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BY:

January 25, 2013

Russ Klassen
Department of State Lands
775 Summer Street N.E.
Salem, OR 97301

Tom Taylor
USACOE, Portland District
CENWP-OP-G
333 S.W. First Avenue
Portland, OR 97204-3495

WETLAND MITIGATION BANK MONITORING REPORT

We have attached the wetland mitigation bank monitoring report for the Bobcat Marsh Wetland Mitigation Bank, a City of Hillsboro-sponsored wetland mitigation bank in Washington County. This report is submitted in partial fulfillment of permit requirements:

Project	DSL Permit	ACOE Permit	Contact	Monitoring Year	Type of Report
Bobcat Marsh Wetland Mitigation Bank	RF-43502	NWP-2008-658	Ed Becker 503.681.6424	First Year	Wetland Mitigation Monitoring

If you have any questions or need to discuss the information in the monitoring report, please contact me at the phone number listed above.

Sincerely,

Signing for Ed Becker

Ed Becker
Natural Resources Manager
Jackson Bottom Wetland Preserve
2600 SW Hillsboro Hwy.
Hillsboro, OR 97123

Attachments: 2012 1st Annual Monitoring Report

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1. Mitigation Monitoring Report Cover Sheet

***1: Bobcat Marsh Wetland Mitigation Bank* Identifiers:**

DSL Permit #: RF-43502 Corps Permit #: NWP-2008-658 Permittee: Port of Portland
County: Washington Report Date: 12/2012 Monitoring Year: 1
Date Removal-Fill Activity Completed: Mitigation bank – multiple R/F actions
Date mitigation was completed: Grading: 2008, 2010, 2011 Planting: April, 2011, February, 2012
Date(s) of data collection: 6/11/2012 & 9/13/2012
Report prepared by: Laura Trunk, City of Hillsboro

2: Monitoring Report Purpose:

This monitoring report is for a project that includes: (check all that apply):

- ☐ Compensatory **freshwater, non-tidal** wetland mitigation for permanent wetland impacts.
- ☐ Compensatory **estuarine** wetland mitigation for permanent wetland impacts.
- ☐ **Only non-wetland** compensatory mitigation.
- ☐ **Only** mitigation for **temporary** impacts that had a monitoring requirement.
- ☐ **Voluntary** wetland enhancement, creation or restoration (General authorization or individual permit) not funded with money from DSL's wetland mitigation fund.
- ☐ Voluntary wetland enhancement, creation or restoration (General authorization or individual permit) funded with money from DSL's **wetland mitigation fund**.
- ☒ **Mitigation Bank** Report
- ☐ Other _____

3: Results: *(add more rows if needed)*

	Performance standards (verbatim from permit)	Fully Met? Y/N	Comments/Reason for shortfall (mark NA if doesn't apply this year)
1.	Entire Site: During years of normal precipitation, no permanent standing water will be found on-site. 0.2/15.66 = 0.013	N	There is a seep on the southwest slope of the site that keeps standing water on 0.2 acres of the mitigation site. Water in this area is always at a minimum depth of 3". All the created ponds and creek channel dry completely at the end of the growing season.
2.	EM-The relative percent native cover for Year 1 must be 40%, Year 2 must by 50%, and Year 3 and thereafter must be 60%.	Y ✓	July, 2012 – 103% native herbaceous cover September, 2012 – 68% native herbaceous cover
3.	EM-The relative herbaceous invasive plant cover (including reed canary grass) is no more than 30% in Years 1 through 3, and no more than 20% in years 4 and 5. Invasive plants other than reed canary grass cannot exceed 10%.	Y/N	July, 2012 – 12% invasive cover (including RCG) – Met standard July, 2012 – 5% invasive cover (excluding RCG) – Met standard September, 2012 - 24% invasive cover (including RCG) – Met standard September, 2012 - 11% invasive cover (excluding RCG) – Did not meet standard

4.	EM – Bare substrate must represent no more than 20% cover by the 3rd year after planting.	N/A	This standard does not apply until year 3.
5.	EM – 6 native species at Year 1 with a total cover of at least 10%.	Y ✓	In September, there were 20 native herbaceous wetland species present in the emergent areas, of which 7 comprise 10% or more of total emergent cover.
6.	EM – 6 native species at Year 5 with a total cover of at least 30%. To quality, a species must have at least 5% cover in the habitat class and occurs in at least 10% of the plots sampled.	N/A	This standard does not apply until year 5.
7.	SSF – The cover of woody invasive species is no more than 10% throughout the monitoring period.	Y ✓	0% woody invasive species present on the site
8.	SSF – The relative herbaceous invasive plant cover is no more than 30% in Years 1 through 3, and no more than 20% in Years 4 and 5.	Y/N	July, 2012 – 7% invasive herbaceous cover September, 2012 – 38% invasive herbaceous cover not good trend
9.	SSF – 6 native species (woody and herbaceous) at Year 5 with a total cover of at least 30%.	N/A	This standard does not apply until year 5.
10.	SSF – Native woody stem density is at least 1,600 stems (trees) or plants (shrubs)/acre at Year 5. Native volunteers are counted, not dead plant or stems.	N/A	This standard does not apply until year 5.
11.	SSF – Native woody canopy cover is 10% by Year 1, 30% by Year 2, 50% by Year 5.	Y ✓	July, 2012 - 11% woody canopy cover September, 2012 - 11% woody canopy cover
12.	Shall meet 1987 Corps of Engineers Delineation Manual Wetland Hydrology Criteria.	N/A ✓	We didn't conduct formal hydrology monitoring on the site in 2012. Site was inundated in early growing season.

4: Further Actions:

Remedial work recommended	Yes ☒	No ☐
Deed Restriction or other protection instrument attached	Yes ☐	No ☒
Final Monitoring Report?	Yes ☐	No ☒
Requesting release or partial release of financial security?	Yes ☐	No ☒

2. Bobcat Marsh Mitigation Bank Plan Purpose and Overview

A. Location.
The mitigation site is located at:

- Address: 2600 SW Hillsboro Highway, Hillsboro, OR 97123
- Latitude and Longitude: 45° 30' 11" N 122° 59'17" W
- Township/Range: T 1S R2W Section 7 WM
- Tax lots: 200, 300 (Tax ID No. 1S207, 200 and 200)

The Bobcat Marsh Wetland Mitigation Bank site is located within the boundary of the 725-acre Jackson Bottom Wetland Preserve. The main public access to the preserve is one mile south of the Hillsboro city center on OR 219. The Bobcat Marsh Mitigation Bank is accessed by a gravel road between the Clean Water Services headquarters building on the north and the Jackson Bottom Wetland Preserve Education Center on the south. Portions of the mitigation bank are both north and south of the main gravel access road. Access to the mitigation bank area for the public is by foot only via the gravel road unless special permission from JBWP has been given.

The Bobcat Marsh Wetland Mitigation Bank boundary includes an area constructed in 2008 that is wetland mitigation associated with two ODOT projects. The ODOT project names and associated permit numbers for these two projects are shown in Table 1. This portion of the mitigation bank is shown in Figures B and C (Appendix A).

Table1: ODOT Permits

ODOT Project	ACOE Permit	DSL Permit
KN 11943 OR 219 @ Unger Rd.	N/A	34788-GA
KN 12861 OR 219 @ Burkhalter/Simpson Rds.	NWP 2005-00793	RE-35732

The monitoring of the wetland mitigation bank meets the regulatory mandate for monitoring for the permits listed above with the knowledge and approval of the permitting agencies.

B. Mitigation Goals and Objectives.
This mitigation project is a two user wetland mitigation bank that was developed by the Port of Portland and the Oregon Department of Transportation in partnership with the City of Hillsboro (land owner). The project is intended to replace the functions and values of wetland lost at the Port of Portland Hillsboro Airport, and for various ODOT projects in Washington County/Tualatin River watershed.

The goal of the mitigation project was to restore 4.52 acres of wetlands and enhance 11.14 acres of wetlands in the Jackson Bottoms Wetland Preserve. The project area was planted with native trees, shrubs and herbs with the objective of creating forest and scrub shrub wetlands with smaller pockets of emergent wetland. The wetland types that are expected to become established include slope-outflow wetlands under the HGM classification and Palustrine Forested (PFO), Palustrine Scrub-Shrub (PSS), and Palustrine Emergent (PEM) seasonally flooded wetlands under the Cowardin classification system. Table 2 describes the wetland types that are expected to become established within the wetland mitigation bank.

The mitigation project area is approximately 18-acres in size (including wetlands, upland buffers, and an access road). The project area contained several large mounds consisting of material that was excavated in the early 1980's to create nearby ponds. The material was placed on agricultural fields that were drained in the 1920's by a drainage ditch, the Jackson Slough. Removal of these mounds and filling a portion of Jackson Slough was identified as a key project in the 2006 JBWP concept plan to improve habitat in the preserve and was the concept that directed the Bobcat Marsh Mitigation Plan.

Table 2: Types of Mitigation and Impacts

Impact Site*				Mitigation Site					
Wetland ID	HGM	Cowardin	Acres lost	Mitigation Method	Acres	HGM	Cowardin	Mitigation Ratio	Credits Pending **
NA	NA	NA							
NA				Enhance	11.14	Slope-outflow	PSS/PEM PFO/PSS PSS	3:1	3.71
NA	NA	NA		Create	- 0 -				- 0 -
NA	NA	NA		Restore	4.52	Slope-Outflow	PSS/PEM PFO/PSS PSS	1:1	4.52
Total					15.66				8.23

** Impact types and amounts are Not Applicable since this is a mitigation bank, not for a specific project.*
*** Until the post-project delineation has been completed, this column will be 'pending'.*

The project included the following:

- Removal of 30,000 cubic yards of material from the project area to restore hydrology to previously filled wetlands;
- Enhancing degraded wetlands by increasing the hydroperiod and replacing reed canary grass that has dominated site with native plant species;
- Creating a shallow braided linear swale through the restored and enhanced wetland area;
- Filling a portion of Jackson Slough and rerouting the flow from the slough through the swale;
- Planting the wetland area with native trees, shrubs and forbs with the objective of creating forest and scrub shrub wetlands with smaller pockets of emergent wetlands;
- Planting an upland buffer with native trees and shrubs;
- Providing wildlife habitat in the wetland by placing large woody debris and root wads.

