

Mud Slough Wetland Mitigation Bank - Phase 3

2009

Monitoring Report

Submitted by:
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June , 2009

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1.0 REGULATORY BACKGROUND

The purpose of this report is to summarize the progress of Phase 3 of the Mud Slough Wetland Mitigation Bank (Bank). The Bank is located in Polk County, Township 7S, Range 4W, Sections 20, Tax Lot 300. Phase 3 of the Bank is only a portion (78.9 acres) of the 413 acre tax lot. The address is 1875 N. Greenwood Road, in the City of Rickreall, Oregon. The MOA for Phase 3 was approved in July 2008. In December 2008, the first 30% (12.45 credits) were released for sale.

The primary goal(s) of the Bank are to enhance approximately 80 acres of cropped wetlands to emergent and wet prairie and restore approximately 1.5 acres of upland to wet prairie habitat. The total acreage of Phase 3 as determined by the as-built survey is 81.5 acres.

Bank credits:	<u>Acres</u>	<u>Mitigation Type</u>	<u>Credit Ratio</u>	<u>Credits Earned</u>
	80.0	Enhancement of cropped wetland	2:1	40.0
	<u>1.5</u>	Restoration	1:1	<u>1.5</u>
	81.5	Total Site		41.5

2.0 WORK SUMMARY

2.1 Site Grading

The initial herbicide application with *Round Up* occurred in November 2008. Additional applications were done in March and July 2008. The grading followed the third herbicide application in July 2008. The grading included removing the existing surface drain system and the construction of four low berms. The berms have a maximum height of two feet, with 10 foot wide tops with 10:1 side slopes. The average pond size created by the berms is 0.7 acres. Overflows are around the upper end of the dikes to avoid any erosion potential. All excavation work was done so that the area has a natural appearance with irregular boundaries and shape mimicking natural features. Two larger areas (approximately 5 and 6 acres) of shallow water/emergent zones were created in the naturally existing lower portions of the site.

2.2 Seeding and Planting

Grass and forb species were seeded October 1-8 with the tree and shrubs following in February 2009. Willow (*Salix spp.*) and Douglas spirea (*Spiraea douglasii*) cuttings were planted with the remainder of the tree and shrub species planted as bare root stock. Seed was applied by both drilling and broadcast in a zone planting for individual species to try and optimize the different hydrological zones (i.e. emergent, wet prairie). Phase 3 was seeded with a wide variety of species in particular forbes to increase the diversity of the plant species on site, and thereby also the wildlife that frequents it. All of the forb seed and much of the grass seed was obtained from the adjacent wetlands owned by the sponsor. The forested and shrub/shrub areas were planted with mixture of less aggressive

wetland herbaceous species to provide slightly less competition for the trees and shrubs. The shrub areas are scattered throughout Phase 3 in small plantings, mimicking naturally occurring shrub areas. Table 1 includes a list of species planted and amount.

Table 1 – Phase 3 Planted Species

<u>LATIN NAME</u>	<u>COMMON NAME</u>	<u>Number</u>	<u>CLASS</u>
<u>OVERSTORY & SHRUB</u>			
<i>Fraxinus latifolia</i>	Oregon ash	600	FACW
<i>Rosa nutkana</i>	Nootka rose	600	FAC
<i>Salix lasiandra</i>	Pacific willow	200	FACW
<i>Salix sitchensis</i>	Sitka willow	200	FACW
<i>Spiraea douglasii</i>	Douglas spirea	500	FACW
<i>Pyrus fusca</i>	Pacific crabapple	30	FAC
<u>HERBACEOUS SPECIES</u>			
		<u>LBS</u>	
<i>Asclepias speciosa</i>	Showy milkweed	<1/2	FAC
<i>Aster hallii</i>	Hall's aster	<1/2	FAC
<i>Bidens cernua</i>	Nodding beggars –tick	5	FACW
<i>Bidens frondosa</i>	Leafy beggars-tick	10	FACW
<i>Boisduvalia densiflora</i>	Dense spike-primrose	1 1/2	FACW
<i>Camassia quamash</i>	Common camas	6	FACW
<i>Carex densa</i>	Dense sedge	20	OBL
<i>Carex feta</i>	Green-sheath sedge	4	FACW
<i>Carex unilateralis</i>	One-sided sedge	20	FACW
<i>Downingia elegans</i>	Showy downingia	20	OBL
<i>Eleocharis ovata</i>	Ovoid spikerush	3	OBL
<i>Eriophyllum lanatum</i>	Wolly sunflower	<1/2	NOL
<i>Eryngium petiolatum</i>	Coyote thistle	10	OBL
<i>Grindelia intergrifolia</i>	Willamette V. gumweed	1	FACW
<i>Juncus nevadensis</i>	Nevada rush	5	FACW
<i>Juncus tenuis</i>	Slender rush	10	FACW
<i>Lomatium nudicaule</i>	Barestem desert-parsley	<1/2	NOL
<i>Lotus purshianus</i>	Spanish clover	2	NOL
<i>Lupinus polyphyllus</i>	Bigleaf lupine	1/2	FAC
<i>Plagiobothrys figuratus</i>	Fragrant popcorn flower	20	FACW
<i>Plagiobothrys scouleri</i>	Scoulers popcorn flower	2	FACW
<i>Potentilla gracilis</i>	Slender cinquefoil	1	FAC
<i>Prunella vulgaris</i>	Self-heal	1	FACU
<i>Scirpus americanus</i>	Bulrush	2	OBL
<i>Sidelcea nelsoniana</i>	Nelson's checker-mallow	2	FAC
<u>GRASS SPECIES</u>			
<i>Agrostis exarata</i>	Spike bentgrass	3	FACW

<i>Alopecurus geniculatus</i>	Water foxtail	6	OBL
<i>Beckmannia syzigachne</i>	American sloughgrass	100	OBL
<i>Danthonia californica</i>	California oatgrass	20	FACU
<i>Deschampsia cespitosa</i>	Tufted hairgrass	8	FACW
<i>Deschampsia elongata</i>	Slender hairgrass	6	FACW
<i>Glyceria occidentalis</i>	Western mannagrass	½	OBL
<i>Hordeum brachyantherum</i>	Meadow barley	30	FACW

2.3 Weed control and Maintenance

Extensive spot spraying and roughing of individual plants and seed heads has been conducted on site beginning in February 2009. Targeted species included annual ryegrass (*Lolium multiflorum*), tall fescue (*Festuca arundinacea*), meadow foxtail (*Alopecurus pratensis*), annual bluegrass (*Poa annua*), rough bluegrass (*Poa trivialis*), hairy vetch (*Vicia hirsuta*), mouse-ear chickweed (*Cerastium vulgatum*) and velvet grass (*Holcus lanatus*). Annual non-native forbes were not targeted since spraying to those species would increase the exposure of the native annuals and perennial forbes to the herbicide. The annual non-native forbes will decrease in abundance as the other more desirable species become more abundant.

