I-405, SR 520 to SR 522 Stage 1 (Kirkland Stage 1) (Forbes Lake West) Mitigation Site

USACE IP 200401410

Northwest Region

2017 MONITORING REPORT

Wetlands Program

Issued March 2018

Washington State Department of Transportation

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I-405, SR 520 to SR 522 Stage 1 (Kirkland Stage 1) (Forbes Lake West) Mitigation Site

**USACE IP 200401410**

<table>
<thead>
<tr>
<th>General Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USACE IP Number</strong></td>
</tr>
<tr>
<td><strong>Mitigation Location</strong></td>
</tr>
<tr>
<td><strong>LLID Number</strong></td>
</tr>
<tr>
<td><strong>Construction Date</strong></td>
</tr>
<tr>
<td><strong>Monitoring Period</strong></td>
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<tr>
<td><strong>Year of Monitoring</strong></td>
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<tr>
<td><strong>Type of Project Impact</strong></td>
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<tr>
<td><strong>Area of Project Impact</strong></td>
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<tr>
<td><strong>Type of Mitigation</strong></td>
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<tr>
<td><strong>Area of Mitigation</strong></td>
</tr>
</tbody>
</table>

1Area of project impact and area of mitigation numbers taken from 2009 February 18 e-mail from Ken Sargent to Tony Bush; unreferenced.

2Additional mitigation is provided by Thrasher’s Corner and Forbes Lake East Mitigation Sites
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Summary of Monitoring Results and Management Activities (2017)

<table>
<thead>
<tr>
<th>Performance Standards (Year-10)</th>
<th>2017 Results</th>
<th>Management Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetland delineation</td>
<td>Wetland delineation occurred on March 14, 2017. See Appendix 3 for delineation report.</td>
<td>Weed control activity occurred on 5/15 and 6/8 in 2017</td>
</tr>
<tr>
<td>80% cover native woody species in the forested and scrub-shrub wetlands; Less than 30% relative cover volunteer red alder (<em>Alnus rubra</em>)</td>
<td>97% cover (CI$_{80%}$ = 95-99%); 14% relative cover red alder</td>
<td></td>
</tr>
<tr>
<td>8% relative cover of three native, non-invasive facultative or wetter plant species in the emergent wetland</td>
<td>Achieved by six species</td>
<td></td>
</tr>
<tr>
<td>10% relative cover of three native, non-invasive facultative or wetter plant species in the forested and scrub-shrub wetland</td>
<td>Achieved by two species; five other species provided between 7-9% relative cover</td>
<td></td>
</tr>
</tbody>
</table>

Report Introduction

This report summarizes final-year (Year 10) monitoring activities at the 405 Forbes Lake West Mitigation Site. Included are a site description, the performance standards, an explanation of monitoring methods, and an evaluation of site success. Monitoring activities included vegetation surveys, photo-documentation, and assessments of wetland hydrology. Vegetation surveys occurred on July 31-August 1, and the delineation occurred on March 14, 2017.
What is the I-405 Forbes Lake West Mitigation Site?
This 2.2-acre mitigation site (Figure 1) was established as partial compensation for impacts to 1.56 of wetland and 2.91 acres of buffer due to road improvements along I-405 between State Route (SR) 520 and SR 522. The site was primarily designed to mitigate for lost wetland habitat functions.

Two other mitigation sites provide additional compensation for project impacts: 405 Forbes Lake East and 405 Thrasher’s corner.

![Figure 1 Site Sketch](image)

The 405 Forbes Lake West Mitigation site is adjacent to Forbes Lake on the southwest shoreline. An emergent area runs from the lakeshore down the center of the site, with a scrub-shrub zone bordering the southern half. The rest of the site is planted as forested wetland except for a small upland buffer area located in the northwestern corner. Appendix 2 includes photo points and site directions.
What are the performance standards for this site?

Year 10 (2017)

Performance Standard 1
Wetland areas will be delineated using methods described in the Washington State Wetlands Identification Manual (Ecology, 1997) to assure that the mitigation site contains at least 1.425 acre of created and enhanced wetland.

Performance Standard 2
After 10 years, aerial cover of native woody species will be at least 80 percent in the forested and scrub-shrub wetlands, of this area no more than 30 percent will be volunteer red alder.

Performance Standard 3
At least three native, non-invasive facultative or wetter plant species will achieve a minimum of eight percent relative cover for each species in the emergent wetland zone by Year 10.

Performance Standard 4
At least three native, non-invasive facultative or wetter plant species will achieve a minimum of 10 percent relative cover for each species in the forested and scrub-shrub wetland zones by Year 10.