C. Maintenance and Management Actions.

Mitigation site construction began in the summer of 2010. Prior to the start of construction the entire site was mowed and sprayed then the top 6-8 inches of reed canary grass was scraped off and stockpiled on site to be used later to fill the Slough channel. The mounds were then excavated and removed from the site and the entire site was graded to create the swale system and restore wetlands. Placement of large wood and root wads followed the earth movement. In spring of 2011, the site was planted with shrubs and trees. In the summer of 2011 Phase 2 of the project was completed which included filling a portion of the Jackson Slough and rerouting

the flow through the mitigation site. The activities that were performed on the Bobcat Marsh site in 2012 are shown in Table 3.

Table 3: 2012 Vegetation Planting and Management Activities

Date:	Actions Performed:
February, 2012	Installed 37,080 bare-root trees/shrubs throughout entire site.
April, 2012	Installed 30,000 emergent plugs around the water's edge in the back water ponds.
April, 2012	Broadcast seeded 260 lbs. native grass seed mix over entire site.
June, 2012	Spot sprayed site for invasive/non-native species.
July, 2012	Spot sprayed site for invasive/non-native species.
July & August, 2012	Plants that were showing signs of heat stress were hand watered. Watering occurred 4 times in the months of July and August.
August, 2012	Spot sprayed site for invasive/non-native species.
September, 2012	Spot sprayed site for invasive/non-native species.
October, 2012	Spot sprayed site for invasive/non-native species.
November, 2012	Spot sprayed site for invasive/non-native species.
November, 2012	Installed 51,350 emergent plugs throughout the site.

The site received regular spot sprays throughout the growing season to control non-native/invasive species that germinated in the mitigation site. The dominant invasive species that came up in Bobcat Marsh were *Lotus corniculatus,* (bird's-foot trefoil), *Cirsium arvense* (Canadian thistle) and *Phalaris arundinacea* (reed canary grass).

The vegetation establishment activities that were performed on the Bobcat Marsh site in 2011 are shown in Table 4.

Table 4: 2011 Vegetation Planting and Management Activities

Date:	Actions Performed:
April, 2011	Installed 30,190 bare-root tree/shrubs throughout entire site.
April, 2011	Broadcast seeded 445 lbs of native grass seed mix.
April, 2011	Broadcast seeded 192 lbs of native herbaceous wetlands species.

Plantings followed the planting plan in the approved mitigation plan with the following exceptions:

- All the trees/shrubs listed in the planting plan were installed except for *Rosa nutkana*. The hydrology of the site favored *Rosa pisocarpa*, so more of this species was planted.
- *Alisma plantago-aquatica, Sagittaria latifolia, Typha latifolia* were seeded into the site instead of planting as plugs.
- Additional native emergent species were added to the planting plan to add diversity and increase percent coverage over the site. The following emergent species were installed in Bobcat Marsh.

- *Carex aperta*
- *Carex densa*
- *Carex obnupta*
- *Carex unilateralis*
- *Eleocharis palustris*
- *Scirpus acutus*
- *Scirpus microcarpus*
- *Juncus effuses*
- *Juncus patens*
- *Juncus ensifolius*
- *Juncus tenuis*
- *Scirpus validus*

In 2011, 445 lbs of native grass seed was applied to the site (planting plan calls for 434.18 lbs) in order to create a dense cover of native grasses in the scrub-shrub areas. In addition, 192 lbs of emergent wetland seed was applied to the ponds to increase the native vegetative cover. The application of the wetland seed resulted in a 93% percent cover of native species in July, 2012 in the emergent marsh areas. The dominate species in the emergent marsh seed mix were:

- *Sparganium emersum*
- *Sagittaria latifolia*
- *Eleocharis palustris*
- *Alisma plantago aquatica*
- *Eleocharis ovata*
- *Glyceria occidentalis*

D. Monitoring Methods
Vegetation and hydrology monitoring followed the routine methods specified in the DSL Removal-Fill Guidelines with the following exceptions:

Vegetation sample plots were randomly selected using GIS that divided the plots proportionately between habitat types (emergent and shrub-scrub/forested areas). To assess the vegetative cover and stem density in the mitigation site, 29 random points were generated and positioned onsite using GPS and marked with a t-post. To assess stem density, 29 circular plots (the centers of the circular plots are the randomly selected points), 12 square meters in size, were monitored. To assess the vegetative cover in the mitigation site 29 meter-squared plots that were located within the larger sample plots were monitored. These vegetative cover plots were placed to align to the center of the circular plots. Species composition, coverage and the number of stems was recorded for each plot.

E. Monitoring Data Locations.
This is a first year monitoring report. Plot locations were randomly generated per DSL's Routine Monitoring Guidance. Vegetation sample plots were randomly selected using GIS that divided the plots proportionately between emergent and shrub-scrub/forested habitat types. See Figure D in Appendix A for the locations of the plots and the photo points.

F. Hydrology Methods and Context.
Formal hydrology monitoring was not conducted in 2012, but will be completed as part of the 2013 monitoring work. However, the Bobcat Marsh wetland mitigation site is subject to regular inundation from the Tualatin River throughout winter and spring. Spring season backwatering is common when river levels rise during the spring freshets and with releases of water from Hagg Lake. Appendix A includes an aerial photo (Figure E) that shows the extent of inundation in March 2012, a time approximating early spring hydrology. Data from an electronic water quality monitoring gauge located about 175 yards downstream from the culvert under the access road in the southern portion of the mitigation site can be used to extrapolate the extent of inundation and the seasonal fluctuations of hydrology on the Bobcat Marsh site.

Hydrology meeting USACE wetland hydrology criteria (generally permanent inundation less than 2 meters or 6.6 feet deep) is present on the site from approximately December through June, depending upon seasonal rainfall, with some of the wetland mitigation site remaining saturated to the surface until mid-August, when the majority of the site dries up.

Table 5: Precipitation Data

Field Dates	Observed Rainfall on Field Dates (in.)	Observed Rainfall Two Weeks Prior to Field Dates (in.)	Percent of Normal Rainfall for the Water Year to Dates	Percent of Normal Precipitation for Three Months Prior to the Field Dates
6/11/2012	0.00"	1.54"	87%	March - 167% April - 96% May - 123%
9/13/2012	0.00"	0.00"	87%	June - 100% July - 15% August - 2%

The site was visually inspected throughout the year to monitor for standing water. On October 9, 2012 there was no permanent standing water found in the ponds or creek channel. Photos were taken to document no permanent standing water (reference photo #1-7 in Appendix A). On the southwest portion of the mitigation site there is a seep that is 0.20 acres in size and always has a water depth of at least 3". This area has standing water year round.

3. Results

A. Vegetation Standards.

Vegetation monitoring data is included in Appendix B. The following lists the performance standards (numbered as listed in the mitigation plan) and a description of whether or not they are being met.

2) EM-The relative percent native cover for Year 1 must be 40%, Year 2 must by 50%, and Year 3 and thereafter must be 60%.

In July 2012 there was 103% native cover[1] within the emergent areas; by September the native cover was down to 68%. The decrease was due to the ponds' naturally drying throughout the year. This caused the native wetland plants to dry up and therefore decreased the percentage of native cover in the emergent marsh area. Native cover during monitoring events met the performance standard of 40% native cover for year 1. The dominant native plant species that were found within the emergent plots were:

- *Sagittaria latifolia*
- *Eleocharis palustris*
- *Ludwigia palustris*
- *Alisma plantago aquatica*
- *Eleocharis ovata*
- *Gnaphalium palustre*

Most of these species were ones that were seeded into the site in 2011.

[1] This value is the result of measuring absolute cover, and the presence of multiple strata (layers) of vegetation within the sample plot. See DSL vegetation monitoring guidelines (RMG's) for an explanation.

Table 6: Native Vegetation Cover in Emergent Marsh

July, 2012	
% native cover, emergent marsh	**103%**
September, 2012	
% native cover, emergent marsh	**68%**

Sample mean = 68% native herbaceous cover, confidence interval 60-76% at an 80% confidence level.

3) **EM - The relative herbaceous invasive plant cover (including reed canary grass) is no more than 30% in Years 1 through 3, and no more than 20% in years 4 and 5. Invasive plants other than reed canary grass cannot exceed 10%.**

In July 2012 there was a 12% total invasive cover (including reed canary grass) within the emergent areas, by September the invasive cover had increased to 24% (including reed canary grass). Excluding reed canary grass, the invasive cover within the emergent marsh area was 5% in July and 11% in September. During both monitoring events the total herbaceous invasive plant cover was less than 30% so this portion of the performance standard was met.

In September the invasive cover (excluding reed canary grass) was at 11%, which is slightly over the standard. Between the July monitoring event and the September monitoring event the, ponds in the mitigation site dried up. As stated above, this caused the native wetland plants to dry up, and there was a subsequent increase in total invasive cover due to survival of tolerant invasive species during the dry season.

The dominant invasive species that germinated in Bobcat Marsh were bird's-foot trefoil and, reed canary grass.

Table 7: Invasive Species Cover

July, 2012	
% invasive cover, emergent marsh (including Reed canary grass)	**12%**
% invasive cover, emergent marsh (excluding Reed canary grass)	**5%**
September, 2012	
% invasive cover, emergent marsh (including Reed canary grass)	**24%**
% invasive cover, emergent marsh (excluding Reed canary grass)	**11%**

Mean cover of herbaceous invasive species, including canary grass (September 2012) = 24%; confidence interval 16-32% at an 80% confidence level.

Mean cover of herbaceous invasive species, EXCLUDING canary grass (September 2012) = 11%; confidence interval 5-17% at an 80% confidence level.

4) **EM – Bare substrate must represent no more than 20% cover by the 3rd year after planting.**

In July 2012 there was 7% bare ground within the emergent areas, by September the bare substrate had increased to 11%. During both monitoring events, bare ground was less than 20% cover so the performance standard was met. The increase in bare soil between monitoring events was due to exposure of pond bottoms and drying of vegetation.

Table 8: Bare Substrate

July, 2012	
% bare substrate, emergent marsh	**7%**
September, 2012	
% bare substrate, emergent marsh	**11%**

Mean bare soil, emergent marsh habitats = 11% (September 2012); confidence interval 7-15% at an 80% confidence level.

5) **EM – 6 native species at Year 1 with a total cover of at least 10%.**

In September, there were 20 native herbaceous wetland species present in the emergent areas, of which 7 species comprise 10% or more of total emergent cover. These species are listed below, along with the mean percent cover of each species across the sample plots in emergent marsh habitat. This performance standard has been met with 7 native species on the site with a total cover of at least 10%.