2.4 Planned Future Work

In addition to the routine spot spraying and roughing of non-native species, two minor berm improvements are planned for July 2009. This includes slightly extending out one berm and overflow to help prevent water from going around the edge of the berm. This will prevent erosion around the ends of the berm. The second activity is removing a section of tile that is seeping slightly from the far west impoundment.

3.0 AS-BUILT PLANS

The as-built plans were submitted to DSL and the ACOE in December 2008.

4.0 HYDROLOGY PERFORMANCE STANDARDS, METHODOLOGY, AND RESULTS

4.1 PERFORMANCE STANDARDS

The hydrology objective is to create areas that will hold precipitation to create seasonal saturation and inundation and meet the criteria defined in the 1987 Corps of Engineers Wetlands Delineations Manual (1987 Wetland Delineation Manual).

4.2 METHODOLOGY:

A one time hydrology delineation designed to meet the requirements of the 1987 Wetland Delineation Manual will be performed. This delineation will include paired plots concentrating along the wetland boundary, any areas dominated by upland vegetation, and any high areas to indicate the exact location of the

wetland boundary. The paired plots will be evaluated using soil probes or pits. In addition to plot data, these areas will be visually documented with photographs to show a dominance of wetland species. The wetland boundary will then be displayed on a site map to confirm acreage achieving the performance measure.

4.3 RESULTS

Delineation: No delineation was needed for Phases 1 and 2. As a result, the need to conduct the delineation for Phase 3 was overlooked until too late in the year, but will be conducted in 2010.

5.0 VEGETATION PERFORMANCE STANDARDS, METHODOLOGY AND RESULTS

5.1. Performance Standards

A. Emergent Herbaceous

1. A minimum of 55% of the relative plant cover is comprised of native species. These densities will be a combination of planted individuals and natural recruitment.
2. No more than 15% of the relative plant cover is comprised of non-native invasive species as defined below.
3. The wetland's moisture index is less than 3.0.
4. By year 5, there will be a minimum of 4 obligate species represented in the monitoring plots.

*Non-native invasive species to be included: reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), Himalayan blackberry (*Rubus discolor*), Japanese knotweed (*Polygonum cuspidatum*), Eurasian water milfoil (*Myriophyllum spicatum*), climbing nightshade (*Solanum dulcamara*), yellow-flag iris (*Iris pseudacorus*), Queen Anne's lace (*Daucus carota*), Canadian thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), orchard grass (*Dactylis glomerata*), annual ryegrass (*Lolium multiflorum*), penny royal (*Mentha pelugium*), and spatulaleaf loosestrife (*Lythrum portula*).

B. Wetgrass Prairie

1. At least 10 wetgrass prairie species are present
2. Tufted hairgrass (*Deschampsia cespitosa*) is represented by 5% or greater relative plant cover in year 1 and 25% by year 5.
3. At least 50% of the relative plant cover is comprised of native species. These densities will be a combination of planted individuals and natural recruitment.
4. No more than 15% of the relative plant cover is comprised of non-native invasive species as defined above.
5. The prairie's moisture index should be between 2.0 and 3.0.
6. No more than 5% relative plant cover is composed of shrubs or trees.

C. Overstory and Scrub-Shrub

1. Relative plant cover, of all layers, is comprised of a minimum of 55% native species.
2. The moisture index is equal or less than 3.0.
3. There will be a minimum of 150 trees per acre and 300-400 shrubs per acre in all years 1-5.
4. No more than 5% of the relative live stem count should be comprised of non-native species.
5. These densities will be a combination of planted individuals and natural recruitment.
6. No more than 15% of the relative plant cover, of all layers, is comprised of non-native invasive species.

5.2 Methodology

Transect and sample plot locations were laid out in a stratified arrangement with approximately 300' between each transect and sample plot. Due to the low percentage of overstory and shrub areas, two additional plots within the overstory/shrub areas were added to provide better coverage. The transects run east to west on the west side of the railroad, and north to side on the east side of the railroad. The starting point of the sample plots was staggered in order to cover a broader area. The sample plots are permanently identified in the field and are plotted on a site map. One plot (#41) is outside of the mapped transects was included to monitor the small 1.5 acre upland portion of the site, which did not fall within plots transects (See Attachment A - Monitoring Point Location Map).

Each sample point is the center of a circular plot, the diameter of which is a ten feet for the herbaceous layer and 30 feet for the scrub/shrub and overstory layers, with center point for the herbaceous, shrub and overstory radius being the same. Each sample plot was evaluated for species, indicator status, native/non-native and invasive status, and the percent cover of each species present.

The number of sample plots within each plant community was evaluated to determine if this number of plots was sufficient, using a species area curve. Separate species-area curves were developed for emergent and wetgrass prairie but not the overstory and scrub-shrub due to low plot numbers.

Established site photo stations will be used in each of the monitoring years to provide a visual record of the overall health and diversity of the wetland vegetation. Six photo station locations are included on the Site Plan.

5.3 VEGETATION MONITORING RESULTS

Vegetation monitoring was conducted on May 29 and June 1, 2009 by Mark Knaupp. Attachment 2 includes spread sheets with the results of the sampling. The spread sheets include a complete listing of all plant species identified in the Bank. Forty-four monitoring plots were examined. The data spread sheets include the botanical names, common names, indicator status, origin (native or non-native), moisture index, and if it was planted or a volunteer species.

