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JBER Field Report

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Introduction

Joint Base Elmendorf-Richardson (JBER) is a 321,667 acre military installation in Anchorage, Alaska. The installation spans multiple ecozones ranging from the tidal waters of Cook Inlet to the alpine environment of the Chugach Mountains. The average annual temperature is 37.6 degrees F and the average annual precipitation is 16.42 inches. The average annual snowfall is 77.9 inches. The geomorphology of the area is a glacial driven system and evidence of the last glacial period is readily observed in the field in the form of eskers, glacial till and erratic boulders. Water plays a significant role in the landscape as the numerous small streams and rivers move water from the alpine to the ocean, and expansive wetland complexes store water in the soil and vegetation.

The United States Air Force (USAF) initiated this project to update JBER's wetland database using the National Wetland Inventory (NWI) standards. The NWI is the National Geospatial Data Asset for wetlands maintained by the U.S. Fish and Wildlife Service (USFWS). The NWI is completed in accordance with Federal Geographic Data Committee (FGDC) standards for classification and mapping. It is valuable to JBER to maintain consistency between internal JBER and public NWI systems. Once the project is complete, the data will be coincident in both systems.

Procedures

The FGDC classification and mapping standards (FGDC 2009, FGDC 2013) characterize three indicators to determine wetland status of an area: Vegetation, soils, and hydrology. Field work correlates ground conditions with imagery signatures to accurately map wetlands at a specific scale or Target Mapping Unit (TMU). The TMU for this project is .25 acres. Common references to support field identification of soil, hydrology, and vegetation included *Field Indicators of Hydric Soils in the United States* (USDA NRCS 2018), *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0)* (USACE 2007), *Plants of the Pacific Northwest Coast* (Pojar 2004), *Alaska Trees and Shrubs* (Viereck 2007), and *The National Wetland Plant List: 2018*.

Field work occurred from June through September 2022. There were five team members who traveled to the field in varying groups of two to five. The groups conducted field work to assess the wetland status of 129 different sites. Field sites were selected based on a variety of characteristics including validating expected wetland characteristics, unclear or complicated photo signatures, and redundancy. Field information clarifies which signatures correspond to different types of wetlands and uplands. Prior to mapping the entire installation, the team will use this information to develop a signature library to reference throughout the mapping process.

Vegetation is a very important component of field evaluation. Across JBER, vegetative cover often reaches or exceeds 100% and therefore image signatures will be tied directly to the vegetation that is visible in the imagery. Wetland plants are categorized using indicator ratings of OBL, FACW, FAC, or FACU. These are defined by the US Army Corps of Engineers (Lichvar 2012) 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 wetlands.

Field Preparation

There are many known ecosystems across the JBER installation that exhibit soils, vegetation and hydrology that can be difficult to tie directly to a wetland indicator. These complicated sites include black spruce (*Picea mariana* [FCW]) wetlands and woodlands, areas with gradual elevation changes, complex upland-wetland mosaics, alpine swales, and fields of bluejoint grass (*Calamagrostis canadensis* [FAC]).

Field preparation activities focused on selecting field sites and reviewing existing information about JBER wetlands. The team consolidated and reviewed previously collected data and reports, aerial and satellite imagery, and LiDAR data including:

- 448 field points collected with USACE methods spanning 1995-2019
- 15 cm resolution multi-spectral imagery collected in 2021
- .15 m resolution LiDAR imagery collected in 2021
- Legacy NWI data
- Existing JBER Wetlands Inventory

After reviewing the available information, field sites were identified throughout the installation. The sites were identified based on a variety of characteristics including complicated habitats (mentioned above), unclear image signatures, obvious wetlands, obvious uplands, and redundancy. Numerous bluejoint grass sites with the same photo signatures but different topographic or association characteristics were selected to determine if they were emergent wetlands, disturbed and reseeded areas, or simple gaps in upland forest cover. Numerous locations with spruce signatures were prioritized because of prior knowledge that black spruce (*Picea mariana* [FCW]) occurs in wetlands and uplands, and black and white spruce woodlands can be difficult to distinguish in imagery. Overall, the goal of site selection was to identify an adequate sample of habitat varieties across the installation to ensure mapping could be accurately completed at the .25 acre TMU.

