

TECHNICAL MEMORANDUM

Date: January 23, 2008

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SUBJECT: Fernhill Wetland Mitigation Bank 2007 Monitoring

INTRODUCTION AND METHODS

SWCA Environmental Consultants was contracted by Clean Water Services to conduct monitoring of the Fernhill Wetland Mitigation Bank. Monitoring was conducted by Christie Galen, Senior Ecologist, C. Mirth Walker, Senior Wetlands Scientist, and Jonas Moiel, Restoration Ecologist, on October 10, 12, and 30, 2007.

Monitoring methods followed revised Fernhill Mitigation Bank monitoring protocols but were adapted to fit site conditions. Twenty six monitoring plots were established including 22 inside and 4 outside the wetland boundary delineated by SWCA in 2007 (Figure 1). The number of plots was based on the number and area of plots established in monitoring protocols to be representative of habitat occurring in the mitigation bank. Monitoring plots consisted of block transects of two different dimensions; 20 were 30' x 30' (900 sq ft) and 6 were 10' x 10' (100 sq ft). Square plots were evaluated rather than circular plots because of the height of trees on the plots and the difficulty of using a radial line that would need to reach above the trees throughout the plot to demarcate the boundary; the total area evaluated was greater than the area described in monitoring protocols and included 15,000 square feet inside the wetland boundary (4% of wetland area). The size of the smaller transects followed monitoring protocols for scrub-shrub habitat but it became apparent that the smaller size was inadequate for evaluating shrub density. Since shrubs were planted in rows approximately 10 feet apart and transect corners had to be located within rows to avoid maintenance problems, density calculations evaluated 2 rows of dense woody vegetation with a bare center. Consequently, we enlarged the remaining PSS transects to 30' X 30' and recommend that all woody vegetation plots become 30' x 30' in future evaluations. A 1 square meter sample plot was also nested in the southeast corner of each block transect to evaluate herbaceous cover according to monitoring protocols. Since this did not always reflect herbaceous cover conditions of the entire 30' x 30' block transect, we also visually estimated total herbaceous cover and invasive species cover of the entire transect. Rebar was placed in the southeast corner of each transect and the other 3 corners were marked with red wire pin flags; an orange cap and bright flagging was placed on top of the rebar to make it more

visible. Each corner of the monitoring plot was mapped using a Trimble Global positioning system (GPS) unit with sub-meter accuracy.

Transects labeled as Palustrine forested wetland (PFO) were defined in this study as areas with at least 20% cover of tree species¹ and included Transects 8-11, 13-16, and 19, 20, 25, and 26. Although Transects 9 and 26 have less than 20% tree cover, the number (11 and 6, respectively) and type of trees present indicate that these transects will soon display 20% aerial cover. Each species' actual percent cover was recorded rather than overall percent cover by stratum. Transects labeled as Palustrine scrub-shrub wetland (PSS) were defined as areas with less than 20% cover by trees and predominant cover by shrub species and included Transects 1-7, 12, and 17. An additional 4 block transects (30' x 30') were established in uplands outside of the SWCA delineated wetland boundary in order to compare species and cover. Upland transects include Transects 21-24. Transect data tables are attached.

Moisture Index (Prevalence Index)

The Moisture Index described in monitoring protocols is called the Prevalence Index (PI) in the *2006 Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region*. The PI is a weighted-average wetland indicator status of all plant species in the sampling plots, where each indicator status category is given a numeric code (OBL=1, FACW=2, FAC=3, FACU=4, and UPL=5) and weighting is by abundance (percent cover). It is a more comprehensive analysis of the hydrophytic status of the community than one based on a few dominant species. The PI is used to determine whether hydrophytic vegetation is present on sites where indicators of hydric soil and wetland hydrology are present but the vegetation initially fails the dominance test (US Army Corps of Engineers 2006). If the plant community being evaluated satisfies the PI with a total value less than or equal to 3.0, hydrophytic vegetation is present. The PI was calculated for forested wetland, scrub-shrub wetland, and upland sample plots and then averaged for each category.

Flood Storage and Water Quality

The USGS stream gauging records from the Dilly gage were used to track over bank events. Sediment accretion stakes were installed in the fall of 2007 and will be evaluated in 2008.

RESULTS AND DISCUSSION

Vegetation

Forested Wetland Transects

Forested wetlands included areas where tree cover was greater than 20% cover or would be greater than 20% within a couple of years; 13 block transects (11,700 square feet) were established in forested wetlands (8, 9, 10, 11, 13, 14, 15, 16, 18, 19, 20, 25, and 26).