Appendix 1 shows the as-built planting plan (Myers 2008).
How were the performance standards evaluated?

A delineation was conducted on March 14, 2017 according to methods described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0) (USACE 2010) (Performance Standard 1).

To evaluate standards for vegetative cover a 115 meter baseline was established through the center of the wetland at 180 degrees (Figure 2). Ten sampling transects were randomly placed perpendicular to the baseline at 12 meter intervals for the PSS and PFO zones (Performance Standards 2 & 4). Due to a small geographic area in the emergent area, a 6 meter interval was used for native herbaceous cover (Performance Standard 3). The cover of noxious and invasive species were estimated qualitatively.

For additional details on the methods, see the [WSDOT Wetland Mitigation Site Monitoring Methods Paper](#) (WSDOT 2008).

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**Figure 2  2017 Sample Design**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>PS 2 &amp; 4</th>
<th>PS 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target population</td>
<td>Native woody species</td>
<td>Herbaceous species</td>
</tr>
<tr>
<td>Zone</td>
<td>PSS/PFO</td>
<td>PEM</td>
</tr>
<tr>
<td>Sample method</td>
<td>Line Intercept</td>
<td>Point Line</td>
</tr>
<tr>
<td>SU length</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Points per SU</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Total # of SU</td>
<td>16</td>
<td>11</td>
</tr>
</tbody>
</table>
Is this site a success?

The 405 Forbes Lake West Mitigation Site is meeting all final-year performance standards that pertain to establishing native plant communities, wetland hydrology, and improved wildlife habitat for small mammals, birds, and amphibians. Dense vegetative communities have developed in the forested and scrub-shrub zones. These communities include an upper tree canopy and a diverse understory of shrubs. In some areas, willow (*Salix*) species are encroaching upon the emergent zone. Nevertheless, a diverse emergent plant community exists with eight different herbaceous species sampled.

Non-native species cover is estimated at five to seven percent cover throughout the site. Reed canarygrass (*Phalaris arundinacea*) and pale yellow iris (*Iris pseudacorus*) have a presence in the wetter parts of the wetland but they are not threatening the native plant community. Small patches of blackberry (*Rubus* species) were present in forested wetland understory. Invasive species management has kept the invasive population low while allowing the native plants to thrive at this site.

The site also provides quality habitat for mammals, with scat and beaver chews observed throughout the site. The landscape position within the Forbes Lake complex provides critical wetland functions within the urbanized environment of Kirkland. These functions include flood attenuation, toxicant removal, and nutrient cycling.

The mitigation site has increased overall wetland acreage, provides a host of wetland functions, and meets all goals outlined in the mitigation plan.
Results for Performance Standard 1
(Wetland Hydrology)

WSDOT delineated the site on March 14, 2017 (Photo 1). See Appendix 3 for full delineation report.

Results for Performance Standard 2
(80% cover woody species in the forested and scrub-shrub wetlands; Less than 30% relative cover volunteer red alder):

Cover of native woody species is estimated at 97% (CI$_{80\%} =$ 95-99%). This exceeds the performance standard target. The site has established two distinct layers of woody vegetation. A canopy of black cottonwood (*Populus balsamifera*) and red alder with a mixed understory of shrubs and conifers (Photo 2). Relative cover of red alder is estimated at 14 percent, which is below the performance standard threshold.
Results for Performance Standard 3
(8% relative cover of at least three native, non-invasive facultative or wetter plant species in the emergent wetland):

Six herbaceous species provide eight percent or more relative cover (Photo 3). These include hardstem bulrush (*Schoenoplectus acutus*), soft rush (*Juncus effusus*), broadleaf cattail (*Typha latifolia*), slough sedge (*Carex obnupta*), small-fruited bulrush (*Scirpus microcarpus*), and lakeshore sedge (*Carex lenticularis*).

Results for Performance Standard 4
(10% relative cover of three native, non-invasive facultative or wetter plant species in the forested and scrub-shrub wetland):

Red alder and Pacific ninebark (*Physocarpus capitatus*), achieved 14 and 25 percent relative cover, respectively. Oregon ash (*Fraxinus latifolia*), nootka rose (*Rosa nutkana*), black cottonwood (*Populus balsamifera*), Scoulers willow (*Salix scouleriana*), and Sitka spruce (*Picea sitchensis*) all had between seven and nine percent relative cover.

What is planned for this site?
Routine weed control will continue until the permits for this site are closed. After closure, the City of Kirkland will maintain the mitigation site in perpetuity.
Appendix 1 – As-built Planting Plan with Photo Point and Hydrology Pit Locations

(Myers 2008)
Appendix 2 – Photo Points

The photographs below were taken from permanent photo-points on August 1, 2017 and document summer site conditions.