Table 9: Mean Percent Cover of Native Emergent Species

Scientific Name	Common Name	Indicator status*	Mean % cover of each species**
Alisma plantago-aquatica	Broadleaf water-plaintain	1	35%
Eleocharis ovata	Ovoid spikerush	1	46%
Epilobium watsonii	Watson willowherb	2	10%
Gnaphalium palustre	Western marsh cudweed	3	20%
Ludwigia palustris	Marsh seedbox	1	20%
Madia elegans	Common madia	NL	55%
Sagittaria latifolia	Wapato	1	10%

*1 = obligate, 2 = FACW, 3 = FAC, 4 = FACU, and 5 = UPL
**in emergent marsh habitat areas only

6) **EM – 6 native species at Year 5 with a total cover of at least 30%. To quality, a species must have at least 5% cover in the habitat class and occurs in at least 10% of the plots sampled.**

This is the first year of monitoring, so this performance standard is not applicable at this time.

7) **SSF – The cover of woody invasive species is no more than 10% throughout the monitoring period.**

There are no woody invasive species present on the site; therefore this performance standard is met.

8) **SSF – The relative herbaceous invasive plant cover is no more than 30% in Years 1 through 3, and no more than 20% in Years 4 and 5.**

In July 2012 there was a 7% herbaceous invasive plant cover within the scrub shrub/forested areas; by September, the invasive cover had increased to 38%. During the September monitoring event the herbaceous invasive plant cover in the scrub shrub and forested areas was greater than 30% so the performance standard was not met. The reason that this performance standard was not met was that the native grass seed that was seeded onto the site in fall, 2011 and spring, 2012 did not germinate. This left large areas bare, allowing invasive/non-native plants to have a higher percent cover on the site.

Table 10: Percent Invasive Herbaceous Cover in Scrub-Shrub Wetlands

July, 2012	
% invasive herbaceous cover, shrub plantings	**7%**
September, 2012	
% invasive herbaceous cover, shrub plantings	**38%**

Mean cover of herbaceous invasive species, SSF habitat (September 2012) = 38%; confidence interval 30-46% at an 80% confidence level.

9) **SSF – 6 native species (woody and herbaceous) at Year 5 with a total cover of at least 30%.**

This is the first year of monitoring so this performance standard is not applicable at this time.

10) **SSF – Native woody stem density is at least 1,600 stems (trees) or plants (shrubs)/acre at Year 5. Native volunteers are counted, not dead plant or stems.**

This is the first year of monitoring so this performance standard is not applicable at this time. However, tree and shrub stem counts are currently at 1,339 stems per acre and we anticipate no issues meeting the performance standard of 1,600 stems per acre by year 5.

11) **SSF – Native woody canopy cover is 10% by Year 1, 30% by Year 2, 50% by Year 5.**

The average percent cover of native woody vegetation in both July and September was 11% (1.7% trees, and 9.3% shrubs). As the performance standard is 10% for native woody canopy in year 1, the site is meeting this standard. (Mean % cover = 11%, confidence interval 10-12% at an 80% confidence level.)

Table 11: Mean Percent Cover of Native Tree and Shrub Species

Species		Indicator status*	Mean % Cover
Trees			
Fraxinus latifolia	Oregon Ash	2	
Populus balsalmifera	Black Cottonwood	3	
Crataegus douglasii	Black Hawthorn	3	
Percent Cover Trees[1]			**1.7%**
Shrubs			
Cornus alba	Red-osier Dogwood	2	
Lonicera involucrata	Black twinberry	3	
Physocarpus capitatus	Pacific Ninebark	2	
Rosa pisocarpa	Cluster/ Swamp Rose	3	
Salix lasiandra	Pacific Willow	2	
Salix hookeriana	Piper Willow	2	
Salix scouleriana	Scouler Willow	3	
Salix sitchensis	Sitka Willow	2	
Spiraea douglasii	Douglas Spirea	2	
Percent Cover Shrubs[2]			**9.3%**
Total cover, native woody vegetation[3]			**11.0%**

*1 = obligate, 2 = FACW, 3 = FAC, 4 = FACU, and 5 = UPL
[1]average of all plots with tree cover
[2]average of all plots with shrub cover
[3]average percent cover of all woody vegetation in sample plots (note that 11% total cover is not an additive statistic, but the true mean of woody vegetation cover across all sample plots; see sample data)

B. Hydrology Standards Result:

1) Entire Site: During years of normal precipitation, no permanent standing water will be found on-site.

While a formal assessment of hydrology was not conducted during this first year monitoring, a visual assessment of the site, in September when the vegetation monitoring was conducted, showed no standing water was remaining on the site except in the area of the seep along the western edge of the mitigation area.

2) Shall meet 1987 Corps of Engineers Delineation Manual Wetland Hydrology Criteria.

This is a first annual monitoring report. A formal delineation will be conducted at the end of the five year monitoring period to determine if the site meets the 1987 USACE Manual wetland criteria.

C. Delineation of wetland acreage achieved.
This is a first annual monitoring report. A formal delineation will not be conducted until the end of the five-year monitoring period or when it appears all the proposed success standards are being met, if that occurs before the end of the fifth year.

D. Other performance standard result:
There are no other performance standards for this site.
Function Assessment.
This is a first annual monitoring report so a functional assessment has not yet been conducted. At the end of the fifth year of monitoring, a functional assessment will be completed for the site. Since the site is a wetland mitigation bank, the functions will not be compared to impact site functions except as credits are withdrawn, but will be compared with the proposed functions that were projected as part of the wetland mitigation banking documents. The weighted functional assessment calculation spreadsheet that was submitted as part of the banking documents is attached in Appendix C.

4. Conclusions and Recommendations

A. Project status.
The mitigation project is in compliance with all the performance standards except for the percent invasive herbaceous cover within the emergent marsh and scrub shrub/forested areas (performance standards #3 & 8). The scrub shrub/forested areas were heavily colonized by non-native species (including reed canary grass) because the native grass seed that was seeded onto the site had poor germination and heavy bird use of the site. This left large areas bare, allowing invasive/non-native plants to have a higher percent cover on the site.

In the emergent marsh areas the percent invasive cover went from 6% to 11% (excluding reed canary grass) between the July monitoring event and the September monitoring event due to the ponds in the mitigation site drying up. This caused the native wetland plants to dry up and therefore decrease the percentage of native cover in the emergent marsh area. A subsequent increase in invasive cover followed, due to survival of tolerant invasive species during the dry season.

Although the site is currently meeting the performance standard for native canopy cover (performance standard #11), the site has had significant tree and shrub mortality. The hydrology of the Bobcat Marsh site makes it difficult to establish bare-root trees and shrubs because the water level is very high during the early spring when plants should be installed. As a result, plants were installed later in the season than is desirable. In addition some woody vegetation was lost due to limited irrigation the first year and herbivory by beaver and nutria in the winter.

B. Recommendations.
The Bobcat Marsh mitigation site is not meeting the performance standards for percent cover of invasive herbaceous species for the reasons stated above. To meet these standards in subsequent monitoring years the following activities will occur on the site.

Table 12: Future Planting and Vegetation Management Activities

Date:	Restoration Actions:
January, 2013	Install 4,000 cuttings (variety of willow species) on the site.
February, 2013	Broadcast seed 190 lbs native grass seed mix over entire site.
February, 2013	Broadcast seed 80 lbs native herbaceous seed mix over entire site.
March, 2013	Install 12,000 bare-root native trees/shrubs (Oregon ash, Black Hawthorne, spirea and a variety of willow species).
July-September, 2013	Hand-water the plants as needed.
April-October, 2012 3	Spot spray site for invasive/non-native species.
September-November, 2013	Trap nutria on the site to reduce herbivory on the plants.

In spring, 2013 the site will be seeded with a native herbaceous/grass seed mix that will produce a dense cover crop over the site, which will hopefully suppress non-native seed from germinating. In addition, we will be spot spraying throughout the year to target invasive/non-native species. This will greatly reduce the percent cover of invasive species in the emergent marsh and scrub-shrub areas and increase the cover of native wetlands species. If large areas are sprayed to control non-native species the resulting bare areas will be seeded with natives to prevent re-infestation of non-natives.

To make sure success standards SSF - 9, 10 and 11 are met in future monitoring years the site will be planted with an additional 12,000 bare-root plants and 4,000 willow cuttings. To facilitate plant establishment the plants will be hand watered as needed and herbivorous animals will be trapped.

C. Financial Security Status.

A performance bond or other type of financial security was not required to be posted for this wetland mitigation bank since the bank sponsors are public or quasi-public agencies with the financial resources to secure a successful outcome for the bank, or to revise the amount of credit available at this bank. However, an endowment will be posted with the City of Hillsboro once the Long Term Management Plan has been approved by DSL and the USACE. The endowment will generate income to support in-perpetuity maintenance of the wetland mitigation site. The site itself is owned by the City of Hillsboro, and is protected in-perpetuity by stringent natural resource preservation zoning that cannot be changed or overturned without replacing the resource values of the site at some other site in the Tualatin River basin.

5. Maps and Figures

The following maps and graphics are included in Appendix A

A: As-built survey

The as-built report, maps and plans were submitted to the agencies in October 2011. Figure A includes the as-built survey from this submittal.

B: Habitat units
The project was constructed as planned. The plans for the plantings, which show the types of habitat units planned for this site, are shown in Figure B.

C: Mitigation plan.
The enhancement and restoration areas are show in Figure C.

D: Monitoring plan
The monitoring plan, including the photo point locations and the vegetation monitoring plot locations, are shown in Figure D.

Figure E: Hydrology Map
Map includes aerial photo that shows the extent of inundation in March 2012, a time approximating early spring hydrology.