The team used ESRI's Field Maps, GeoPortal, and ArcGIS Pro software to collect and manage data, and create maps. A map of JBER was created in GeoPortal with reference layers (such as current NWI and JBER delineations) and downloaded as an offline map to ESRI Field Maps on an iPad. The map included a layer for data entry, which the team used to add field data points with attributes for NWI Code, Dominant Vegetation, Soil Characteristics, Hydrology Characteristics, Additional Notes, and Photos. The app also automatically recorded GPS location and the date for each point.

After data points were collected, they were either synced to the online map in GeoPortal (and later downloaded to a PC) or transferred to a PC directly from the iPad at regular intervals. Eventually, all field data were located on a PC. At this point, GeoPortal and Field Maps were no longer needed, and a separate map was created in ArcGIS Pro for data processing and management. Here, all field data were consolidated into one geodatabase with their original attributes, including Photos. This map is where future delineation will take place.

Field Activities

Field work began on June 6th, 2022 and ended on September 13, 2022. JBER is a military installation with controlled access. All personnel working on this project needed to be registered and granted access for field activities. JBER is made up of many training areas (TAs) that require special advanced

permission to access, and one “Cantonment Area” that does not require advanced authorization. TAs are used for military exercises which are restricted from civilians, so they must be reserved at least 30 days in advance for field work. Some areas were never accessible, such as the Eagle River Flats. Difficulty of access to TAs occasionally altered field plans, from rescheduling specific field point visits to removing a field point entirely. Additionally, the team was required to complete hazard trainings and Safety Awareness in Bear Country training before travelling on the installation.

The team generally completed two days of field work each week. At each site, the team travelled to the area and to observe dominant vegetation, hydrology, and surface soil conditions. Complex or unknown vegetation and soils were sometimes further investigated using references or a soil probe to evaluate conditions in the top 10-20 inches of the soil profile.

Data were collected at 78 distinct sites. For most sites, data was successfully entered into the field maps application. The NWI code was taken as preliminary assessment that would be reviewed and revised later during mapping and quality control. Dominant Vegetation recorded species present in larger than trace amounts, with some comments on general presence of wetland or upland vegetation based on wetland indicator status and professional judgement, in cases of morphological adaptation. Soil Characteristics recorded the organic content of the soils and other hydric soil indicators. Hydrology recorded hydrology indicators such as tussocking, waterways, presence of a water table and water-stained leaves.

Weather conditions in the Anchorage area can vary widely and bring challenges to field activities. Anchorage weather at the start of 2022 and throughout the field season did not align closely with average conditions. The first few months (January-March) of 2022 brought above normal snow depths and temperatures to the Anchorage area. May and June of 2022 were unseasonably warm with numerous high temperatures over 70 degrees and below average precipitation (ACRC 2022, NWS 2022). In the second week of July, there was a sudden shift to cooler and wetter conditions. This brought above normal precipitation and below normal temperatures. The late season snowpack, above average high temperatures and unprecedented midsummer precipitation presented unique challenges in determining average hydrologic conditions at numerous sites.

Field data processing was dynamic throughout the season because of technical issues. Data was processed using the FWS GeoPortal and direct hardwire download from the iPad. Eventually, using ArcGIS Pro, all field data were consolidated into a single geodatabase.

Summary

383 data points were collected over the field season making up 78 distinct sites. Several types of sites were identified or verified as difficult to classify: Fields of bluejoint grass, mature spruce stands, mosaicked areas with strong upland and wetland characteristics, areas with treefall from past weather events, alpine swales, and areas with slight gradients of elevation. However, most wetlands have consistent characteristics that are easily photo interpreted.