During the May/June 2009 monitoring, 106 plant species were identified in the Bank. Of the species present over half (60) were native and accounted for well over 90% of the vegetation cover. Thirty-eight wet prairie/vernal pool species were identified on site. Some of the more aggressive non-native species have been heavily targeted with spot spray but other less aggressive annual non-native forbes were not targeted since spraying for those species would increase the exposure of the native annuals and perennial forbes to the herbicide.

5.3.1 Emergent Vegetation

Currently plots 1, 2, 3, 4, 24, 25, 32, and 33 are classified as emergent plots. As the site ages some of these plots could be reclassified as wet prairie and/or perhaps currently classified wet prairie plots could be reclassified as emergent. This initial classification was based on the mapping and planned vegetation and hydrologic regimes.

Twenty-two native species were identified in the emergent plots with by far the most abundant species being showy downingia (*Downingia elegans*) at 46%. The next two most abundant species are purslane speedwell (*Veronica peregrine*) and fragrant popcorn flower (*Plagiobothrys figuratus*). It is assumed that as the site ages, the diversity within this area will change. Downingia will remain a primary component of the emergent wetland but will decrease in relative abundance.

Required: A minimum of 55% of the relative plant cover is comprised of native species. These densities will be a combination of planted individuals and natural recruitment. -- *Met, The emergent plots are comprised of 93.75% native species.*

Required: No more than 15% of the relative plant cover is comprised of non-native invasive species --*Met with 0% of non-native invasive species. There are 2 non-native invasive species present (bull thistle and annual ryegrass), but only in trace amounts.*

Required: The wetland's moisture index is less than 3 --*Met with an average moisture index of 1.47.*

Required: By year 5, there will be a minimum of 4 obligate species represented in the monitoring plots --*Met, there are 7 obligate species in the monitoring plots, with 4 of those in greater than trace amounts, and it is only year 1.*

5.3.2 Wetland Prairie

Native herbaceous cover averaged 93.2% throughout the wetland prairie with 25 native species identified in the 31 prairie plots. The two most abundant forbs are fragrant popcorn flower (*Plagiobothrys figuratus*) at 31.3% and purslane speedwell (*Veronica peregrine*) at 22.5%. The two most common grass species are meadow barley (*Hordeum brachyantherum*) at 9.4% and slender hairgrass (*Deschampsia elongata*) at 8.4 %.

The performance criteria for **wetland prairie** was met for 4 of the 6 requirements.

Required: At least 10 wetgrass prairie species are present *Met. Twenty wet grass prairie/vernal pool species have been identified within the prairie plots.*

Required: Tufted hairgrass (*Deschampsia cespitosa*) is represented by 5% or greater relative plant cover in year 1 and 25% by year 5. **Not met.** Tufted hairgrass was present in trace amounts in 28 of the 32 the wet prairie plots, it does not however, reach the targeted 5% cover. The sponsor is not concerned by this percentage as experience has shown that the hairgrass becomes more dominant with several years of growth.

Required: At least 50% of the relative plant cover is comprised of native species. **Met.** Native species accounted for 93.2% of the vegetative cover.

Required: No more that 15% of the relative plant cover is comprised of non-native invasive species. **Met with 0% of non-native invasive species.** There are 3 non-native invasive species present (bull thistle, Queen Anne's lace, and annual ryegrass), but only in trace amounts.

Required: The wetland prairie moisture index is between 2.0 and 3.0. **Not Met.** The average moisture index is slightly low at 1.84. This will be monitored in future years to determine is some plots should eventually be considered emergent rather than wet prairie.

Required: No more than 5% relative plant cover is comprised of shrubs or trees. **Met.** No trees or shrubs occurred in the wet prairie.

5.3.3 Shrub and Forest

Oregon ash (*Fraxinus latifolia*) was planted and has done well, but the volunteer ash has done exceedingly well. Many of the volunteers will not survive, but even with the anticipated die off, it may be necessary to selectively eliminate others to prevent encroachment into the wet prairie. Two forest/shrub plots (#42 and #43) were added to the monitoring points to provide better coverage of the forest/shrub areas as the initial random plots did not adequately cover the small size of the shrub/forest area. The herbaceous cover of these two plots will be included in the monitoring next year.

Required: Relative plant cover, of all layers, is comprised of a minimum of 55% native species. **Met, with 95% of the herbaceous and 100% of the tree and shrub cover being native.**

Required: There will be a minimum of 150 trees per acre and 300-400 shrubs per acre in all years 1-5. **Met with mean trees per acres of 7,835 (includes the seedlings) or 123 without seedlings. The average shrubs per acre is 894.**

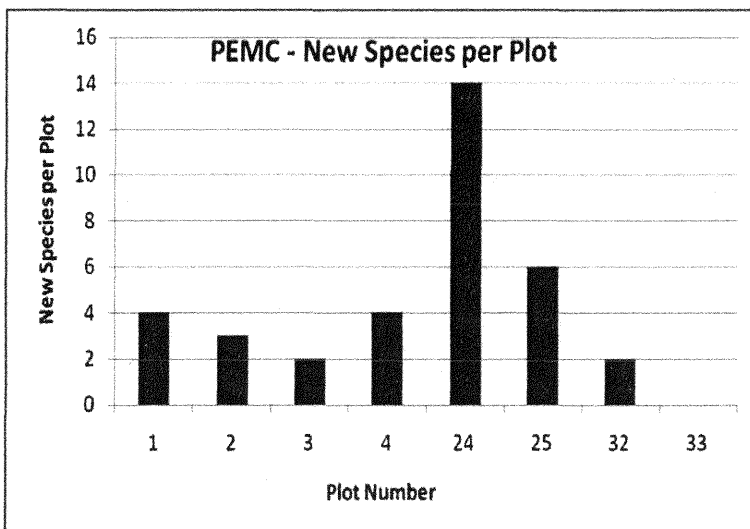
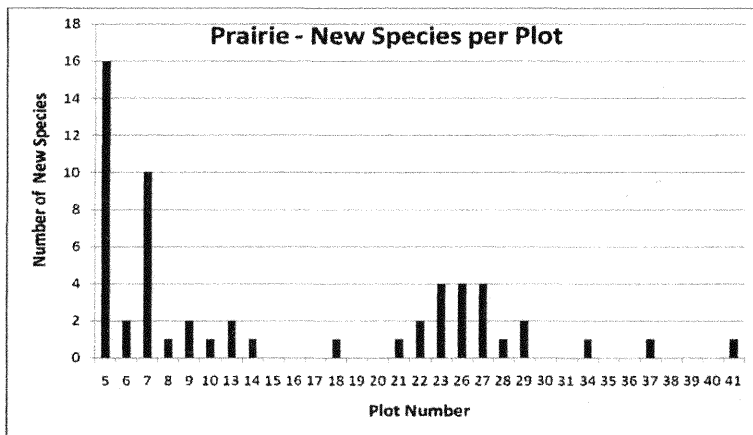
Required: No more than 5% of the relative live stem count should be comprised of non-native species. **Met, with 0% of the live stem count comprised of non-native species.**