6. Appendices

Appendix A – Plans, Maps, and Ground-levels of Photos of Site

- Figure A: As-built survey
- Figure B: Habitat units
- Figure C: Mitigation Plan
- Figure D: Monitoring plan
- Figure E: Hydrology Map
- Photos Point Photos
- Hydrology Monitoring Photos

Appendix B – Vegetation Data, Plot Locations

APPENDIX A

Plans, Maps, and Ground-levels of Photos of Site

Figure A: As-Built Survey

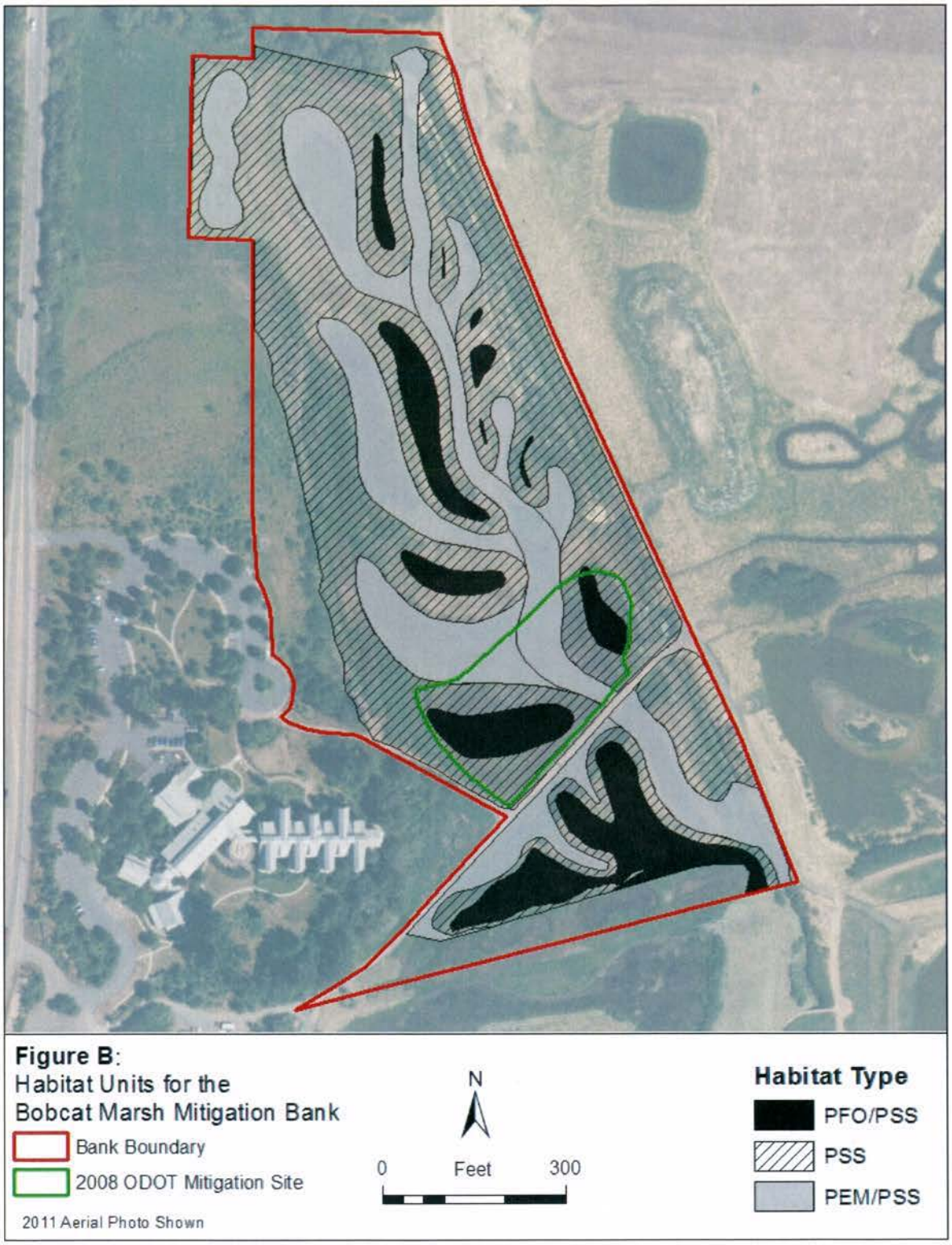

Figure B:
Habitat Units for the
Bobcat Marsh Mitigation Bank

Figure C:
Mitigation Plan for the
Bobcat Marsh Mitigation Bank

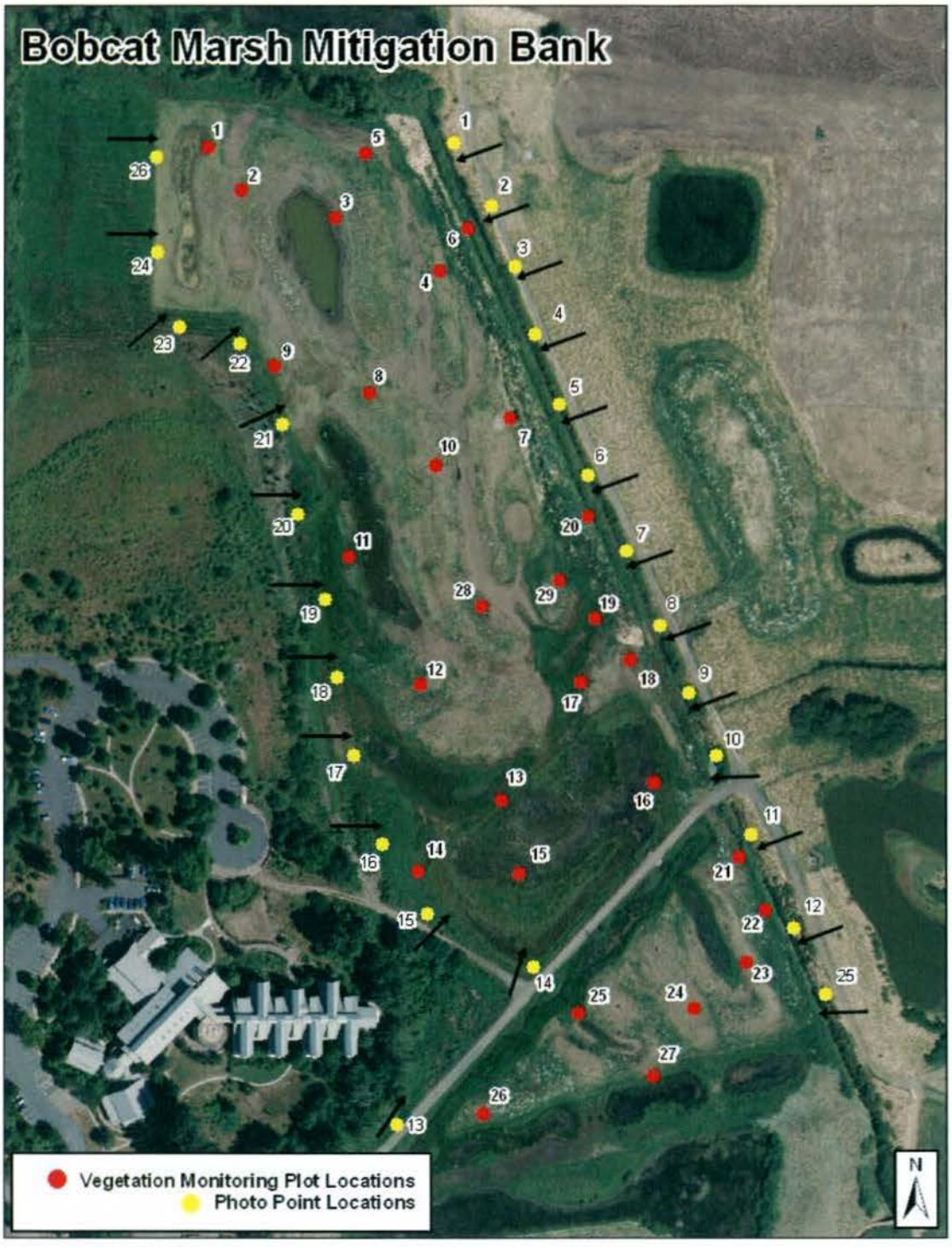

Figure D: Monitoring Points

Figure E: Aerial photo that shows the extent of inundation in March 2012, a time approximating early spring hydrology.

SITE PHOTOS

Bobcat Marsh Mitigation Bank - Photo Point

Photo-point 1: North end of mitigation site, looking west.

Photo-point 2: Looking west into mitigation site.

Photo-point 3: Looking west into mitigation site.

Photo-point 4: Looking west into mitigation site.

Photo-point 5: Looking west into mitigation site.

Photo-point 6: Looking west into mitigation site.

Photo-point 7: Looking west into mitigation site.

Photo-point 8: Looking west into mitigation site.

Photo-point 9: Looking west into mitigation site.

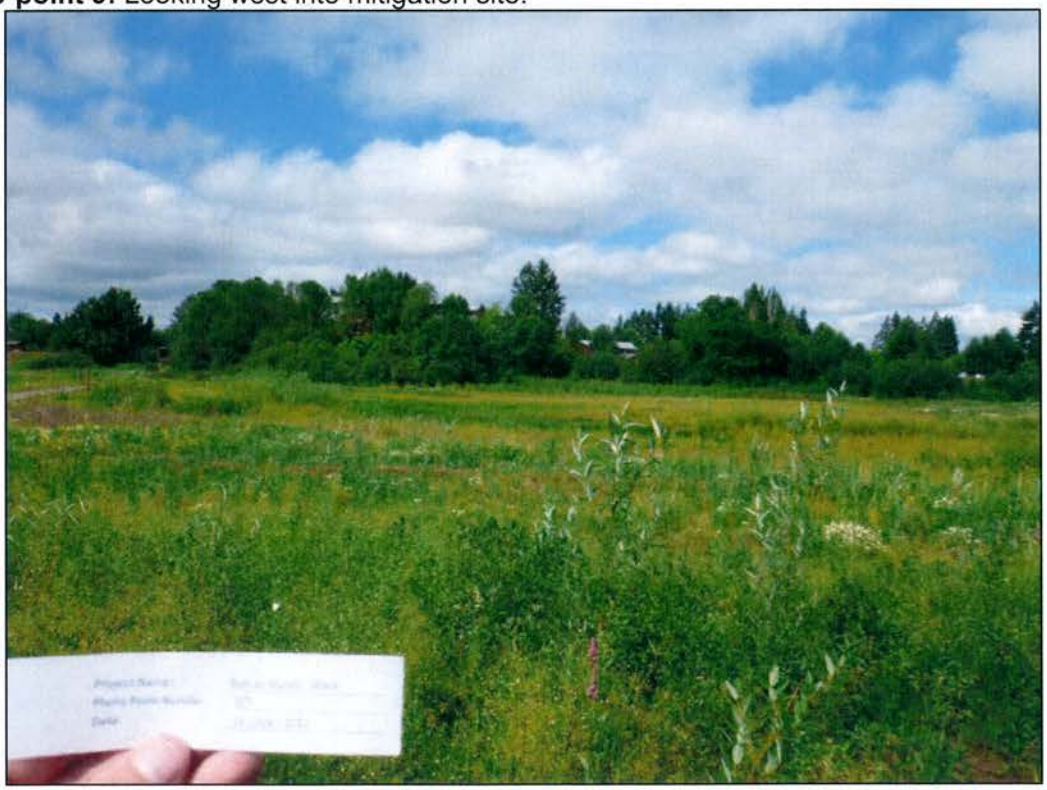

Photo-point 10: Looking west into mitigation site.

