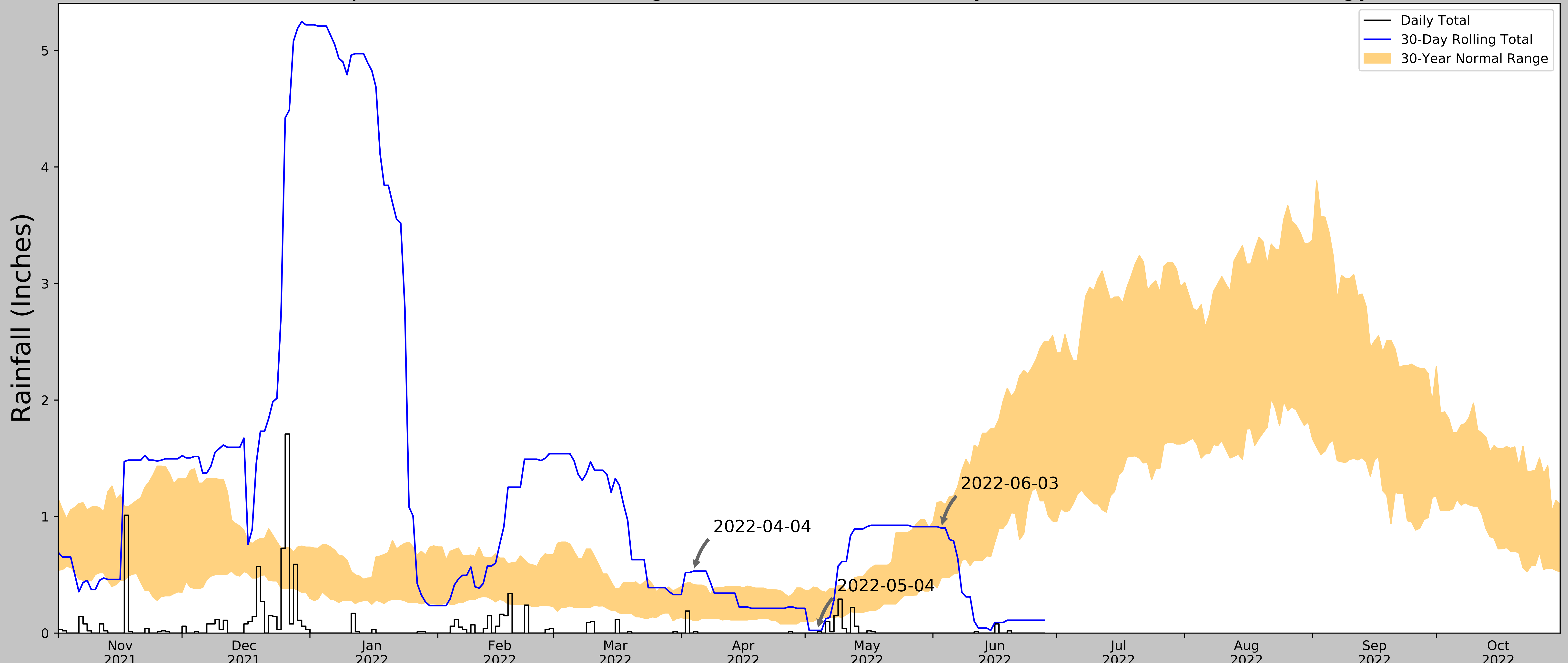
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-02	0.38937	1.120079	0.913386	Normal	2	3	6
2022-05-03	0.101969	0.394488	0.023622	Dry	1	2	2
2022-04-03	0.126378	0.434252	0.519685	Wet	3	1	3
Result							Normal Conditions - 11

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
ANDERSON	64.3458, -149.1947	509.843	18.203	64.023	9.357	1291	0
CLEAR 4 N	64.3547, -149.0436	495.079	20.328	49.259	10.149	315	0
CLEAR SKY	64.2453, -149.1828	645.997	24.623	200.177	16.009	3962	0
KOBE HILL	64.1942, -149.4314	799.869	26.381	354.049	21.212	2898	0
NENANA MUNI AP	64.55, -149.0717	359.908	12.71	85.912	6.811	2657	90
FAIRBANKS 5.7 N	64.9186, -147.6304	996.063	59.894	550.243	59.909	3	0
CRESTLINE	64.9239, -147.665	1120.079	59.103	674.259	66.447	119	0
COLLEGE 5 NW	64.925, -147.8803	978.018	53.406	532.198	52.455	108	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	64.575, -149.496
Observation Date	2022-06-03
Elevation (ft)	445.82
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