Required: No more than 15% of the relative plant cover, of all layers, is comprised of non-native invasive species. *Met, with 0% of non-native invasive species.*

Required: The wetland's moisture index is less than 3. *Met, with an average moisture index of 1.44.*

6.0 SPECIES AREA CURVE

The number of sample plots was evaluated to determine if the number of plots is sufficient, using a species area curve. A species area curve was analyzed for both the wet prairie and emergent wetland. A curve was not analyzed for the forest/shrub plots due to the low number of plots.



7.0 PHOTO POINT MONITORING

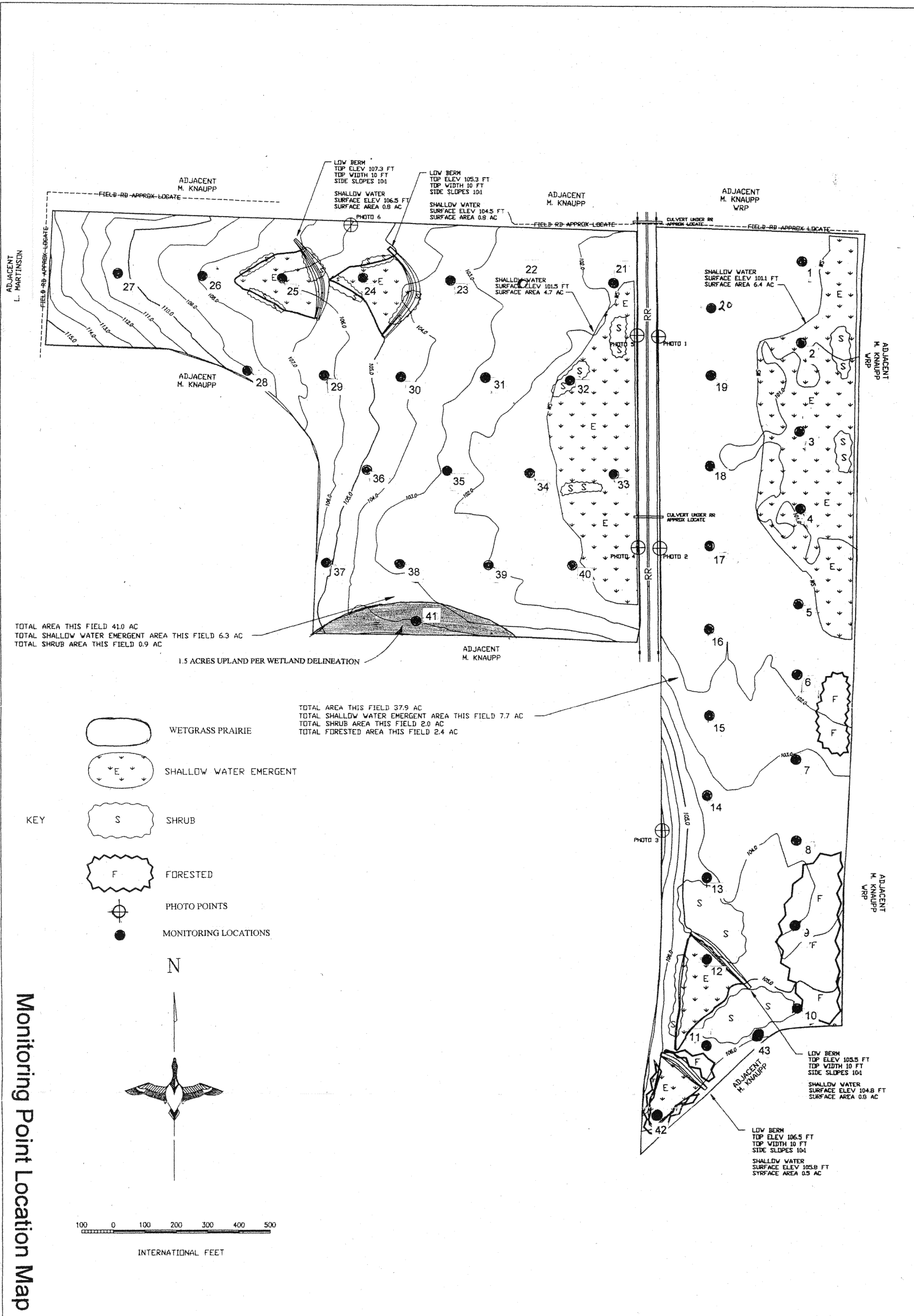
Photos from the photo points are included as Attachment 3.

8.0 CREDIT SALES SUMMARY

To date there have been no credit sales from Phase 3.

9.0 Bond Release Request

Phase 3 has 41.5 credits, 30% (12.45 credits) of which have been released for sale. With this submission of the 2009 monitoring report, we are requesting the release of the next 20% credit release for an additional 8.3 credits.