Photo-point 11: Looking west into mitigation site.

Photo-point 12: Looking west into mitigation site.

Photo-point 13: Looking northeast into mitigation site.

Photo-point 14: Looking Northeast into mitigation site.

Photo-point 15: Looking North into mitigation site.

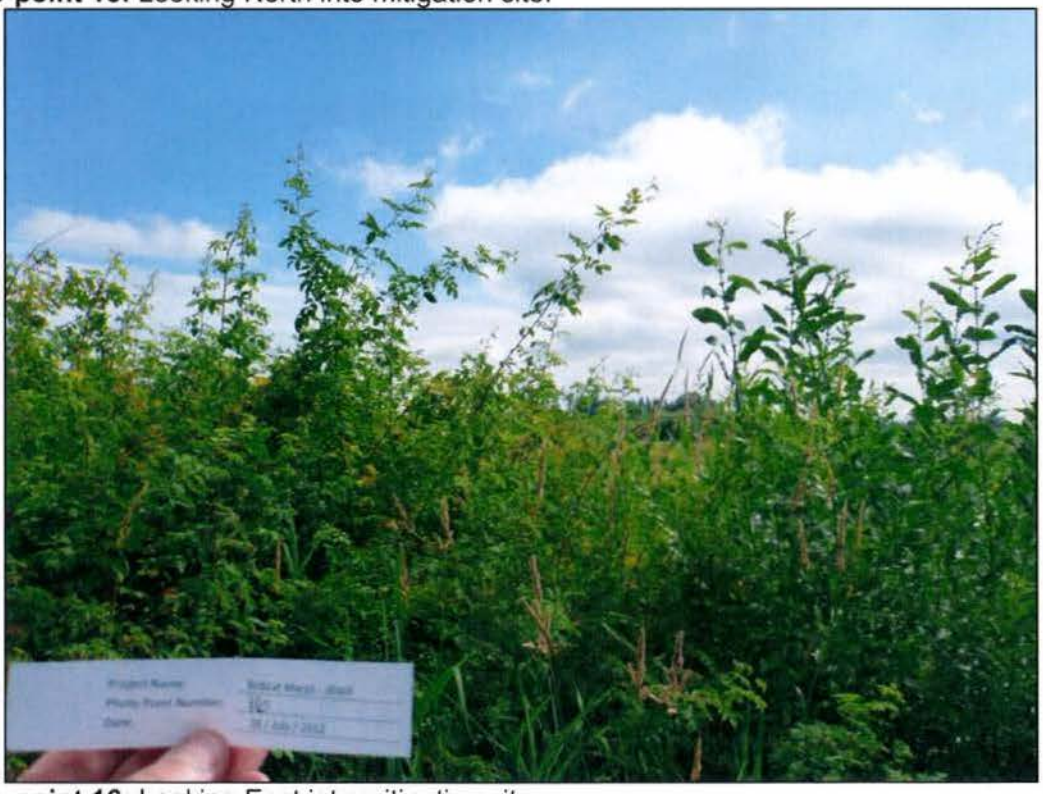

Photo-point 16: Looking East into mitigation site.

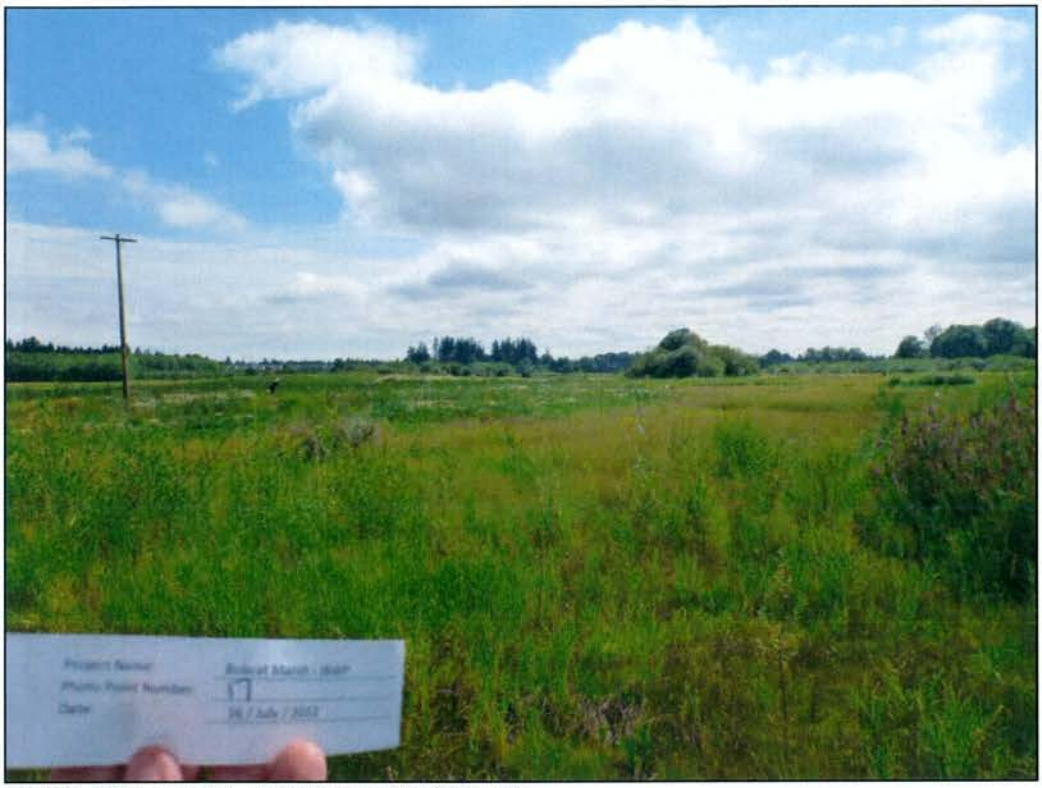

Photo-point 17: Looking East into mitigation site.

Photo-point 18: Looking East into mitigation site.

Photo-point 19: Looking East into mitigation site.

Photo-point 20: Looking East into mitigation site.

Photo-point 21: Looking East into mitigation site.

Photo-point 22: Looking northeast into mitigation site.

Photo-point 23: Looking northeast into mitigation site.

Photo-point 24: Looking east into mitigation site.

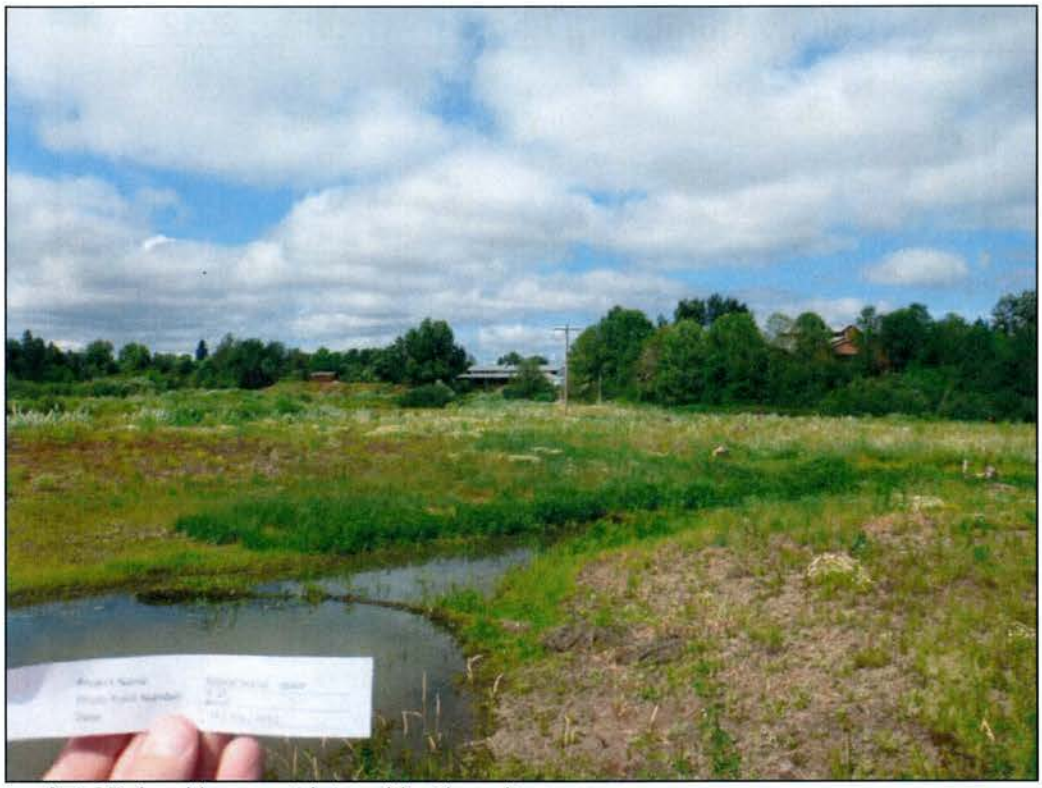

Photo-point 25: Looking west into mitigation site.