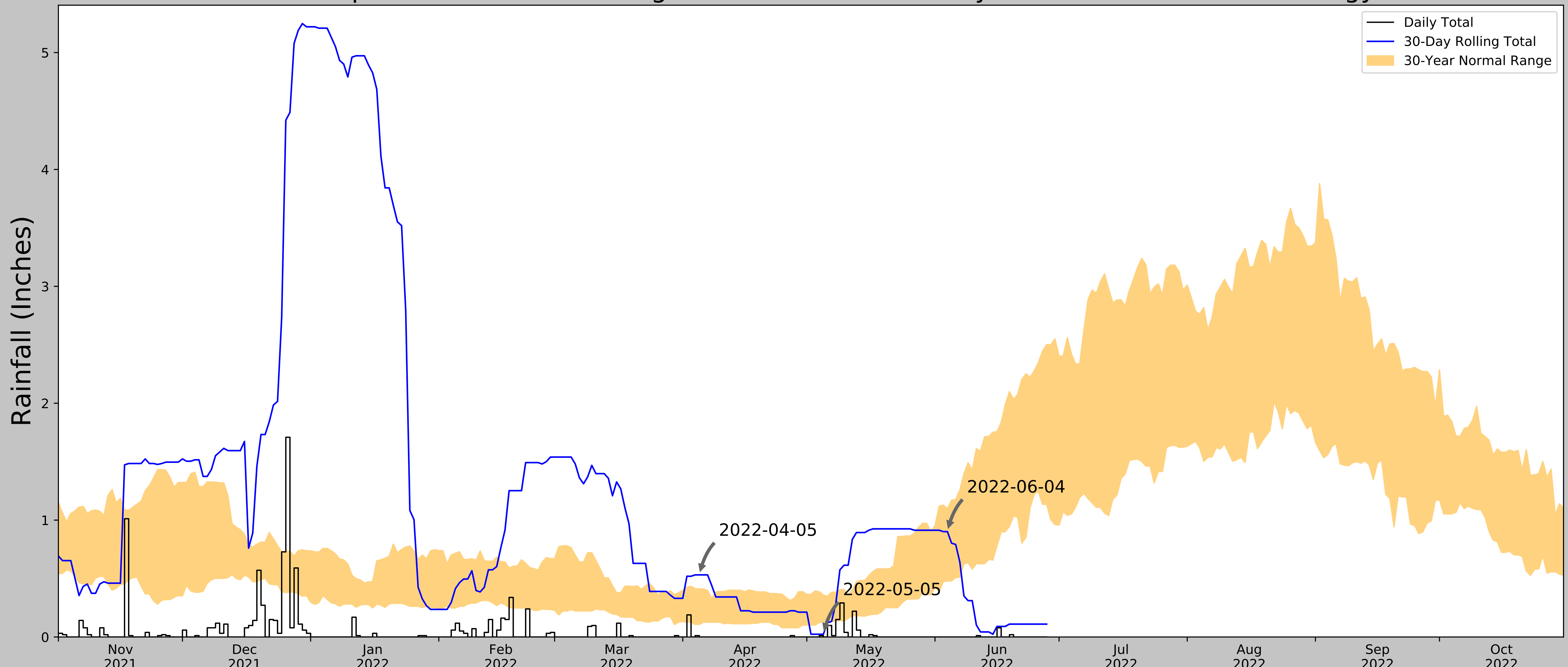
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-03	0.474016	1.128346	0.901575	Normal	2	3	6
2022-05-04	0.124016	0.387008	0.023622	Dry	1	2	2
2022-04-04	0.10748	0.41378	0.531496	Wet	3	1	3
Result							Normal Conditions - 11