PROJECT NO.		DESIGNED BY: MK	
MUD SLOUGH WETLAND MITIGATION BANK		DRAWN BY: JPS	
		SURVEYED BY: MK&JPS	
		CHECKED BY:	
DATE: SURVEY 12/15/07	SHEET NO.	APPROVED BY:	APPROVED BY:

HORIZONTAL COORDINATES: OREGON STATE PLANE NORTH ZONE NAD83 (2007)
 VERTICAL COORDINATES: ASSUMED ELEVATION
 (ASSUMED ELEVATION MONUMENT SE CRNR SEC17=100.0 FT, NAVD88 ELEVATION = 174.7 FT)
 SURVEY CONTROL BY GPS OBSERVATION NGS NESMITH PID QE2664

Phase 3 Mud Slough Wetland Mitigation Bank

Plant Species List

May 29, 2009

Includes species identified in monitored plots, planted, or found while walking between sample plots

Common Name	Botanical Name	Status	Origin	Wet Prairie Vernal pool	Moisture Index	Planted
Overstory and Scrub/shrub Species		Species				
<i>Fraxinus latifolia</i>	Oregon ash	FACW	native		2	X
<i>Pyrus fusca</i>	Pacific crabapple	FAC	native		3	X
<i>Rosa nutkana</i>	Nootka rose	FAC	native	Yes	3	X
<i>Salix lasiandra</i>	Pacific willow	FACW	native		2	X
<i>Salix sitchensis</i>	Sitka willow	FACW	native		2	X
<i>Spiraea douglasii</i>	<i>Douglas spirea</i>	FACW	native		2	X
Herbaceous Species						
<i>Alisma plantago</i>	Water plantain	OBL	native		1	
<i>Anthemis cotual</i>	Mayweed chamomile	FACU	introduced		4	
<i>Asclepias speciosa</i>	Showy milkweed	FAC	native		3	X
<i>Aster hallii</i>	Hall's aster	FAC	native	Yes	3	X
<i>Bidens cernua</i>	Nodding beggars-tick	FACW	native		2	X
<i>Bidens frondosa</i>	Leafy beggars-tick	FACW	native		2	X
<i>Boisduvalia densiflora</i>	Dense spike-primrose	FACW	native	Yes	4	X
<i>Bria minor</i>	Little quaking-grass	FAC	introduced		3	
<i>Camassia quamash</i>	Common Camas	FACW	native	Yes	2	X
<i>Capsella bursa-pastoris</i>	Shepherd's purse	FACU	introduced			
<i>Carex densa</i>	Dense sedge	OBL	native	Yes	1	X
<i>Carex feta</i>	Green-sheath sedge	FACW	native	Yes	2	X
<i>Carex ssp</i>	sedge		native			
<i>Carex unilateralis</i>	One-sided sedge	FACW	native	Yes	2	X
<i>Centaurium umbellatum</i>	Common centuary	FAC	introduced		3	
<i>Cerastium vulgatum</i>	Mouse-ear chickweed	FACU	introduced		4	
<i>Chamaemelum mixtum</i>	Dog fennel	NOL	introduced			
<i>Chamomilla suaveoleus</i>	Pineapple weed	FACU	native		4	
<i>Cirsium arvense</i>	Canada thistle	FACU	introduced		4	
<i>Cirsium vulgare</i>	Bull thistle	FACU	introduced		4	
<i>Convolvulus arvensis</i>	Bindweed	NOL	introduced			
<i>Daucus carota</i>	Queen Anne's Lace	NOL	introduced			
<i>Downingia elegans</i>	Showy downingia	OBL	native	Yes	1	X
<i>Eleocharis ovata</i>	Ovoid spikerush	OBL	native	Yes	1	X
<i>Epilobium ciliatum</i>	Hairy willow-herb	FACW	native	Yes	2	
<i>Epilobium paniculatum</i>	Autumn willow-herb	NOL	native	Yes		
<i>Eriophyllum lanatum</i>	Wolly sunflower	NOL	native	Yes		X
<i>Eryngium petiolatum</i>	Rush leaf Coyote thistle	OBL	native	Yes	1	X
<i>Galium aparine</i>	Catchweed	FACU	introduced		4	
<i>Ghaphalium palustre</i>	Lowland cudweed	FAC	native	Yes	3	
<i>Grindelia integrifolia</i>	Willamette Valley gumweed	FACW	native	Yes	2	X
<i>Hypochaeris radicata</i>	Cat's ear dandelion	FACU	introduced		4	
<i>Juncus bufonius</i>	Toad rush	FACW	native	Yes	2	
<i>Juncus exsifolius</i>	Dagger leaf rush	FACW	native		2	
<i>Juncus nevadensis</i>	Sierra rush	FACW	native	Yes	2	X
<i>Juncus tenuis</i>	Slender rush	FACW	native	Yes	2	X
<i>Kickxia elatine</i>	Sharppoint fluvelin	NOL	introduced			
<i>Lactuca serriola</i>	Prickly lettuce	FAC	introduced		3	
<i>Lathyrus sphaericus</i>	Grass pea-vine	NOL	introduced			
<i>Lamium amplexicaule</i>	Henbit	NOL	introduced			
<i>Lomatium nudicaule</i>	Barestem desert-parsley	NOL	native	Yes		X
<i>Lotus purshianus</i>	Spanish clover	NOL	native	Yes		X