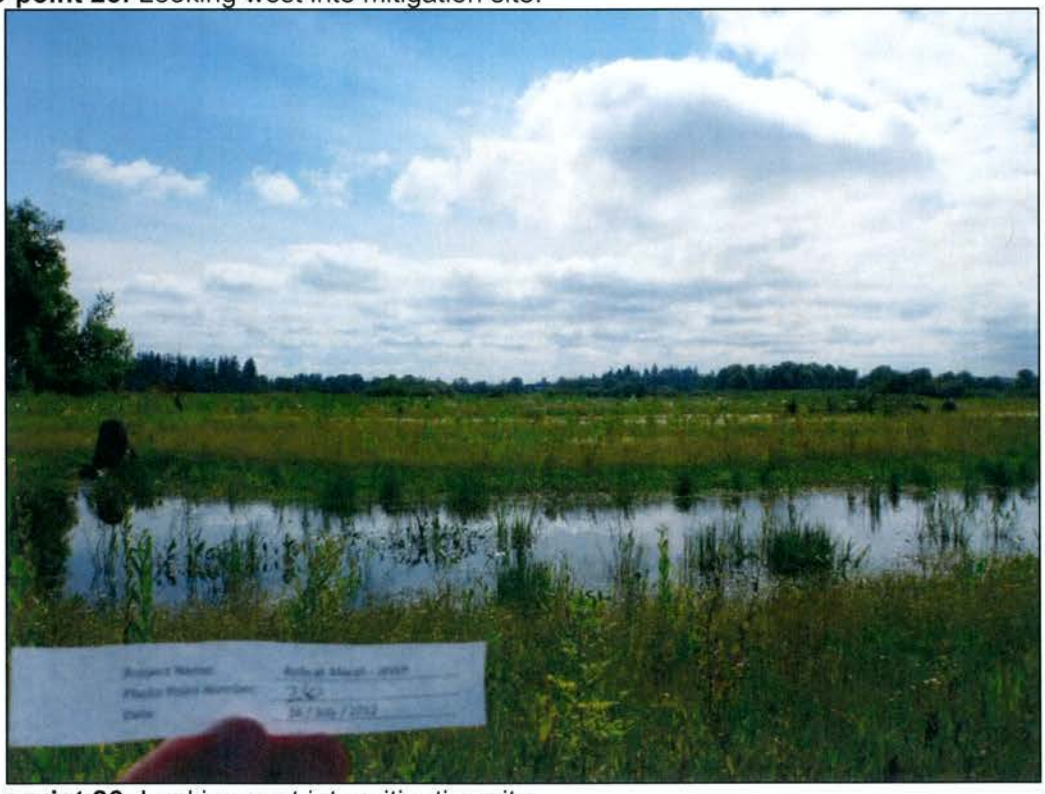

Photo-point 26: Looking east into mitigation site.

Hydrology Monitoring Photos – October, 2012

Hydrology Reference Photo #1

Hydrology Reference Photo #2

Hydrology Reference Photo #3

Hydrology Reference Photo #4

Hydrology Reference Photo #5

Hydrology Reference Photo #6

Hydrology Reference Photo #7

APPENDIX B

Vegetation Data and Plot Locations

Bobcat Marsh Vegetation Monitoring Data - July 11, 2012

Scientific Name	Common Name	Native (N) or Introduced (I)	Indicator status	Total % cover	% cover, emergent marsh only	% cover, upland habitat	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26
Alisma plantago aquatica	Broadleaf water-plaintain	N	1	39%	51%	9%	5%	50%	90%	30%				10%	5%				100%		20%	20%	100%			2%			100%	5%	5%	
Amsinckia menziesii var. intermedia	Common Fiddleneck	N	4	40%		40%					45%		60%					5%		20%										10%		100%
Bare Soil				31%	75%	20%	75%						7%			5%		4%											65%		
Beckmannia syzigachne	American sloughgrass	N	1																													
Bidens cernua	Nodding beggartick	N	2	45%		45%														80%						10%						
Carex pachystachya	Thick-head sedge	N	3	2%	2%					2%																						
Chrysanthemum leucanthemum	Oxeye daisy	NN	NL	10%		10%												10%						10%								
Conyza canadensis	Canadian horseweed	NN	4																													
Cyperus strigosus	Strawcolor flatsedge	N	2	1%	1%					1%																						
Deschampsia cespitosa	Tufted hairgrass	N	2																													
Echinochloa crusgalli	Large barnyard grass	NN	2	15%		15%								15%																		
Eleocharis ovata	Ovoid spikerush	N	1	64%	71%	50%		50%		70%				90%	100%		65%									10%						
Eleocharis palustris	Creeping spikerush	N	1	20%	20%		10%		30%										20%													
Epilobium watsonii	Watson willowherb	N	2																													
Glyceria occidentalis	Northwestern mannagrass	N	1																													
Gnaphalium palustre	Western marsh cudweed	N	3	46%	5%	53%				5%		90%	30%					80%						80%				30%		10%		
Hieracium canadense	Hawkweed	NN	NL	8%		8%										5%											10%					
Juncus bufonius	Toad rush	N	2																													
Lactuca serriola	Prickly lettuce	NN	4																													
Lotus corniculatus	Birdsfoot trefoil	I	3	4%		4%					1%							1%												10%		
Lotus purshianus	Spanish clover	N	NL	10%		10%																		10%								
Ludwigia palustris	Marsh seedbox	N	1	95%	95%			95%																								
Madia elegans	Common madia	N	NL																													
Mentha pulegium	Pennyroyal	NN	1																													
Phalaris arundinacea	Reed canarygrass	I	2	13%	40%	6%					1%	5%	1%				40%			20%						2%	10%	2%			40%	
Plagiobothrys figuratus	Fragrant popcornflower	N	2	80%		80%										90%										90%	60%					
Polygonum hydropiper	Waterpepper	NN	2	50%	50%					50%																						
Polygonum persicaria var. persicaria	Ladysthumb	NN	2	1%		1%																			1%							
Rorippa islandica	Marsh yellow cress	N	NL	50%		50%					80%	10%	2%												100%	90%		20%				
Rumex crispus	Curly dock	NN	3																													
Rumex occidentalis var. labradoricus	Western dock	NN	3	1%		1%					1%																					
Sagittaria latifolia	Wapato	N	1	25%	33%	1%	10%		30%													1%									60%	
Sparganium emersum	Narrowleaf burreed	N	1	90%	80%	100%															80%	100%										
Total Cover				**108%**			25%	195%	150%	158%	128%	105%	93%	115%	105%	95%	105%	96%	120%	120%	100%	121%	100%	100%	101%	114%	110%	112%	100%	35%	105%	100%
% Bare Ground				**6%**			75%	0%	0%	0%	0%	0%	7%	0%	0%	5%	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	65%	0%	0%
% of vegetative cover in native species				**87%**			25%	195%	150%	108%	45%	90%	90%	100%	105%	90%	65%	85%	120%	100%	100%	121%	100%	90%	0%	22%	90%	90%	100%	25%	65%	100%
% of vegetative cover in introduced species				**9%**			0%	0%	0%	50%	3%	5%	1%	15%	0%	5%	40%	11%	0%	20%	0%	0%	0%	10%	1%	2%	20%	2%	0%	10%	40%	0%
% of vegetative cover in introduced species (excluding RCG)				**4%**			0%	0%	0%	50%	2%	0%	0%	15%	0%	5%	0%	11%	0%	0%	0%	0%	0%	10%	1%	0%	10%	0%	0%	10%	0%	0%
% native cover, emergent marsh		**Native**	**103%**																													
nvasive cover (including RCG), emergent marsh		**Invasive**	**12%**																													
nvasive cover (Excluding RCG), emergent marsh		**Invasive**	**5%**																													
% bare substrate		**Bare**	**7%**																													
% native cover, shrub		**Native**	**76%**																													
% invasive cover, shrub		**Invasive**	**7%**																													
% bare substrate, shrub		**Bare**	**5%**																													

Prevalence Index	sample mean	standard deviation	square root of (# sample units)	standard error	standard error (t-factor for 80% CI)	mean+ standard error	mean- standard error
% cover native species, emergent marsh	**103%**	**41%**	**5.385164807**	**8%**	10%	113%	93%
% cover invasive species, emergent marsh	**12%**	**20%**	**5.385164807**	**4%**	5%	17%	7%
% cover invasive species, excluding canary grass, emergent marsh	**5%**	**15%**	**5.385164807**	**3%**	4%	9%	1%
% cover bare soil, emergent marsh	**7%**	**43%**	**5.385164807**	**8%**	10%	17%	-3%
% native cover, shrub	**76%**	**35%**	**5.385164807**	**7%**	8%	84%	68%
% invasive cover, shrub	**7%**	**7%**	**5.385164807**	**1%**	2%	9%	5%
% cover bare soil, shrub	**5%**	**20%**	**5.385164807**	**4%**	5%	10%	0%

Bobcat Marsh Vegetation Monitoring Data - July 11, 2012

Species		Native (N) or Introduced (I)	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29
Trees																														
Fraxinus latifolia	Oregon Ash	N	1	5		2	3	3	2	9	7	6	1	13		1				1	1	5		6		9	4	1	1	4	5
Populus trichocarpa	Black Cottonwood	N		1		1	2			2	2	2	1	7							1		3	2		21	1	11	2	11	11
Crataegus douglasii	Black Hawthorn	N																					2	10		3				1	
Total Live Trees			**1**	**6**	**0**	**3**	**5**	**3**	**2**	**11**	**9**	**8**	**2**	**20**	**0**	**1**	**0**	**0**	**0**	**1**	**2**	**5**	**5**	**18**	**0**	**33**	**5**	**12**	**3**	**16**	**16**
Shrubs																														
Cornus stolonifera	Red-osier Dogwood	N		3				1		4	3	15	1	3		2						3	5	4	2		6	7	1		6
Lonicera involucrata	Black twinberry	N										3		1									3	1		17	2		2	8	
Physocarpus capitatus	Pacific Ninebark	N																												1	
Rosa pisocarpa	Cluster/ Swamp Rose	N		1		14		10	2	4	1	7	1	14		2				12	6	14	17	26		22	5	4	1	12	6
Salix lasiandra	Pacific Willow	N	13	12	12	20	2	16	12	12	24	12	11	12		2		1		22	22	3	3	1		4	26	12	34	10	12
Salix piperi	Piper Willow	N		2		2		5	9	3		4	8	3		10				1	2	1	2						5		6
Salix scouleriana	Scouler Willow	N	1	4		1	11		5			1	4							3	4		5			8	3	3		8	1
Salix sitchensis	Sitka Willow	N	2	2		1			6	3	2	3	1	4						1		2				1	1	3		1	1
Spiraea douglasii	Douglas Spirea	N	4	1		5		17	9	6	7	9	2	9	9	3		1		7	13	8	3		3	2	3	8	2		9
Total Live Shrubs			**20**	**25**	**12**	**43**	**13**	**49**	**43**	**32**	**37**	**54**	**28**	**46**	**9**	**17**	**0**	**2**	**0**	**46**	**47**	**31**	**38**	**32**	**5**	**54**	**46**	**39**	**43**	**40**	**41**
Total Number of Stems:			**21**	**31**	**12**	**46**	**18**	**52**	**45**	**43**	**46**	**62**	**30**	**66**	**9**	**18**	**0**	**2**	**0**	**47**	**49**	**36**	**43**	**50**	**5**	**87**	**51**	**51**	**46**	**56**	**57**
Stems per Acre:			**756**	**1116**	**432**	**1656**	**648**	**1872**	**1620**	**1548**	**1656**	**2232**	**1080**	**2376**	**324**	**648**	**0**	**72**	**0**	**1692**	**1764**	**1296**	**1548**	**1800**	**180**	**3132**	**1836**	**1836**	**1656**	**2016**	**2052**
Average Stems per Acre:		**1339**																												