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
ANDERSON	64.3458, -149.1947	509.843	18.203	64.023	9.357	1291	0
CLEAR 4 N	64.3547, -149.0436	495.079	20.328	49.259	10.149	315	0
CLEAR SKY	64.2453, -149.1828	645.997	24.623	200.177	16.009	3962	0
KOBE HILL	64.1942, -149.4314	799.869	26.381	354.049	21.212	2898	0
NENANA MUNI AP	64.55, -149.0717	359.908	12.71	85.912	6.811	2657	89
FAIRBANKS 5.7 N	64.9186, -147.6304	996.063	59.894	550.243	59.909	3	1
CRESTLINE	64.9239, -147.665	1120.079	59.103	674.259	66.447	119	0
COLLEGE 5 NW	64.925, -147.8803	978.018	53.406	532.198	52.455	108	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	64.575, -149.496
Observation Date	2022-06-04
Elevation (ft)	445.82
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

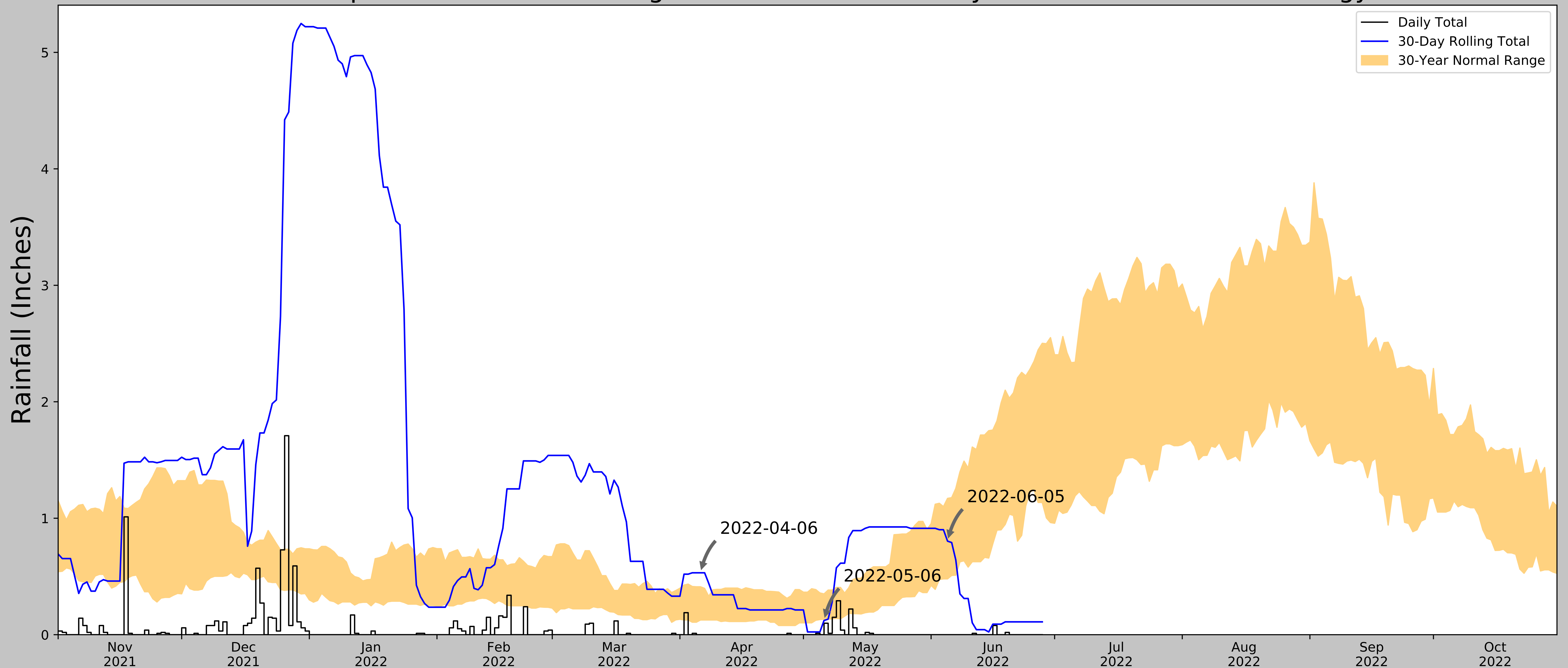
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-04	0.479528	1.099606	0.901575	Normal	2	3	6
2022-05-05	0.130315	0.358268	0.023622	Dry	1	2	2
2022-04-05	0.10748	0.411417	0.531496	Wet	3	1	3
Result							Normal Conditions - 11