<i>Lupinus micranthus</i>	Minature lupine	NOL	native			
<i>Lupinus polyphyllus</i>	Bigleaf lupine	FAC	native	Yes	3	X
<i>Medicago lupina</i>	Black medic	FACU	introduced		4	
<i>Mimulus guttatus</i>	Common mnkey flower	OBL	native	Yes	1	
<i>Myosotis discolor</i>	Yellow & blue forget-me-no	FACW	introduced		2	
<i>Navarretia intertexta</i>	Needle-leaved navarretia	FACW	native	Yes	2	
<i>Navarretia squarrosa</i>	Skunkweed	NOL	native	Yes		
<i>Peplis portula</i>	Water-purslane	NOL	introduced			
<i>Phacelia ssp.</i>	Phacelia					
<i>Plagiobothrys figuratus</i>	Fragrant popcorn flower	FACW	native	Yes	2	X
<i>Plagiobothrys scouleri</i>	Scouler's popcorn flower	FACW	native	Yes	2	X
<i>Plantago lanceolata</i>	Buckhorn plantain	FAC	introduced		3	
<i>Plantago major</i>	Common plantain	FACU	introduced		4	
<i>Polygonum aviculare</i>	Prostrate knotweed	FACW	introduced		2	
<i>Potentilla gracilis</i>	Northwest cirquefoil	FAC	native	Yes	3	X
<i>Prunella vulgaris</i>	Self-heal	FACU	native	Yes	4	X
<i>Ranunculus orthorhynchus</i>	Straight beaked buttercup	FACW	native	Yes	2	
<i>Ranunculus sceleratus</i>	Cellery leaf buttercup	OBL	native		1	
<i>Rorippa curvisiliqua</i>	Western yellowcress	FACW	native	Yes	2	
<i>Rumex crispis</i>	Curly dock	FAC	introduced		3	
<i>Scirpus americanus</i>	Bulrush	OBL	native		1	X
<i>Senecio jacobea</i>	Tansy ragwort	FACU	introduced		4	
<i>Senecio vulgaris</i>	Common groundsel	FACU	introduced			
<i>Sidelcea nelsoniana</i>	Nelson's checker-mallow	FAC	native		3	X
<i>Sonchus asper</i>	Prickly sow-thistle	NOL	introduced			
<i>Spergularia ssp.</i>	Sand spurry					
<i>Taraxicum officinale</i>	Dandelion	FACU	introduced		4	
<i>Typa latifolia</i>	Cat-tail	OBL	native		1	
<i>Veronica peregrina</i>	Purslane speedwell	OBL	native	Yes	1	
<i>Vicia hirsuta</i>	Hairy vetch	NOL	introduced			
<i>Vicia tetrasperma</i>	Slender vetch	NOL	introduced			
Grass Species						
<i>Agrostis exarata</i>	Spike bentgrass	FACW	native	Yes	2	X
<i>Alopecurus aequalis</i>	Short-awned foxtail	OBL	native		1	
<i>Alopecurus geniculatus</i>	Water foxtail	OBL	native		1	X
<i>Alopecurus pratensis</i>	Meadow Foxtail	FACW	introduced		2	
<i>Beckmania syzigachne</i>	American Sloughgrass	OBL	native	Yes	1	X
<i>Bromus carinatus</i>	California brome	NOL	native			
<i>Bromus mollis</i>	Soft brome	NOL	introduced			
<i>Bromus rigidus</i>	Rippgut brome	NOL	introduced			
<i>Danthonia californica</i>	California oatgrass	NOL	native	Yes		X
<i>Deschampsia cespitosa</i>	Tufted hairgrass	FACW	native	Yes	2	X
<i>Deschampsia elongata</i>	Slender hairgrass	FACW	native	Yes	2	X
<i>Festuca arundinacea</i>	Tall fescue	FAC	introduced		3	
<i>Festuca bromoides</i>	Barren fescue	NOL	introduced			
<i>Festuca myuros</i>	Rat-tail fescue	NOL	introduced			
<i>Glyceria borealis</i>	Northern mannagrass	OBL	native		1	
<i>Glyceria occidentalis</i>	Western mannagrass	OBL	native		1	X
<i>Holcus lanatus</i>	Velvet grass	FAC	introduced		3	
<i>Hordeum brachyantherum</i>	Meadow barley	FACW	native	Yes	2	X
<i>Lolium multiflorum</i>	Annual ryegrass	NOL	introduced			
<i>Lolius perenne</i>	Perennial ryegrass	FACU	introduced		4	
<i>Panicum capillare</i>	Common witchgrass	FACU	native	Yes	4	
<i>Poa annua</i>	Annual bluegrass	FAC	introduced		3	
<i>Poa pratensis</i>	Kentucky bluegrass	FAC	introduced		3	
<i>Poa trivialis</i>	Rough bluegrass	FACW	introduced		2	