Species		Native (N) or Introduced (I)	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29
Trees																														
Fraxinus latifolia	Oregon Ash	N	1.0%	3.0%		1.0%	1.0%	1.0%	0.5%	2.0%	2.0%	2.0%	0.5%	3.0%		1.0%				0.5%	0.5%	0.5%		0.5%		2.0%	0.5%	0.5%	0.5%	0.5%	0.5%
Populus trichocarpa	Black Cottonwood	N		0.5%		0.5%	1.0%	1.0%		0.5%	0.5%	0.5%	0.5%	1.0%							0.5%		0.5%	1.0%		3.0%	0.5%	3.0%	0.5%	3.0%	3.0%
Crataegus douglasii	Black Hawthorn	N																					0.5%	2.0%		0.5%				0.5%	
Percent Cover Live Trees			**1.0%**	**3.5%**	**0.0%**	**1.5%**	**2.0%**	**2.0%**	**0.5%**	**2.5%**	**2.5%**	**2.5%**	**1.0%**	**4.0%**	**0.0%**	**1.0%**	**0.0%**	**0.0%**	**0.0%**	**0.5%**	**1.0%**	**0.5%**	**1.0%**	**3.5%**	**0.0%**	**5.5%**	**1.0%**	**3.5%**	**1.0%**	**4.0%**	**3.5%**
Shrubs																														
Cornus stolonifera	Red-osier Dogwood	N		0.5%				0.5%		1.0%	0.5%	3.0%	0.5%	1.0%		4.0%						0.5%	1.0%	0.5%	0.5%		0.5%	0.5%	0.5%		1.0%
Lonicera involucrata	Black twinberry	N																								2.0%	0.5%			2.0%	
Physocarpus capitatus	Pacific Ninebark	N										0.5%		1.0%									0.5%	0.5%				0.5%		0.5%	
Rosa pisocarpa	Cluster/ Swamp Rose	N		0.5%		2.0%		2.0%	0.5%	1.0%	0.5%	3.0%	0.5%	4.0%		2.0%				2.0%	2.0%	2.0%	4.0%	5.0%		4.0%	0.5%	0.5%	0.5%	3.0%	2.0%
Salix lasiandra	Pacific Willow	N	3.0%	3.0%	2.0%	10.0%	1.0%	8.0%	6.0%	8.0%	8.0%	4.0%	4.0%	5.0%				0.5%		4.0%	4.0%	0.5%	0.5%	0.5%		0.5%	10.0%	4.0%	10.0%	4.0%	6.0%
Salix piperi	Piper Willow	N		1.0%		1.0%		1.0%	2.0%	1.0%		1.0%	4.0%	1.0%		8.0%				0.5%	1.0%	0.5%	0.5%						0.5%		0.5%
Salix scouleriana	Scouler Willow	N	1.0%	3.0%		0.5%	5.0%		1.0%			0.5%	2.0%							1.0%	1.0%		1.0%			1.0%	0.5%	0.5%		2.0%	0.5%
Salix sitchensis	Sitka Willow	N	1.0%	1.0%		0.5%			1.0%	1.0%	0.5%	0.5%	0.5%	1.0%						0.5%		0.5%				0.5%	0.5%	0.5%		0.5%	0.5%
Spiraea douglasii	Douglas Spirea	N	3.0%	0.5%		2.0%		4.0%	3.0%	2.0%	3.0%	4.0%	0.5%	3.0%	2.0%	2.0%		0.5%		2.0%	3.0%	1.0%	0.5%		0.5%	0.5%	0.5%	3.0%	0.5%		2.0%
Percent Cover Live Shrubs			**8.0%**	**9.5%**	**2.0%**	**16.0%**	**6.0%**	**15.5%**	**13.5%**	**14.0%**	**12.5%**	**16.5%**	**12.0%**	**16.0%**	**2.0%**	**16.0%**	**0.0%**	**1.0%**	**0.0%**	**10.0%**	**11.0%**	**5.0%**	**8.0%**	**6.5%**	**1.0%**	**8.5%**	**13.0%**	**9.5%**	**12.0%**	**12.0%**	**12.5%**
Total Percent Cover			**9.0%**	**13.0%**	**2.0%**	**17.5%**	**8.0%**	**17.5%**	**14.0%**	**16.5%**	**15.0%**	**19.0%**	**13.0%**	**20.0%**	**2.0%**	**17.0%**	**0.0%**	**1.0%**	**0.0%**	**10.5%**	**12.0%**	**5.5%**	**9.0%**	**10.0%**	**1.0%**	**14.0%**	**14.0%**	**13.0%**	**13.0%**	**16.0%**	**16.0%**

Total Average % Cover of Woody Vegetation:	11.0%
Total Average % Cover of Trees:	1.7%
Total Average % Cover of Shrubs:	9.3%

Prevalence Index	sample mean	standard deviation	square root of (# sample units)	standard error	standard error(t-factor for 80% CI)	mean+ standard error	mean- standard error
% cover woody vegetation	**11%**	**6%**	**5.385164807**	1%	1%	12%	10%
# live stems	**2**	**1**	**5.385164807**	0	0	2	2

Bobcat Marsh Vegetation Monitoring Data - September 13, 2012

Scientific Name	Common Name	Native (N) or Introduced (I)	Indicator status	Total % cover	% cover, emergent marsh only	% cover, upland habitat	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29
Alisma plantago aquatica	Broadleaf water-plaintain	N	1	28%	35%	1%	30%	15%	15%	30%					5%				80%		5%	1%	100%			1%									
Amsinckia menziesii var. intermedia	Common Fiddleneck	N	4	20%		20%														20%		19%													
Bare Soil				30%	24%	33%	40%		44%			11%	50%	3%	5%	65%				14%		15%			15%	20%	25%	2%			90%			16%	20%	73%
Beckmannia syzigachne	American sloughgrass	N	1	1%		1%								0.5%																					
Bidens cernua	Nodding beggartick	N	2	29%		29%														80%						2%				4%					
Carex pachystachya	Thick-head sedge	N	3	1%	1%					0.5%																									
Cirsium arvense	Canadian thistle	I	4	15%		15%																													15%
Chrysanthemum leucanthemum	Oxeye daisy	NN	NL	5%		5%					2.5%	0.5%				5%		10%																	
Conyza canadensis	Canadian horseweed	NN	4	19%		19%					2.5%	10%						40%						20%		1%							40%		
Cyperus strigosus	Strawcolor flatsedge	N	2																																
Deschampsia cespitosa	Tufted hairgrass	N	2	1%	1%	1%				0.5%				0.5%																					
Echinochloa crusgalli	Large barnyard grass	NN	2	3%		3%								3%																					
Eleocharis ovata	Ovoid spikerush	N	1	46%	46%	45%	5%	40%	30%	50%				45%	90%		60%																		
Eleocharis palustris	Creeping spikerush	N	1	7%	7%		10%		5%										5%																
Epilobium watsonii	Watson willowherb	N	2	10%	10%																								10%						
Glyceria occidentalis	Northwestern mannagrass	N	1	2%	2%					2%																									
Gnaphalium palustre	Western marsh cudweed	N	3	28%	20%	30%						30%						40%						40%				10%	20%						
Hieracium canadense	Hawkweed	NN	NL	5%		5%										5%																			
Juncus bufonius	Toad rush	N	2	45%		45%								45%																					
Lactuca serriola	Prickly lettuce	NN	4	5%		5%							5%																						
Lotus corniculatus	Birdsfoot trefoil	I	3	26%		26%					90%	2%	5%			5%								10%		5%	60%	10%		3%				70%	
Lotus purshianus	Spanish clover	N	NL	3%		3%								0.5%										5%											
Ludwigia palustris	Marsh seedbox	N	1	20%	20%			40%	1%	20%																									
Madia elegans	Common madia	N	NL	25%	55%	23%					5%		40%	0.5%		20%		20%								10%				3%	55%	100%	40%	0.5%	10%
Mentha pulegium	Pennyroyal	NN	1																																
Phalaris arundinacea	Reed canarygrass	I	2	20%	23%	18%		5%		2%		45%		2%			40%		1%	20%						4%	30%	45%	45%		45%		4%	10%	2%
Plagiobothrys figuratus	Fragrant popcornflower	N	2	25%		25%																					15%	35%							
Polygonum hydropiper	Waterpepper	NN	2	11%	21%	1%				1%		0.5%														2%			40%						
Polygonum persicaria var. persicaria	Ladysthumb	NN	2	10%		10%																			10%		10%							
Rorippa islandica	Marsh yellow cress	N	NL	40%		40%						0.5%													70%	50%									
Rumex crispus	Curly dock	NN	3	1%		1%						0.5%																							
Rumex occidentalis var. labradoricus	Western dock	NN	3																																
Sagittaria latifolia	Wapato	N	1	10%	10%		15%		5%																										
Sparganium emersum	Narrowleaf burreed	N	1																																
Trifolium repens L.	White clover	NN	3	54%	80%	40%															80%	80%				0.5%									
Total Cover				**85%**			60%	100%	56%	106%	100%	89%	50%	97%	95%	35%	100%	110%	86%	120%	85%	100%	100%	75%	80%	76%	115%	100%	115%	10%	100%	100%	84%	81%	27%
% Bare Ground				**18%**			40%	0%	44%	0%	0%	11%	50%	3%	5%	65%	0%	0%	14%	0%	15%	0%	0%	15%	20%	25%	2%	0%	0%	90%	0%	0%	16%	20%	73%
% of vegetative cover in native species				**52%**			60%	95%	56%	103%	5%	31%	40%	92%	95%	20%	60%	60%	85%	100%	5%	20%	100%	45%	70%	63%	15%	45%	30%	7%	55%	100%	40%	1%	10%
% of vegetative cover in Introduced species (including RCG)				**33%**			0%	5%	0%	3%	95%	59%	10%	5%	0%	15%	40%	50%	1%	20%	80%	80%	0%	30%	10%	13%	100%	55%	85%	3%	45%	0%	44%	80%	17%
% of vegetative cover in Introduced species (excluding RCG)				**22%**			0%	0%	0%	1%	95%	14%	10%	3%	0%	15%	0%	50%	0%	0%	80%	80%	0%	30%	10%	9%	70%	10%	40%	3%	0%	0%	40%	70%	15%