Due to lack of access, estuarine features were not observed in the field, so NWI delineations will rely on professional judgement supported by imagery and ancillary data.

Bluejoint grass fields

Bluejoint grass fields are difficult to classify from imagery alone because the plant can grow equally well in wetland and upland environments. Classification relies on the presence of hydrology and soil indicators; the most frequently noted were saturation or standing water, tussocking, evidence of watercourses, and organic soils. Some sites had dry soils and minimal hydrology, while others were clearly saturated with organic soils. Landscape and association are good references for classification; bluejoint grass fields in depressions could consistently be classified as wetlands, as well as those adjacent to or connecting other wetland types. Grass fields on elevation gradients will require close inspection of available data to determine the proper wetland boundary.

Representative field sites include 9, 48, 103, 109, and 113.

Spruce stands

Spruce stands were found in a variety of landscape positions and plant associations. These ranged from depressions to steep slopes. These include:

- stunted (scrubby) black spruce adjacent to bogs/fens (Sites 57, 94)
- healthy black spruce trees (Sites 112, 94)
- mixed stands of black and white spruce (*Picea glauca* [FCU]) trees (Sites 92, 73)
- stands of white spruce killed by spruce beetles (Sites 110, 91), and
- stands of spruce mixed with deciduous trees (Site 88).

Black spruce without other trees present were more commonly identified as wetlands. Mixed stands of black and white spruce, mixed stands of spruce and deciduous trees, or robust white spruce stands were identified as uplands. Stunted black spruce stands adjacent to bogs/fens were confidently identified as wetlands due to the obvious hydrology present. More robust black spruce and higher densities of white spruce implied drier conditions. Even with general guidelines for discerning dominant spruce characteristics, spruce forests could be difficult to classify as wetland or upland based on the following characteristics:

- Microtopography that included wetland vegetation and soils in the depressions, and upland characteristics in the rises
- A restrictive layer (which could include seasonal frost, bedrock or fine soil texture) with organic soils above and dry soils below
- An elevation gradient with no distinct boundary of wetland and upland

The presence of robust birch forests will be considered an upland indicator.

Mosaics

Mosaics are areas where both wetland and upland characteristics are present. The team encountered two types of mosaics. In one type, prior treefall created areas cross-hatched with old logs over boot-topping saturation. Upland vegetation such as dwarf dogwood (*Cornus canadensis* [FCU]) grew on the logs and stumps amidst large puddles of water. The other type of mosaic included more minor puddles or pockets of water-stained leaves scattered throughout deciduous forest.

The cross-hatched mosaics arise from treefall in landforms that encourage inundation, such as depressions or toe slopes. The presence of upland vegetation differentiates the photo signature from areas with only wetland vegetation, but inundation is visible in the imagery along with landscape clues. These will be considered wetland signatures.

The upland forest mosaics were associated with more minor depressional landforms or more gradual slopes. The photo signature alone shows a dominance of healthy upland vegetation with minor openings that are potentially inundated. These pockets do not have the frequency or connectivity to meet the TMU. These will be considered upland signatures.

Site 70 is an example of a cross-hatched mosaic and site 13 is an example of an upland forest mosaic.

Windthrow

There are large upland areas on base, particularly in the northeast corner, where trees were knocked over in large wind events. In the field, they were clearly upland, but the treefall created signatures that mimic the signatures of wetlands between forest cover. Digital mapping will rely on close investigation of high-resolution imagery for the presence of fallen logs, analysis of topography in open pockets, and comparison to past imagery where available.

Alpine Swales

Alpine swales are difficult areas to classify remotely. Wetland swales often occur on slopes with microtopography that may not be captured in the elevation data used in the GIS. Furthermore, the subtle differences in the vegetation communities are difficult to observe even with high resolution imagery. Many alpine swale wetlands also fall below the target mapping unit of this project.

Of note, there were also many unmapped pockets of standing water in the alpine.

Site 124 is an example of an alpine site.