Figure and tables made by the **Antecedent Precipitation Tool** Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
ANDERSON	64.3458, -149.1947	509.843	18.203	64.023	9.357	1291	0
CLEAR 4 N	64.3547, -149.0436	495.079	20.328	49.259	10.149	315	0
CLEAR SKY	64.2453, -149.1828	645.997	24.623	200.177	16.009	3962	0
KOBE HILL	64.1942, -149.4314	799.869	26.381	354.049	21.212	2898	0
NENANA MUNI AP	64.55, -149.0717	359.908	12.71	85.912	6.811	2657	89
FAIRBANKS 5.7 N	64.9186, -147.6304	996.063	59.894	550.243	59.909	3	1
CRESTLINE	64.9239, -147.665	1120.079	59.103	674.259	66.447	119	0
COLLEGE 5 NW	64.925, -147.8803	978.018	53.406	532.198	52.455	108	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	64.575, -149.496
Observation Date	2022-06-05
Elevation (ft)	445.82
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-05	0.479528	1.170472	0.80315	Normal	2	3	6
2022-05-06	0.133858	0.35	0.122047	Dry	1	2	2
2022-04-06	0.126378	0.411417	0.531496	Wet	3	1	3
Result							Normal Conditions - 11

Figure and tables made by the
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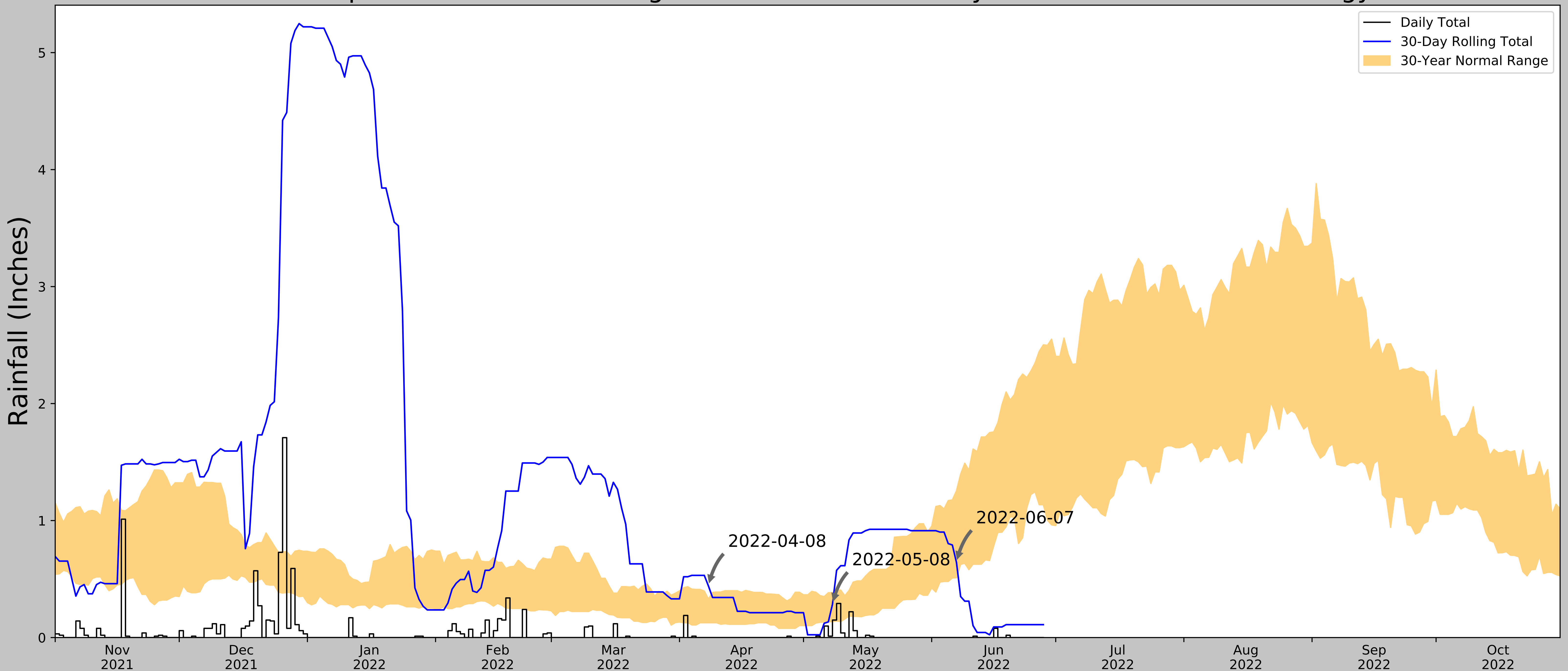
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
ANDERSON	64.3458, -149.1947	509.843	18.203	64.023	9.357	1291	0
CLEAR 4 N	64.3547, -149.0436	495.079	20.328	49.259	10.149	315	0
CLEAR SKY	64.2453, -149.1828	645.997	24.623	200.177	16.009	3962	0
KOBE HILL	64.1942, -149.4314	799.869	26.381	354.049	21.212	2898	0
NENANA MUNI AP	64.55, -149.0717	359.908	12.71	85.912	6.811	2657	89
FAIRBANKS 5.7 N	64.9186, -147.6304	996.063	59.894	550.243	59.909	3	1
CRESTLINE	64.9239, -147.665	1120.079	59.103	674.259	66.447	119	0
COLLEGE 5 NW	64.925, -147.8803	978.018	53.406	532.198	52.455	108	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	64.575, -149.496
Observation Date	2022-06-07
Elevation (ft)	445.82
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