Photo Point 1a

Photo Point 1b

Photo Point 1c

Photo Point 2a
Driving Directions:
Take I-405 north from Bellevue. Exit at Northeast 85th Street. At the end of the ramp turn right and head east. At the third intersection, turn left and travel north on 124 Street Northeast. Turn left on 97th Street and then left again at Slater Avenue. Follow Slater Avenue to the end and park at the cul-de-sac. Walk down the paved path, between the last house on the left side of the road and the retirement home at the end of the cul-de-sac to the site.
Appendix 3 – Delineation Report
405 Forbes Lake West Mitigation Site

I-405, SR 520 to SR 522 Stage 1 (Kirkland Stage 1)
USACE IP 200401410
Ecology WQC Order 2547

King County, Washington

Prepared by:
Kristen Andrews
WSDOT Environmental Services Office
Olympia, Washington

October 23, 2017
Introduction

This report was prepared by the Washington State Department of Transportation (WSDOT) to describe the wetland boundary delineation for the 405 Forbes lake West Mitigation Site. Field work was conducted by WSDOT wetland biologists Tatiana Dreisbach and Kristen Andrews, on March 14, 2017. The delineation identifies 2.47 acres of wetland within the mitigation site boundaries.

### General Information for the 405 Forbes Lake West Mitigation Site

<table>
<thead>
<tr>
<th>Location</th>
<th>USACE IP Number</th>
<th>Long./Lat. ID Number</th>
<th>Land Resource Region (LRR)</th>
<th>Major Land Resource Area (MLRA)</th>
<th>Construction Date</th>
<th>Monitoring Period</th>
<th>Year of Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>S4, T25N, R5E. King County. (Vicinity map, Figure 1)</td>
<td>200401410</td>
<td>1221811476844</td>
<td>A</td>
<td>2</td>
<td>2008</td>
<td>2008-2017</td>
<td>10 of 10 (in 2017)</td>
</tr>
</tbody>
</table>

| Area of Project Impact\(^1\) | 1.84 acres     |
| Type of Mitigation            | Required Acreage\(^1\) | 2017 Delineated Acreage |
| Establishment                 | 0.536           | 0.42                 |
| Enhancement                   | 0.72            |                      |
| Totals                        | 0.536\(^2\)     | 1.14                 |

**Total Delineated Wetland Area**

In addition to 0.42 acre of wetland occurring within the required establishment area, there is 0.72 acre of wetland enhancement present. An additional 1.33 acres of wetland is present in upland buffer enhancement areas, lakeshore and City of Kirkland wetland. The total delineated wetland area within the study area is 2.47 acres (Figure 2).

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\(^1\) Project impact from USACE Individual Permit 200401410 (USACE 2004) and WQC #2547, 4th amendment (WSDOE 2011), required acreages sourced from Table 3-2 (WSDOT August 22, 2005)

\(^2\) The required wetland establishment mitigation acreage for this site is 0.536 acre. Additional wetland mitigation acreage is provided at three other mitigation sites, 405 Forbes Lake East, 405 Thrashers Corner, and 405 Kelsey Creek. (Ecology 2011).
Location

Figure 1. Vicinity Map

I-405 Forbes Lake West
Vicinity Map

Mitigation Site
City
County Boundaries (1:500K)
Methods

Wetland boundaries within the 405 Forbes lake West Mitigation Site were delineated using routine methods described in the:

- Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987),
- Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) (USACE 2010)

Wetland boundaries were delineated based on on-site observations of hydrology, soils, and plant communities, in conjunction with background information.

A Global Positioning System (GPS) Trimble GeoXT mapping grade unit was used to record wetland boundaries and sampling point locations (Figure 2). Wetland boundary points were recorded at regular intervals and at any change in direction along the boundary. Wetland mitigation types (Figure 2) were georeferenced by digitizing the mitigation site as-built planting plan in ArcGIS 10.3.1. Inherent in both GPS and georeferencing are minute errors, resulting in slight inaccuracies in both boundary line placement and acreage calculations. These tools represent the best available methods at the time of the study and report preparation.

Wetland Delineation and Study Area

Study Area
Wetlands described in this report were assessed only within the wetland mitigation site boundary (Figure 2). Wetland preservation areas as well as areas enhanced by the City of Kirkland are present within the mitigation site boundary and were included in this delineation.