Bogs and Fens

Bogs and fens are the easiest wetlands to identify. They often have a central pocket of inundation or saturation surrounded by a gradient of emergent obligate vegetation (*Drosera spp.* [OBL], *Carex spp.* [FCW/OBL]) with a sphagnum mat understory to wetland scrubs (*Betula nana* [FAC], *Andromeda polifolia* [FCW], *Chamaedaphne calyculata* [FCW], *Myrica gale* [OBL], etc.) with a sphagnum mat understory to bluejoint grass or forest. Site visits to these areas confirmed the borders between steps of the gradient, particularly between emergent and scrub vegetation.

While bogs and fens have different technical definitions (US EPA 2022), they are lumped together here because they share NWI codes when mapped as wetland complexes.

Sites 50 and 57 are examples of bog or fen complexes.

Rivers

Riverine field site visits documented bare and vegetated areas immediately adjacent to the river to determine water regime and wetland status. Some physical phenomena were documented as either current or historical altered watercourses. Vegetated areas immediately adjacent to the rivers were

often upland, dominated by devil's club (*Oplopanax horridus* [FCU]), paper birch (*Betula papyrifera* [FCU]), fireweed (*Chamaenerion angustifolium* [FCU]), etc.

Sites 37, 76, and 31 are examples of riverine sites.

Upland

Upland sites include highly disturbed areas, upland scrub, and forest. The first two types of areas were investigated because they were suspicious openings in the forest or alongside roads. Highly disturbed areas included gravel lots or areas used historically for military training. Upland scrub areas resembled bluejoint grass fields in the imagery, but in reality were vegetated with prickly rose (*Rosa acicularis* [FCU]), quaking aspen (*Populus tremuloides* [FCU]) saplings, fireweed, etc. Some open pockets resembled stunted vegetation in the imagery, which indicates wetland, but were actually stunted by browsing moose. Deciduous forest areas were visited to confirm whether birch morphology was present in certain aerial signatures. It was not, and the forests also contained quaking aspen and white spruce which are both upland plant species.

Sites 8 and 90 were disturbed areas, site 52 represents upland scrub, and 49 was deciduous forest.

Future Work

The data will be used to create a signature library that matches NWI wetland codes to photo signatures representative of the sites visited. This library along with ancillary data (LiDAR, USGS soil survey, etc.) will inform updated and new wetland delineations according to NWI standards.

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Appendix

Table of Field Sites with Coordinates

Wetland Type	Field Site	Coordinates
Bluejoint grass field	9	149.6260043°W 61.3609127°N
	48	149.6964672°W 61.3481090°N
	103	149.6344710°W 61.3523257°N
	109	149.6056307°W 61.3854479°N
	113	149.5785816°W 61.3905346°N
Spruce stand (stunted)	57	149.6118751°W 61.3766999°N
Spruce stand (stunted, healthy)	94	149.6627503°W 61.3729074°N
Spruce stand (healthy)	112	149.5797702°W 61.3923451°N
Spruce stand (mixed spruces)	92	149.6977681°W 61.3539249°N
	73	149.5797702°W 61.3923451°N
Spruce stand (beetle kill)	110	149.6064966°W 61.3857984°N
	91	149.7022299°W 61.3471476°N
Spruce stand (deciduous mix)	88	149.6955177°W 61.3207280°N
Mosaic (cross-hatched)	70	149.8707579°W 61.2571782°N

Mosaic (upland forest)	13	149.5781796°W 61.3715744°N
Alpine	124	149.6103356°W 61.1975490°N
Bog/fen complex	50	149.6856122°W 61.3447846°N
	57	149.6113210°W 61.3770169°N
Riverine	37	149.7812212°W 61.2377620°N
	76	149.8225810°W 61.2910273°N
	31	149.6701114°W 61.2302486°N
Upland (disturbed)	8	149.6682188°W 61.3525088°N
	90	149.6894356°W 61.3496505°N
Upland (scrub)	52	149.6699649°W 61.3404386°N
Upland (deciduous forest)	49	149.6917058°W 61.3469665°N