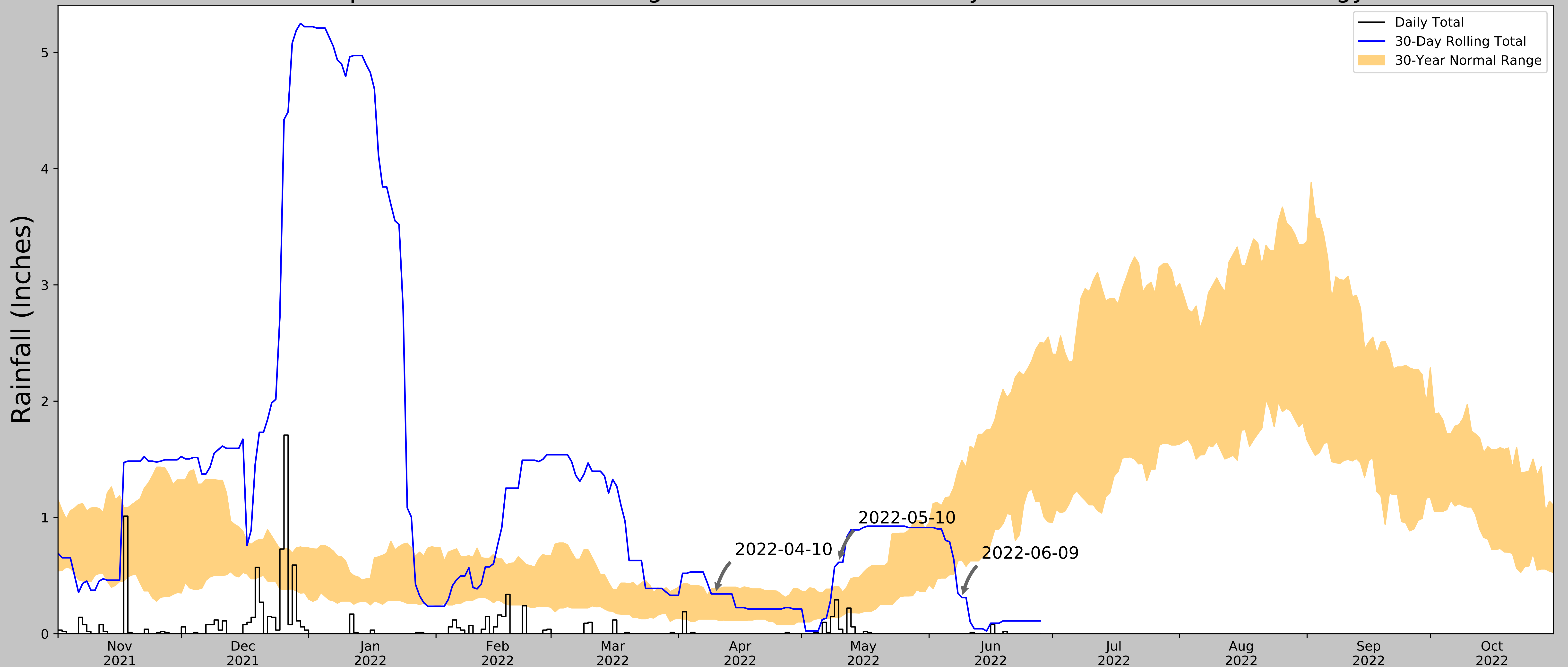
30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-07	0.511417	1.255906	0.641732	Normal	2	3	6
2022-05-08	0.136614	0.383071	0.283465	Normal	2	2	4
2022-04-08	0.126378	0.329528	0.440945	Wet	3	1	3
Result							Normal Conditions - 13