Wetlands
The 405 Forbes Lake West Mitigation Site has depressional wetland areas with a variety of Cowardin classes. Palustrine emergent (PEM), palustrine scrub-shrub (PSS), and palustrine forested (PFO) characterize the wetland vegetation communities. The PFO community has developed a canopy structure with three distinct strata including an herbaceous understory, a shrub and sapling layer, with individual trees beginning to form a forested overstory. Wetter areas of the wetland are dominated by PEM communities, forming gaps in the canopy and further contributing complexity to the habitat and structure of the wetland.

The delineation determined 2.47 acres of wetland were present within the 405 Forbes Lake West Mitigation Site. Delineation data were collected at three sampling points and recorded on wetland determination data forms (Appendix A). Paired wetland and upland sample points were used to define the wetland edge. Additional wetland sample points
characterize various wetland vegetation communities. Data recorded on wetland
determination data forms characterize typical wetland and upland conditions observed
on site. Vegetation, soils, and hydrology were examined in many additional sampling
locations to determine the wetland boundary.

Precipitation
The Regional Delineation Supplement Version 2.0 (USACE 2010) recommends using
methods described in Chapter 19 in *Engineering Field Handbook* (NRCS 2015) to
determine if precipitation occurring in the three full months prior to the site visit was
normal, drier than normal, or wetter than normal. Actual rainfall is compared to the
normal range of the 30-year average. When considering the three prior months as a
whole, normal precipitation conditions were present prior to field work. The month prior
to field work was wetter then normal, the second month prior was within normal range,
with the third prior month drier than normal (Appendix B-1).

Heavy precipitation was recorded in the ten days preceding field work (Appendix B-2).

Growing Season
The following evidence of the growing season was observed at the time of the
delineation:

- Buds breaking on willows (*Salix spp.*).
- The leaves on red-flowering currant (*Ribes sanguineum*) emerging.
Figure 2. Study area in black, wetland boundary in red, and sampling point locations in black.
### 405 Forbes Lake West Mitigation Site – Wetland Delineation Summary

<table>
<thead>
<tr>
<th><strong>Total Delineated Wetland Area</strong></th>
<th>2.48 acres</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wetland Determination</strong></td>
<td>Appendix A; Sampling Points W1-SP1 and W1-SP2</td>
</tr>
<tr>
<td><strong>Data Forms</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Upland Determination</strong></td>
<td>Appendix A; Sampling Point W1-SP3</td>
</tr>
<tr>
<td><strong>Data Forms</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Delineators</strong></td>
<td>Tatiana Dreisbach, Kristen Andrews</td>
</tr>
<tr>
<td><strong>Delineation Date</strong></td>
<td>March 14, 2017</td>
</tr>
</tbody>
</table>

#### Vegetation

- Trees – Oregon ash (*Fraxinus latifolia*), Sitka spruce (*Picea sitchensis*), red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*)
- Shrubs – Pacific ninebark (*Physocarpus capitatus*), Pacific willow (*Salix lasiandra*), Scouler’s willow (*Salix scouleriana*), Nootka rose (*Rosa nutkana*)
- Herbs – soft rush (*Juncus effusus*), hardstem bulrush (*Schoenoplectus acutus*), slough sedge (*Carex obnupta*), broadleaf cattail (*Typha latifolia*)

#### Soils

Soils examined to a depth of 20 inches exhibited hydric characteristics. Matrix colors of 10YR 2/2 and 10YR 3/2 were observed. Distinct redoximorphic concentrations and were observed below six inches. Indicator F6 met for W1-SP2. The sample point located in the PEM was inundated to four inches and meets the definition of hydric soil due to prolonged inundation during the growing season.

#### Hydrology

Groundwater appears to be the main source of hydrology. Precipitation also contributes to the hydrologic regime of this wetland along with beaver activity in a nearby tributary to the lake. Water table in the observation pit was recorded at nine inches with saturation present at four inches below the soil surface. Surface water deeper than 6 inches was observed in some areas.

#### Rationale for Delineation

Positive indicators of all three wetland criteria are present. Placement of boundary determined by vegetation and hydric soils in most areas. Wetland vegetation blended with the upland species where the slope was gradual. Soil pits were dug to determine the location of the wetland boundary in these areas.