Phase 3 Mud Slough Wetland Mitigation Bank

Emergent Wetland Plot Data

May 29, 2009

Botanical Name	Common Name	Status	Origin	Index	Ave. % Cover	1	2	3	4	24	25	32	33
Herbaceous Species - percent cover					ea. Species								
<i>Capsella bursa-pastoris</i>	Shepherd's purse	FACU	introduced	4	0.00						T		
<i>Centaureum umbellatum</i>	Common centuary	FAC	introduced	3	0.00					T			
<i>Cirsium vulgare</i>	Bull thistle	FACU	introduced	4	0.00					T			
<i>Downingia elegans</i>	Showy downingia	OBL	native	1	52.38	96	68	90	80			T	85
<i>Eleocharis ovata</i>	Ovoid spike rush	OBL	native	1	0.00			T	T				
<i>Epilobium ciliatum</i>	Hairy willow-herb	FACW	native	3	0.00					T	T	T	
<i>Epilobium paniculatum</i>	Autumn willow-herb	NOL	native		1.38					1	10	T	
<i>Eriophyllum lanatum</i>	Wolly sunflower	NOL	native		0.00						T		
<i>Galium aparine</i>	Catchweed	FACU	introduced	4	0.00						T		
<i>Gnaphalium palustre</i>	Cudweed	FAC	native	3	0.00				T				
<i>Hypochaeris radicata</i>	Cat's ear dandelion	FACU	introduced	4	0.63					5	T	T	
<i>Juncus bufonius</i>	Toad rush	FACW	native	2	1.88					10	T	5	
<i>Lactuca seriola</i>	Prickly lettuce	FAC	introduced	3	0.00					T	T	T	
<i>Lotus purshianus</i>	Spanish clover	NOL	native		0.00					T	T	T	
<i>Lupinus micranthus</i>	Minature lupine	NOL	native		0.00						T		
<i>Lupinus polyphyllus</i>	Bigleaf lupine	FAC	native	3	0.00							T	
<i>Medicago lupina</i>	Black medic	FACU	introduced	4	0.00					T	T		
<i>Peplis portula</i>	Water-purslane	NOL	introduced		0.25			2					T
<i>Plagiobothrys figuratus</i>	Fragrant popcorn flower	FACW	native	2	10.13	3	30	1	8	1		30	8
<i>Plagiobothrys scouleri</i>	Scouler's popcorn flower	FACW	native	2	0.00		T			T		T	T
<i>Prunella vulgaris</i>	Self-heal	FACU	native	4	6.25					10	40		
<i>Ranunculus sceleratus</i>	Cellery leaf buttercup	OBL	native	1	0.00				T				
<i>Rorippa curvisiliqua</i>	Western yellowcress	FACW	native	2	0.38							1	2
<i>Senecio vulgaris</i>	Common groundsel	FACU	introduced	4	1.00						8		
<i>Sonchus asper</i>	Prickly sow-thistle	NOL	introduced		3.13					5	20		
<i>Veronica peregrina</i>	Purslane speedwell	OBL	native	1	14.00		T		5	43	5	59	
Grass Species													
<i>Alopecurus aequalis</i>	Short-awned foxtail	OBL	native	1	0.00				T				
<i>Alopecurus geniculatus</i>	Water foxtail	OBL	native	1	2.00	1	2	1	T	5	2	5	T
<i>Alopecurus pratensis</i>	Meadow Foxtail	FACW	introduced	2	0.00						T	T	
<i>Beckmania syzigachne</i>	American Sloughgrass	OBL	native	1	1.00	T	T	1	2		T	T	5
<i>Deschampsia cespitosa</i>	Tufted hairgrass	FACW	native	1	0.00					T	T	T	
<i>Deschampsia elongata</i>	Slender hairgrass	FACW	native	1	3.13		T			15	10	T	
<i>Hordeum brachyantherum</i>	Meadow barley	FACW-	native	2	1.25					5	5	T	
<i>Lolium multiflorum</i>	Annual rye grass	FACU	introduced	4	0.00				T	T	T	T	
<i>Poa trivialis</i>	Rough-stalk bluegrass	FAC	introduced	3	0.00					T		T	
Total vegetative cover						100	100	95	95	100	100	100	100
Bareland		Mean Bareland =	1.43					5	5				
Relative Percent Native Cover		Mean =	93.75			100	100	93	95	90	72	100	100
Relative Percent Non-Native Co		Mean=	4.00			0	0	2	0	10	20	0	0
Relative % non-native invasive canopy cover :		0.00											
Moisture Index		Mean =	1.47			1.03	1.30	1.01	1.08	1.64	3.27	1.36	1.10
Total # of Native Species: 22													

**Phase 3 Mud Slough Wetland Mitigation Bank
Planted Shrub/Forest (PFO) Sample Plot Monitoring Results**

May 29, 2009

Species Observed				Moisture				
Botanical Name	Common Name	Status	Origin	Index	11	12	42	43
Planted Overstory Species - stem count within 30' diameter								
<i>Fraxinus latifolia</i>	Oregon ash	FACW	native	2			5	
Ash seedlings							500	
<i>Pyrus fusca</i>	Pacific crabapple	FAC	native	3				3
<i>Rosa nutkana</i>	Nootka rose	FAC	native	3				23
<i>Salix lasiandra</i>	Pacific willow	FACW	native	2	5.0			
<i>Salix sitchensis</i>	Sitka willow	FACW	native	2	11.0			
<i>Spiraea douglasii</i>	Douglas spirea	FACW	native	2	14.0	5		
Total Stems per plot:					30.0	5	505	26
Average Trees per Plot =		127.0						
Average trees per Plot (w/o) seedlings=		2.0						
Mean Trees/Acre =		7,835 or 123 without seedlings						
Average shrubs per plot =		14.5						
Mean Shrubs/Acre =		894.0						
Herbaceous Species - percent cover								
<i>Downingia elegans</i>	Showy downingia	OBL	native	1	10			
<i>Eleocharis ovata</i>	Ovoid spikerush	OBL	native	1	T			
<i>Epilobium ciliatum</i>	Hairy willow-herb	FACW	native	2		T		
<i>Epilobium paniculatum</i>	Autumn willow-herb	NOL	native		5	2		
<i>Eriophyllum lanatum</i>	Wolly sunflower	NOL	native					
<i>Ghaphalium palustre</i>	Lowland cudweed	FAC	native	3	T			
<i>Juncus bufonius</i>	Toad rush	FACW	native	2		10		
<i>Lactuca serriola</i>	Prickly lettuce	FAC	introduced	3		T		
<i>Lupinus micranthus</i>	Minature lupine	NOL	native		5	2		
<i>Mimulus guttatus</i>	Common mnkey flower	OBL	native	1		T		
<i>Peplis portula</i>	Water-purslane	NOL	introduced		T	T		
<i>Plagiobothrys figuratus</i>	Fragrant popcorn flower	FACW	native	2	15	20		
<i>Plagiobothrys scouleri</i>	Scouler's popcorn flower	FACW	native	2	T	2		
<i>Rorippa curvisiliqua</i>	Western yellowcress	FACW	native	2	T	T		
<i>Senecio vulgaris</i>	Common groundsel	FACU	introduced	4		T		
<i>Sonchus asper</i>	Prickly sow-thistle	NOL	introduced		T	10		
<i>Veronica peregrina</i>	Purslane speedwell	OBL	native	1	10	30		
<i>Vicia hirsuta</i>	Hairy vetch	NOL	introduced			T		
Grass Species								
<i>Alopecurus geniculatus</i>	Water foxtail	OBL	native	1	T			
<i>Beckmania syzigachne</i>	American Sloughgrass	OBL	native	1	5	20		
<i>Deschampsia elongata</i>	Slender hairgrass	FACW	native	2	2	2		
<i>Hordeum brachyantherum</i>	Meadow barley	FACW	native	2	10	2		
<i>Poa annua</i>	Annual bluegrass	FAC	introduced	3		T		
Bareground					38			
Relative % non-native canopy cover:		Mean =	5.00		0.00	10.0		
% of Total Vegetation that is Native =			95.00					
Relative % non-native invasive canopy cover:		Mean =	0					
Sample plot average moisture index			1.48		1.52	1.44		
Total # of native Species: 23								