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
ANDERSON	64.3458, -149.1947	509.843	18.203	64.023	9.357	1291	0
CLEAR 4 N	64.3547, -149.0436	495.079	20.328	49.259	10.149	315	0
CLEAR SKY	64.2453, -149.1828	645.997	24.623	200.177	16.009	3962	0
KOBE HILL	64.1942, -149.4314	799.869	26.381	354.049	21.212	2898	0
NENANA MUNI AP	64.55, -149.0717	359.908	12.71	85.912	6.811	2657	89
FAIRBANKS 5.7 N	64.9186, -147.6304	996.063	59.894	550.243	59.909	3	1
CRESTLINE	64.9239, -147.665	1120.079	59.103	674.259	66.447	119	0
COLLEGE 5 NW	64.925, -147.8803	978.018	53.406	532.198	52.455	108	0

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	64.575, -149.496
Observation Date	2022-06-09
Elevation (ft)	445.82
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2022-06-09	0.635039	1.490158	0.311024	Dry	1	3	3
2022-05-10	0.136614	0.405512	0.614173	Wet	3	2	6
2022-04-10	0.126378	0.388976	0.34252	Normal	2	1	2
Result							Normal Conditions - 11

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

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U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
ANDERSON	64.3458, -149.1947	509.843	18.203	64.023	9.357	1291	0
CLEAR 4 N	64.3547, -149.0436	495.079	20.328	49.259	10.149	315	0
CLEAR SKY	64.2453, -149.1828	645.997	24.623	200.177	16.009	3962	0
KOBE HILL	64.1942, -149.4314	799.869	26.381	354.049	21.212	2898	0
NENANA MUNI AP	64.55, -149.0717	359.908	12.71	85.912	6.811	2657	89
FAIRBANKS 5.7 N	64.9186, -147.6304	996.063	59.894	550.243	59.909	3	1
CRESTLINE	64.9239, -147.665	1120.079	59.103	674.259	66.447	119	0
COLLEGE 5 NW	64.925, -147.8803	978.018	53.406	532.198	52.455	108	0

Appendix B PLANT LIST

Plants recorded in the study area during wetland field work in 2022 are presented in the table.

Indicator status abbreviations are as follows:

- OBL: Obligate Wetland Plants (Almost always occur in wetlands)
- FACW: Facultative Wetland Plants (Usually occur in wetlands, but may occur in non-wetlands)
- FAC: Facultative Plants (Occur in wetlands and non-wetlands)
- FACU: Facultative Upland Plants (Usually occur in non-wetlands, but may occur in uplands)
- UPL: Upland Plants (Almost always occur in non-wetlands)
- NL: Not listed in the National Wetland Plant List (Assigned a status of UPL)
- N/A: Not applicable (Applies to unkeyed plants listed by Genus or larger group)

Latin name, common name, and indicator status rating are from the National Wetland Plant List (USACE 2020a).