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**Limitations**

This wetland delineation report documents the investigation, best professional judgment and conclusions of WSDOT based on the site conditions encountered at the time of this study. The wetland delineation was performed in compliance with accepted standards for professional wetland biologists and applicable federal, state, and local ordinances. It is correct and complete to the best of our knowledge. It should be considered a preliminary jurisdictional determination of wetlands and other waters until it has been reviewed and approved in writing by the appropriate jurisdictional authorities.
References


Appendix A — Wetland Determination Data Forms

Wetland Delineation Data Forms for:
W1-SP1
W1-SP2
W1-SP3

Wetland polygons, sampling point locations, and wetland names shown in Figure 2.
### WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

**Project/Site:** 405 Forbes Lake West  
**City/County:** Kirkland/King County  
**Applicant/Owner:** WSDOT  
**State:** WA  
**Sampling Date:** 3/14/2017  
**Investigator(s):** Tatiana Dreisbach, Kristen Andrews  
**Section, Township, Range:** S4, T25N, R5E  
**Landform (hillslope, terrace, etc.):** depression  
**Local relief (concave, convex, none):** convex  
**Latitude:** 47.684472  
**Long:** -122.181194  
**Datum:** NAD83HARN  

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

<table>
<thead>
<tr>
<th>Hydrophytic Vegetation Present?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydric Soil Present?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wetland Hydrology Present?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**Remarks:**

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**VEGETATION – Use scientific names of plants.**

<table>
<thead>
<tr>
<th>Tree Stratum (Plot size: 15ft x 15ft)</th>
<th>Absolute % Cover</th>
<th>Relative % Cover</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
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<tr>
<td>2.</td>
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<td>3.</td>
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<td></td>
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<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sapling/Shrub Stratum (Plot size: 15ft x 15ft)</th>
<th>Absolute % Cover</th>
<th>Relative % Cover</th>
<th>Indicator Status</th>
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<tbody>
<tr>
<td>1. <em>Alnus rubra</em> (Y)</td>
<td>15</td>
<td>100.0</td>
<td>FAC</td>
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<tr>
<td>2.</td>
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<td>3.</td>
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<tr>
<td>4.</td>
<td></td>
<td></td>
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<tr>
<td>5.</td>
<td>15</td>
<td>= Total Cover</td>
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<table>
<thead>
<tr>
<th>Herb Stratum (Plot size: 5ft x 5ft)</th>
<th>Absolute % Cover</th>
<th>Relative % Cover</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <em>Carex obnupta</em> (Y)</td>
<td>80</td>
<td>84.2</td>
<td>OBL</td>
</tr>
<tr>
<td>2. <em>Juncus effusus</em> (N)</td>
<td>10</td>
<td>10.5</td>
<td>FACW</td>
</tr>
<tr>
<td>3. <em>Schoenoplectus acutus</em></td>
<td>5</td>
<td>5.3</td>
<td>OBL</td>
</tr>
<tr>
<td>4.</td>
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<td>5.</td>
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<td>6.</td>
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<td>8.</td>
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<td>9.</td>
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<td>10.</td>
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<tr>
<td>11.</td>
<td>95</td>
<td>= Total Cover</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>Woody Vine Stratum (Plot size: 5ft x 5ft)</th>
<th>Absolute % Cover</th>
<th>Relative % Cover</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>% Bare Ground in Herb Stratum</td>
<td>5</td>
<td></td>
<td></td>
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</tbody>
</table>

**Dominance Test worksheet:**

- Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
- Total Number of Dominant Species Across All Strata: 2 (B)
- Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

**Prevalence Index worksheet:**

- Total % Cover of: Multiply by:
  - OBL species: 85 x 1 = 85
  - FAC species: 10 x 2 = 20
  - FACU species: 15 x 3 = 45
  - UPL species: 0 x 5 = 0

Column Totals: 110

Prevalence Index = B/A = 1.364

**Hydrophytic Vegetation Indicators:**

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0
- 4 - Morphological Adaptations (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants
- 6 - Problematic Hydrophytic Vegetation

Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
### SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>Matrix</th>
<th>Redox Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Color (moist) %</td>
<td>Color (moist) %</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:** (Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- Sandy Gleyed Matrix (S4)
- Depleted Dark Surface (F7)

**Restrictive Layer (if present):**

- Type: ____________________________
- Depth (inches): ________________

**Hydric Soil Present?**  Yes  No

Remarks:

Inundated to 4 inches. Meets definition of hydric soil due to prolonged inundation and high water table during growing season.