% native cover, emergent marsh	**Native**	**68%**
% invasive cover (including RCG), emergent marsh	**Invasive**	**24%**
% invasive cover (Excluding RCG), emergent marsh	**Invasive**	**11%**
% bare substrate	**Bare**	**11%**
% native cover, shrub	**Native**	**42%**
% invasive cover, shrub	**Invasive**	**38%**
% bare substrate, shrub	**Bare**	**22%**

Prevalence Index	sample mean	standard deviation	square root of (# sample units)	standard error	standard error (t-factor for 80% CI)	mean+ standard error	mean-standard error
% cover native species, emergent marsh	**68%**	**34%**	**5.385164807**	**6%**	8%	76%	60%
% cover invasive species, emergent marsh	**24%**	**33%**	**5.385164807**	**6%**	8%	32%	16%
% cover invasive species, excluding canary grass, emergent marsh	**11%**	**26%**	**5.385164807**	**5%**	6%	17%	5%
% cover bare soil, emergent marsh	**11%**	**16%**	**5.385164807**	**3%**	4%	15%	7%
% native cover, shrub	**42%**	**33%**	**5.385164807**	**6%**	8%	50%	34%
% invasive cover, shrub	**38%**	**33%**	**5.385164807**	**6%**	8%	46%	30%
% cover bare soil, shrub	**22%**	**33%**	**5.385164807**	**6%**	8%	30%	14%

Bobcat Marsh Vegetation Monitoring Data - September 13, 2012

Species		Native (N) or Introduced (I)	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29
Trees																														
Fraxinus latifolia	Oregon Ash	N	1	5		2	3	3	2	9	7	6	1	13		1				1	1	5		6		9	4	1	1	4	5
Populus trichocarpa	Black Cottonwood	N		1		1	2			2	2	2	1	7							1		3	2		21	1	11	2	11	11
Crataegus douglasii	Black Hawthorn	N																					2	10		3				1	
Total Live Trees			**1**	**6**	**0**	**3**	**5**	**3**	**2**	**11**	**9**	**8**	**2**	**20**	**0**	**1**	**0**	**0**	**0**	**1**	**2**	**5**	**5**	**18**	**0**	**33**	**5**	**12**	**3**	**16**	**16**
Shrubs																														
Cornus stolonifera	Red-osier Dogwood	N		3				1		4	3	15	1	3		2						3	5	4	2		6	7	1		6
Lonicera involucrata	Black twinberry	N																								17	2			8	
Physocarpus capitatus	Pacific Ninebark	N										3		1									3	1				2		1	
Rosa pisocarpa	Cluster/ Swamp Rose	N		1		14		10	2	4	1	7	1	14		2				12	6	14	17	26		22	5	4	1	12	6
Salix lasiandra	Pacific Willow	N	13	12	12	20	2	16	12	12	24	12	11	12			1			22	22	3	3	1		4	26	12	34	10	12
Salix piperi	Piper Willow	N		2		2		5	9	3		4	8	3		10				1	2	1	2						5		6
Salix scouleriana	Scouler Willow	N	1	4		1	11		5			1	4							3	4		5			8	3	3		8	1
Salix sitchensis	Sitka Willow	N	2	2		1			6	3	2	3	1	4						1		2				1	1	3		1	1
Spiraea douglasii	Douglas Spirea	N	4	1		5		17	9	6	7	9	2	9	9	3		1		7	13	8	3		3	2	3	8	2		9
Total Live Shrubs			**20**	**25**	**12**	**43**	**13**	**49**	**43**	**32**	**37**	**54**	**28**	**46**	**9**	**17**	**0**	**2**	**0**	**46**	**47**	**31**	**38**	**32**	**5**	**54**	**46**	**39**	**43**	**40**	**41**
Total Number of Stems:			**21**	**31**	**12**	**46**	**18**	**52**	**45**	**43**	**46**	**62**	**30**	**66**	**9**	**18**	**0**	**2**	**0**	**47**	**49**	**36**	**43**	**50**	**5**	**87**	**51**	**51**	**46**	**56**	**57**
Stems per Acre:			**756**	**1116**	**432**	**1656**	**648**	**1872**	**1620**	**1548**	**1656**	**2232**	**1080**	**2376**	**324**	**648**	**0**	**72**	**0**	**1692**	**1764**	**1296**	**1548**	**1800**	**180**	**3132**	**1836**	**1836**	**1656**	**2016**	**2052**
Average Stems per Acre:	**1339**																													

Species		Native (N) or Introduced (I)	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29
Trees																														
Fraxinus latifolia	Oregon Ash	N	1.0%	3.0%		1.0%	1.0%	1.0%	0.5%	2.0%	2.0%	2.0%	0.5%	3.0%		1.0%				0.5%	0.5%	0.5%		0.5%		2.0%	0.5%	0.5%	0.5%	0.5%	0.5%
Populus trichocarpa	Black Cottonwood	N		0.5%		0.5%	1.0%	1.0%		0.5%	0.5%	0.5%	0.5%	1.0%							0.5%		0.5%	1.0%		3.0%	0.5%	3.0%	0.5%	3.0%	3.0%
Crataegus douglasii	Black Hawthorn	N																					0.5%	2.0%		0.5%				0.5%	
Percent Cover Live Trees			**1.0%**	**3.5%**	**0.0%**	**1.5%**	**2.0%**	**2.0%**	**0.5%**	**2.5%**	**2.5%**	**2.5%**	**1.0%**	**4.0%**	**0.0%**	**1.0%**	**0.0%**	**0.0%**	**0.0%**	**0.5%**	**1.0%**	**0.5%**	**1.0%**	**3.5%**	**0.0%**	**5.5%**	**1.0%**	**3.5%**	**1.0%**	**4.0%**	**3.5%**
Shrubs																														
Cornus stolonifera	Red-osier Dogwood	N		0.5%				0.5%		1.0%	0.5%	3.0%	0.5%	1.0%		4.0%						0.5%	1.0%	0.5%	0.5%		0.5%	0.5%	0.5%		1.0%
Lonicera involucrata	Black twinberry	N																								2.0%	0.5%			2.0%	
Physocarpus capitatus	Pacific Ninebark	N										0.5%		1.0%									0.5%	0.5%				0.5%		0.5%	
Rosa pisocarpa	Cluster/ Swamp Rose	N		0.5%		2.0%		2.0%	0.5%	1.0%	0.5%	3.0%	0.5%	4.0%		2.0%				2.0%	2.0%	2.0%	4.0%	5.0%		4.0%	0.5%	0.5%	0.5%	3.0%	2.0%
Salix lasiandra	Pacific Willow	N	3.0%	3.0%	2.0%	10.0%	1.0%	8.0%	6.0%	8.0%	8.0%	4.0%	4.0%	5.0%				0.5%		4.0%	4.0%	0.5%	0.5%	0.5%		0.5%	10.0%	4.0%	10.0%	4.0%	6.0%
Salix piperi	Piper Willow	N		1.0%		1.0%		1.0%	2.0%	1.0%		1.0%	4.0%	1.0%		8.0%				0.5%	1.0%	0.5%	0.5%						0.5%		0.5%
Salix scouleriana	Scouler Willow	N	1.0%	3.0%		0.5%	5.0%		1.0%			0.5%	2.0%							1.0%	1.0%		1.0%			1.0%	0.5%	0.5%		2.0%	0.5%
Salix sitchensis	Sitka Willow	N	1.0%	1.0%		0.5%			1.0%	1.0%	0.5%	0.5%	0.5%	1.0%						0.5%		0.5%				0.5%	0.5%	0.5%		0.5%	0.5%
Spiraea douglasii	Douglas Spirea	N	3.0%	0.5%		2.0%		4.0%	3.0%	2.0%	3.0%	4.0%	0.5%	3.0%	2.0%	2.0%		0.5%		2.0%	3.0%	1.0%	0.5%		0.5%	0.5%	0.5%	3.0%	0.5%		2.0%
Percent Cover Live Shrubs			**8.0%**	**9.5%**	**2.0%**	**16.0%**	**6.0%**	**15.5%**	**13.5%**	**14.0%**	**12.5%**	**16.5%**	**12.0%**	**16.0%**	**2.0%**	**16.0%**	**0.0%**	**1.0%**	**0.0%**	**10.0%**	**11.0%**	**5.0%**	**8.0%**	**6.5%**	**1.0%**	**8.5%**	**13.0%**	**9.5%**	**12.0%**	**12.0%**	**12.5%**
Total Percent Cover			**9.0%**	**13.0%**	**2.0%**	**17.5%**	**8.0%**	**17.5%**	**14.0%**	**16.5%**	**15.0%**	**19.0%**	**13.0%**	**20.0%**	**2.0%**	**17.0%**	**0.0%**	**1.0%**	**0.0%**	**10.5%**	**12.0%**	**5.5%**	**9.0%**	**10.0%**	**1.0%**	**14.0%**	**14.0%**	**13.0%**	**13.0%**	**16.0%**	**16.0%**

Total Average % Cover of Woody Vegetation:	11.0%
Total Average % Cover of Trees:	1.7%
Total Average % Cover of Shrubs:	9.3%

Prevalence Index	sample mean	standard deviation	square root of (# sample units)	standard error	standard error(t-factor for 80% CI)	mean+ standard error	mean-standard error
% cover woody vegetation	**11%**	**6%**	**5.385164807**	1%	1%	12%	10%
# live stems	**37**	**22**	**5.385164807**	4	5	42	32

Data Plot Locations

Plots are marked in the field with a t-post painted pink and GPS coordinates collected using a GPS receiver with an accuracy of 3 meters.

Plot Number	*Longitude*	*Latitude*
1	-122.98973	45.50496
2	-122.98962	45.50492
3	-122.98900	45.50467
4	-122.98848	45.50456
5	-122.98882	45.50497
6	-122.98840	45.50469
7	-122.98801	45.50406
8	-122.98879	45.50407
9	-122.98903	45.50418
10	-122.98867	45.50872
11	-122.98892	45.50341
12	-122.98852	45.50293
13	-122.98797	45.50251
14	-122.98862	45.50219
15	-122.98777	45.50223
16	-122.98722	45.50251
17	-122.98763	45.50281
18	-122.98743	45.50272
19	-122.98759	45.50324
20	-122.98763	45.50367
21	-122.98669	45.50240
22	-122.98657	45.50211
23	-122.98663	45.50192
24	-122.98686	45.50176
25	-122.98743	45.50176
26	-122.98801	45.50130
27	-122.98715	45.50146
28	-122.98821	45.50326
29	-122.98794	45.50337