Trees

Latin Name	Common Name	Indicator Status Rating
Betula neoalaskana	Alaska Paper Birch	FACU
Picea glauca	White Spruce	FACU
Picea mariana	Black Spruce	FACW
Populus tremuloides	Quaking Aspen	FACU

Saplings/Shrubs

Latin Name	Common Name	Indicator Status Rating
Alnus incana	Speckled Alder	FAC
Alnus viridis	Sitka Alder	FAC
Andromeda polifolia	Bog-Rosemary	FACW
Arctous ruber	Red Torpedoberry	FAC
Arctostaphylos uva-ursi	Red Bearberry	UPL
Betula glandulosa	Resin Birch	FAC
Betula nana	Swamp Birch	FAC
Betula neoalaskana	Alaska Paper Birch	FACU
Chamaedaphne calyculata	Leatherleaf	FACW
Dasiphora fruticosa	Golden-Hardhack	FAC
Larix laricina	American Larch	FACW
Linnaea borealis	American Twinflower	FACU
Picea mariana	Black Spruce	FACW
Populus balsamifera	Balsam Poplar	FACU
Populus tremuloides	Quaking Aspen	FACU

Appendix B Plant List

Latin Name	Common Name	Indicator Status Rating
Rhododendron groenlandicum	Rusty Labrador-Tea	FAC
Rhododendron tomentosum	Marsh Labrador-Tea	FACW
Rosa acicularis	Prickly Rose	FACU
Salix alaxensis	Felt-Leaf Willow	FAC
Salix arbusculoides	Little-Tree Willow	FACW
Salix bebbiana	Gray Willow	FAC
Salix fuscescens	Alaska Bog Willow	FACW
Salix pulchra	Diamond-Leaf Willow	FACW
Salix scouleriana	Scouler's Willow	FAC
Shepherdia canadensis	Russet Buffalo-Berry	FACU
Vaccinium oxycoccos	Small Cranberry	OBL
Vaccinium uliginosum	Alpine Blueberry	FAC
Vaccinium vitis-idaea	Northern Mountain-Cranberry	FAC
Viburnum edule	Squashberry	FACU

Herbs

Latin Name	Common Name	Indicator Status Rating
Anticlea elegans	Mountain False Deathcamas	FACU
Calamagrostis canadensis	Bluejoint	FAC
Carex aquatilis	Leafy Tussock Sedge	OBL
Carex bigelowii	Bigelow's Sedge	FAC
Carex rariflora	Loose-Flower Alpine Sedge	OBL
Carex vaginata	Sheathed Sedge	OBL
Chamaenerion angustifolium	Narrow-Leaf Fireweed	FACU
Comarum palustre	Purple Marshlocks	OBL
Coptidium lapponicum	-	OBL
Cornus canadensis	Canadian Bunchberry	FACU
Cypripedium passerinum	Sparrow-Egg Lady's-Slipper	FAC
Diphasiastrum complanatum	Trailing Creeping-Cedar	FACU
Equisetum arvense	Field Horsetail	FAC
Equisetum fluviatile	Water Horsetail	OBL
Equisetum scirpoides	Dwarf Scouring-Rush	FACU
Eriophorum vaginatum	Tussock Cotton-Grass	FACW
Festuca altaica	Rough Fescue	FAC
Geocaulon lividum	False Toadflax	FACU
Iris setosa	Beach-Head Iris	FAC
Lupinus arcticus	Arctic Lupine	FACU
Lycopodium clavatum	Running Ground-Pine	FACU

Appendix B Plant List

Mertensia paniculata	Tall Bluebells	FACU
Orthilia secunda	Sidebells	FACU
Pedicularis labradorica	Labrador Lousewort	FACW
Pyrola asarifolia	Pink Wintergreen	FACU
Rubus chamaemorus	Cloudberry	FACW
Spinulum annotinum	Interrupted Club-Moss	FACU
Stellaria calycantha	Northern Bog Starwort	FACW
Tofieldia coccinea	Scotch Featherling	FAC
Trichophorum cespitosum	Tufted Leafless-Bulrush	OBL

Appendix C FIELD DATA FORMS AND PHOTOS

Appendix D WETLANDS AND WATERS DETAIL FIGURES

Appendix E VEGETATION DETAIL FIGURES