### HYDROLOGY

**Wetland Hydrology Indicators:**

**Primary Indicators** (minimum of one required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Surface Soil Cracks (B6)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)

**Secondary Indicators** (2 or more required)

- Water-Stained Leaves (B9) (MLRA 1, 2, 4A, 4B)
- Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Stunted or Stressed Plants (D1) (LRR A)
- Other (Explain in Remarks)

**Field Observations:**

- Surface Water Present?  Yes  No
- Water Table Present?  Yes  No
- Saturation Present?  Yes  No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

**Wetland Hydrology Present?**  Yes  No

Remarks:
### WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

**Project/Site:** 405 Forbes Lake West  
**City/County:** Kirkland/King  
**Sampling Date:** 3/14/2017  
**Applicant/Owner:** WSDOT  
**State:** WA  
**Investigator(s):** Tatiana Dreisbach, Kristen Andrews  
**Sampling Point:** w1-sp2  

**Landform (hillslope, terrace, etc.):** slope of a depression  
**Local relief (concave, convex, none):** concave  
**Slope (%):** 10

**Subregion (LRR):** A  
**Lat:** 47.684472  
**Long:** -122.181194  
**Datum:** NAD83HARN

### Remarks:

**Hydrophytic Vegetation Present?** Yes  
**Hydric Soil Present?** Yes  
**Wetland Hydrology Present?** Yes

**Is the Sampled Area within a Wetland?** Yes

---

### VEGETATION – Use scientific names of plants.

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Absolute % Cover</th>
<th>Relative % Cover</th>
<th>Indicator Status</th>
<th>Prevalence Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tree Stratum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. <em>Populus balsamifera</em></td>
<td>60 Y</td>
<td>85.7 FAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. <em>Picea sitchensis</em></td>
<td>10 N</td>
<td>14.3 FAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
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<td></td>
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<tr>
<td>4.</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sapling/Shrub Stratum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. <em>Physocarpus capitatus</em></td>
<td>15 Y</td>
<td>37.5 FACW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. <em>Populus balsamifera</em></td>
<td>15 Y</td>
<td>37.5 FAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. <em>Picea sitchensis</em></td>
<td>10 Y</td>
<td>25.0 FAC</td>
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<td>4.</td>
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<tr>
<td>5.</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Herb Stratum</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.</td>
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<td>2.</td>
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<td>4.</td>
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<td>10.</td>
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<tr>
<td>11.</td>
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<td></td>
<td></td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Woody Vine Stratum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Bare Ground in Herb Stratum</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Number of Dominant Species That Are OBL, FACW, or FAC:** 4

**Total Number of Dominant Species Across All Strata:** 4

**Percent of Dominant Species That Are OBL, FACW, or FAC:** 100.0%

**Hydrophytic Vegetation Indicators:**

- 1 - Rapid Test for Hydrophytic Vegetation
- 2 - Dominance Test is >50%
- 3 - Prevalence Index is ≤3.0'
- 4 - Morphological Adaptations` (Provide supporting data in Remarks or on a separate sheet)
- 5 - Wetland Non-Vascular Plants`
- Problematic Hydrophytic Vegetation` (Explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Hydrophytic Vegetation Present?** Yes

---

**Summary of Findings:** Attach site map showing sampling point locations, transects, important features, etc.

---

**Remarks:**

---

[US Army Corps of Engineers (WSDOT Adapted Form - February 2016) Western Mountains, Valleys, and Coast – Version 2.0](#)
### Profile Description:
(Describe to the depth needed to document the indicator or confirm the absence of indicators.)

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>Color (moist)</th>
<th>%</th>
<th>Color (moist)</th>
<th>%</th>
<th>Type¹</th>
<th>Loc²</th>
<th>Texture</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6</td>
<td>10YR</td>
<td>2/2</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>Sandy Loam</td>
<td></td>
</tr>
<tr>
<td>6-16</td>
<td>10YR</td>
<td>3/2</td>
<td>60</td>
<td>7.5YR</td>
<td>3/2</td>
<td>40</td>
<td>C</td>
<td>M</td>
</tr>
</tbody>
</table>

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ²Location: PL=Pore Lining, M=Matrix.

### Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- Sandy Gleyed Matrix (S4)

### Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

### Restrictive Layer (if present):

- Type:
- Depth (inches):

### Hydric Soil Present?

- Yes
- No

### Remarks:

### HYDROLOGY

### Wetland Hydrology Indicators:

#### Primary Indicators (minimum of one required; check all that apply)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Surface Soil Cracks (B6)
- Inundation Visible on Aerial Imagery (B7)
- Sparsely Vegetated Concave Surface (B8)

- Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, and 4B)
- Salt Crust (B11)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Stunted or Stressed Plants (D1) (LRR A)
- Other (Explain in Remarks)

#### Secondary Indicators (2 or more required)

- Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
- Drainage Patterns (B10)
- Dry-Season Water Table (C2)
- Saturation Visible on Aerial Imagery (C9)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)
- Raised Ant Mounds (D6) (LRR A)
- Frost-Heave Hummocks (D7)