**Phase 3 Mud Slough Wetland Mitigation Bank
Wetland Prairie Plot Data
May 29, 2009**

Species Observed		Status	Origin	Wet/Prairie		Ave. % Cover ea	Plot #s																																								
Botanical Name	Common Name			Vernal Pool	Moisture Index		Species	5	6	7	8	9	10	13	14	15	16	17	18	19	20	21	22	23	26	27	28	29	30	31	34	35	36	37	38	39	40	41									
Herbaceous Species																																															
<i>Bidens cernua</i>	Nodding beggars-tick	FACW	native		2	0.00	T																																								
<i>Capsella bursa-pastoris</i>	Shepherd's purse	FACU	introduced		4	0.00																																									
<i>Centaurium umbellatum</i>	Common centuary	FAC	introduced		3	0.00																																									
<i>Cerastium vulgatum</i>	Mouse-ear chickweed	FACU	introduced		4	0.00																																									
<i>Chamaemelum mixtum</i>	Dog fennel	NOL	introduced			0.00																																									
<i>Chamomilla suaveoleus</i>	Pineapple weed	FACU	native		4	0.10																																									
<i>Cirsium vulgare</i>	Bull thistle	FACU	introduced		4	0.00																																									
<i>Convolvulus arvensis</i>	Bindweed	NOL	introduced			0.03																																									
<i>Daucus carota</i>	Queen Anne's Lace	NOL	introduced			0.00																																									
<i>Downingia elegans</i>	Showy downingia	OBL	native	Yes	1	0.16																																									
<i>Epilobium ciliatum</i>	Hairy willow-herb	FACW	native	Yes	2	0.65																																									
<i>Epilobium paniculatum</i>	Autumn willow-herb	NOL	native	Yes		2.90	1	1	10	12	6	15	3																																		
<i>Eriophyllum lanatum</i>	Woolly sunflower	NOL	native	Yes		0.00																																									
<i>Gnaphalium palustre</i>	Lowland cudweed	FAC	native	Yes	3	0.48																																									
<i>Hypochaeris radicata</i>	Cat's ear dandelion	FACU	introduced		4	0.71																																									
<i>Juncus bufonius</i>	Toad rush	FACW	native	Yes	2	4.81																																									
<i>Kickxia elatine</i>	Sharpshoot fluelin	NOL	introduced			2.61																																									
<i>Lactuca serriola</i>	Prickly lettuce	FAC	introduced		3	0.90																																									
<i>Lamium amplexicaule</i>	Henbit	NOL	introduced			0.00																																									
<i>Lotus purshianus</i>	Spanish clover	NOL	native	Yes		0.29																																									
<i>Lupinus micranthus</i>	Minature lupine	NOL	native			0.00																																									
<i>Medicago lupina</i>	Black medic	FACU	introduced		4	0.00																																									
<i>Myosotis discolor</i>	Yellow & blue forget-me-not	FACW	introduced		2	0.00																																									
<i>Navaretia squarrosa</i>	Skunkweed	NOL	native	Yes		0.00																																									
<i>Peplis portula</i>	Water-purslane	NOL	introduced			0.58																																									
<i>Plagiobothrys figuratus</i>	Fragrant popcorn flower	FACW	native	Yes	2	31.29	80	85	10	T	25																																				
<i>Plagiobothrys scouleri</i>	Scouler's popcorn flower	FACW	native	Yes	2	1.81	3	T																																							
<i>Plantago major</i>	Common plantain	FACU	introduced		4	0.00																																									
<i>Plantago lanceolata</i>	Buckhorn plantain	FAC	introduced		3	0.00																																									
<i>Polygonum aviculare</i>	Prostrate knotweed	FACW	introduced		2	0.00																																									
<i>Potentilla gracilis</i>	Northwest cirquefoil	FAC	native	Yes	3	0.00																																									
<i>Prunella vulgaris</i>	Self-heal	FACU	native	Yes	4	1.84																																									
<i>Rorippa curvisiliqua</i>	Western yellowcress	FACW	native	Yes	2	3.23	T																																								
<i>Senecio vulgaris</i>	Common groundsel	FACU	introduced		4	1.58																																									
<i>Sonchus asper</i>	Prickly sow-thistle	NOL	introduced			1.97																																									
<i>Spergularia ssp.</i>	Sand spurry					0.03																																									
<i>Taraxicum officinale</i>	Dandelion	FACU	introduced		4	0.00																																									
<i>Veronica peregrina</i>	Purslane speedwell	OBL	native	Yes	1	22.52	10	10																																							
<i>Vicia hirsuta</i>	Hairy vetch	NOL	introduced			0.00	T																																								
Grass Species																																															
<i>Agrostis exarata</i>	Spike bentgrass	FACW	native	Yes	2	0.00	T																																								
<i>Alopecurus geniculatus</i>	Water foxtail	OBL	native		1	1.94	2	2	5	4	3	2	T	T	3	5	5	5	5	3	T	T	1	4	2	T	3	T	T	2	T	3															
<i>Alopecurus pratensis</i>	Meadow Foxtail	FACW	introduced		2	0.00	T	T																																							
<i>Beckmania syzigachne</i>	American Sloughgrass	OBL	native	Yes	1	0.74	1	T																																							
<i>Bria minor</i>	Little quaking-grass	FAC	introduced		3	0.00																																									
<i>Bromus mollis</i>	Soft brome	NOL	introduced			0.00																																									
<i>Bromus carinatus</i>	California brome	NOL	native			0.03																																									
<i>Deschampsia cespitosa</i>	Tufted hairgrass	FACW	native	Yes	2	0.00	T	T	T	T	T	T	T	T	T	T																															
<i>Deschampsia elongata</i>	Slender hairgrass	FACW	native	Yes	2	8.39	1	T	20	40	20	20	15	4	T	T																															
<i>Festuca arundinacea</i>	Tall fescue	FAC	introduced		3	0.00																																									
<i>Festuca myuros</i>	Rat-tail fescue																																														

PHOTO POINT #1 Facing East (June 2009)



PHOTO POINT #2 Facing East (June 2009)



PHOTO POINT #3 Facing East (June 2009)



PHOTO POINT #4 Facing West (June 2009)



PHOTO POINT #5 Facing West (June 2009)



PHOTO POINT #6 Facing South (June 2009)