### Field Observations:

- Surface Water Present?  Yes  No
- Water Table Present?  Yes  No
- Saturation Present?  Yes  No

#### Wetland Hydrology Present?

- Yes
- No

### Remarks:

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 405 Forbes Lake West
City/County: Kirkland/King
Sampling Date: 3/14/2017
Applicant/Owner: WSDOT
State: WA
Sampling Point: w1-sp3

Investigator(s): Tatiana Dreisbach
Kristen Andrews
Section, Township, Range: 4, 25N, 5E

Landform (hillslope, terrace, etc.): mounded bern
Local relief (concave, convex, none): convex
Slope (%): 5

Subregion (LRR): A
Lat: 47.684472
Long: -122.181194
Datum: NAD83HARN

Soil Map Unit Name: Snohomish Silt Loam
NWI Classification: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? ☑ Yes ☐ No
(If no, explain in Remarks.)

Are Vegetation ☐ , Soil ☐ , or Hydrology ☐ significantly disturbed?
Are "Normal Circumstances" present? ☑ Yes ☐ No
(If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? ☑ Yes ☐ No
Hydric Soil Present? ☑ Yes ☐ No
Wetland Hydrology Present? ☑ Yes ☐ No

Is the Sampled Area within a Wetland? ☑ Yes ☐ No

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft x 15ft )

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>% Cover</th>
<th>Dom. Sp.?</th>
<th>Relative % Cover</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Populus balsamifera</td>
<td>40</td>
<td>Y</td>
<td>88.9</td>
<td>FAC</td>
</tr>
<tr>
<td>2.</td>
<td>Picea sitchensis</td>
<td>5</td>
<td>N</td>
<td>11.1</td>
<td>FAC</td>
</tr>
</tbody>
</table>

45 = Total Cover

Sapling/Shrub Stratum (Plot size: 20ft x 20ft )

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>% Cover</th>
<th>Dom. Sp.?</th>
<th>Relative % Cover</th>
<th>Indicator Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Physocarpus capitatus</td>
<td>40</td>
<td>Y</td>
<td>66.7</td>
<td>FACW</td>
</tr>
<tr>
<td>2.</td>
<td>Picea sitchensis</td>
<td>10</td>
<td>N</td>
<td>16.7</td>
<td>FAC</td>
</tr>
<tr>
<td>3.</td>
<td>Acer circinatum</td>
<td>5</td>
<td>N</td>
<td>8.3</td>
<td>FAC</td>
</tr>
<tr>
<td>4.</td>
<td>Thuja plicata</td>
<td>5</td>
<td>N</td>
<td>8.3</td>
<td>FAC</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>60</td>
<td></td>
<td></td>
<td>FAC</td>
</tr>
</tbody>
</table>

60 = Total Cover

Herb Stratum (Plot size: 5ft x 5ft )

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>% Cover</th>
<th>Dom. Sp.?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
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<tr>
<td>5.</td>
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<td></td>
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<tr>
<td>6.</td>
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<tr>
<td>7.</td>
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<tr>
<td>8.</td>
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<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

= Total Cover

Woody Vine Stratum (Plot size: 5ft x 5ft )

<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>% Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

= Total Cover

% Bare Ground in Herb Stratum 100

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

<table>
<thead>
<tr>
<th>Species</th>
<th>Total % Cover</th>
<th>Multiply by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBL</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FACW</td>
<td>40 x 2</td>
<td>80</td>
</tr>
<tr>
<td>FAC</td>
<td>65 x 3</td>
<td>195</td>
</tr>
<tr>
<td>FACU</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>UPL</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Column Totals:</td>
<td>105</td>
<td>(A) 275 (B)</td>
</tr>
</tbody>
</table>

Prevalence Index = B/A = 2.619

Hydrophytic Vegetation Indicators:

☐ 1 - Rapid Test for Hydrophytic Vegetation
☑ 2 - Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0'
☐ 4 - Morphological Adaptations' (Provide supporting data in Remarks or on a separate sheet)
☐ 5 - Wetland Non-Vascular Plants'
☐ Problematic Hydrophytic Vegetation' (Explain)

1Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? ☑ Yes ☐ No

Remarks:
### Profile Description:
(Describe to the depth needed to document the indicator or confirm the absence of indicators.)

<table>
<thead>
<tr>
<th>Depth (inches)</th>
<th>Matrix</th>
<th>Redox Features</th>
<th>Texture</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>10YR</td>
<td>2/2 93</td>
<td>2.5Y</td>
<td>4/3 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7.5Y</td>
<td>4/6 2</td>
</tr>
<tr>
<td>5-10</td>
<td>7.5Y</td>
<td>2.5/3 93</td>
<td>10YR</td>
<td>4/1 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10YR</td>
<td>4/6 2</td>
</tr>
<tr>
<td>10-16</td>
<td>10YR</td>
<td>2/1 90</td>
<td>10YR</td>
<td>4/6 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10YR</td>
<td>5/1 7</td>
</tr>
</tbody>
</table>

1Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.

### Hydric Soil Indicators:
(Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- Sandy Gleyed Matrix (S4)

- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1) (except MLRA 1)
- Loamy Gleyed Matrix (F2)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)

### Restrictive Layer (if present):

- Type: 
- Depth (inches): 
- Hydric Soil Present? [ ] Yes [ ] No

Remarks:
Does not meet an indicator. Not enough concentrations. This area is just beyond the wetland boundary.

### HYDROLOGY

#### Wetland Hydrology Indicators:

- Primary Indicators (minimum of one required; check all that apply)
  - Surface Water (A1)
  - High Water Table (A2)
  - Saturation (A3)
  - Water Marks (B1)
  - Sediment Deposits (B2)
  - Drift Deposits (B3)
  - Algal Mat or Crust (B4)
  - Iron Deposits (B5)
  - Surface Soil Cracks (B6)
  - Inundation Visible on Aerial Imagery (B7)
  - Sparsely Vegetated Concave Surface (B8)

- Secondary Indicators (2 or more required)
  - Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
  - Water-Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
  - Drainage Patterns (B10)
  - Dry-Season Water Table (C2)
  - Saturation Visible on Aerial Imagery (C9)
  - Geomorphic Position (D2)
  - FAC-Negative Test (D5)
  - Frost-Heave Hummocks (D7)

#### Field Observations:

- Surface Water Present? [ ] Yes [ ] No Depth (inches): 
- Water Table Present? [ ] Yes [ ] No Depth (inches): 
- Saturation Present? [ ] Yes [ ] No Depth (inches): 
  (includes capillary fringe) 5-10

### Remarks:
Epi-saturated from lots of rain in past few weeks. Not indicative of wetland hydrology.
Appendix B — Precipitation Data

Appendix B-1. Comparison of Observed and Normal Precipitation (NRCS 2015)


<table>
<thead>
<tr>
<th>Month</th>
<th>3 yrs. in 10 less than</th>
<th>Average</th>
<th>3 yrs. in 10 more than</th>
<th>Rainfall(^a)</th>
<th>Condition</th>
<th>Condition Value</th>
<th>Month weight value</th>
<th>Product of previous two columns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(^{st}) prior month</td>
<td>Feb</td>
<td>2.73</td>
<td>4.18</td>
<td>5.02</td>
<td>W</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Jan</td>
<td>3.58</td>
<td>5.13</td>
<td>6.10</td>
<td>N</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Dec</td>
<td>3.94</td>
<td>5.62</td>
<td>6.68</td>
<td>D</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

\(^{a}\) NRCS 2017

\(^{b}\) Conditions are considered normal if they fall within the low and high range around the average.

<table>
<thead>
<tr>
<th>Note: If sum is</th>
<th>Condition value:</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 - 9</td>
<td>Dry (D) = 1</td>
</tr>
<tr>
<td>10 - 14</td>
<td>Normal (N) = 2</td>
</tr>
<tr>
<td>15 - 18</td>
<td>Wet (W) = 3</td>
</tr>
</tbody>
</table>

Conclusions: Normal precipitation conditions were present prior to the field visit.
Appendix B-2.
Daily Precipitation 10 days preceding field work


<table>
<thead>
<tr>
<th>Date (2017)</th>
<th>Daily Precipitation (inches)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 13</td>
<td>0.65</td>
</tr>
<tr>
<td>March 12</td>
<td>0.02</td>
</tr>
<tr>
<td>March 11</td>
<td>0.37</td>
</tr>
<tr>
<td>March 10</td>
<td>0.03</td>
</tr>
<tr>
<td>March 9</td>
<td>0.70</td>
</tr>
<tr>
<td>March 8</td>
<td>0.13</td>
</tr>
<tr>
<td>March 7</td>
<td>0.75</td>
</tr>
<tr>
<td>March 6</td>
<td>T</td>
</tr>
<tr>
<td>March 5</td>
<td>T</td>
</tr>
<tr>
<td>March 4</td>
<td>0.04</td>
</tr>
<tr>
<td>Sum</td>
<td>2.69</td>
</tr>
</tbody>
</table>

*NRCS 2017

Conclusions: Heavy precipitation was recorded in the ten days preceding field work.
Literature Cited