Forested wetland transects were planted with 8 tree species (black cottonwood, black hawthorn, crabapple, grand fir, Oregon ash, Pacific willow, red alder, ponderosa pine) and 11 shrub species (red-osier dogwood, tall Oregon grape, Indian plum, Pacific ninebark, clustered rose, Douglas spirea, red elderberry, twinberry, Piper's willow, Sitka willow, snowberry). PFO transects were dominated by black cottonwood (97 trees); sub-dominants included Oregon ash (16) and red alder (7). Shrubs were dominated by willow (49), red-osier dogwood (44), Pacific ninebark (27), and Douglas spirea (18). Transects contained more than 100% of the species diversity than the reference wetland: 8 tree species and 11 shrub species compared with 4

¹ The 20% cover threshold is defined by the 50/20 rule in the Corps of Engineers Wetland Delineation Manual online edition (Environmental Laboratory 1987).

tree species and 7 shrub species at the reference site. Transects also contained limited invasive trees; only 8 English hawthorn were observed on 3 transects and all but one of the hawthorn were less than 1 foot tall seedlings. Including these seedlings as stems they represented 2.6% of the live woody stem count. Stem density targets were exceeded for tree species, although not for shrub species. The total stem density collected for PFO is only 10% short of the target density.

Herbaceous cover was dominated by Queen Anne’s lace (22.5%), colonial bentgrass (11.2%), and reed canarygrass (12.6%); broad-leafed lupine, Watson’s willowherb, hoary aster, tarweed, Italian ryegrass, and prickly lettuce were also common. Native species cover averaged 6.5% and includes willowherb, lupine, hoary aster, and tarweed. Invasive species cover averaged 14% and is dominated by reed canarygrass and also includes morning glory, teasel and Himalayan blackberry. The Prevalence Index was calculated to be 2.97 which is less than 3 and reflects wetland conditions.

Forested Wetland Summary

	Bank Site	Reference Site	Target	Target Achieved (Y/N)
Aggregate species composition (by species)	8 trees 11 shrubs	4 trees 7 shrubs	80% of species found at reference	Y
Average tree stems/acre	525/acre	35-195	200-300	Y
Average shrub stems/acre	596/acre	no data	1050-1200	N
Total stem density (stems/acre)	1121/acre	incomplete data	1250-1500	N
Avg. invasive stems/acre (not included in stem counts)	30 (2.6%) English hawthorn/acre	no data	≤5%	Y
Aggregate herbaceous species composition (by species)	12% (reed canarygrass & nightshade)	17 species	80% of species found at reference	N
Average relative herbaceous plant cover (by species)	6.5% native 14.1% invasive	15-59% native 5-16% invasive	≥55% native, ≤20% invasive	Native: N Invasive: Y
Prevalence Index	2.97	no data	<3	Y

Scrub-Shrub Wetland Transects

Scrub-shrub wetlands (PSS) were defined as areas dominated by shrubs and with less than 20% cover by trees. Nine block transects were established in PSS (3300 square feet) and included Transects 1-7, 12, and 17.

Scrub-shrub wetlands were planted with 4 tree species (black cottonwood, Oregon ash, Pacific willow, and red alder) and 9 shrub species (red-osier dogwood, Pacific ninebark, clustered rose, Douglas spirea, red elderberry, black twinberry, Piper’s willow, Sitka willow, snowberry). On the 9 PSS block transects (2,500 square feet), trees were dominated black cottonwood (7), Oregon ash (4), and Pacific willow (3); shrubs were dominated by willow (46), red-osier dogwood (25), Pacific ninebark (22), Douglas spirea (15), and clustered rose (12). Transects contained greater species diversity than the reference wetland. No invasive trees or shrubs were present. Herbaceous cover was dominated by non-native species including Queen Anne’s lace (24%), birds-foot trefoil (10%), and wild radish (7.2%). Herbaceous cover included 11.6% native species including spike bentgrass, Watson’s willowherb, common horsetail, and cudweed. Herbaceous cover of invasive species was 3.4% and included reed canarygrass, Himalayan blackberry,

and field morning glory. The Prevalence Index for PSS was calculated to be 3.16 which is slightly higher than the target of 3 or less because of the predominance of upland weeds in the herbaceous layer. These weeds are being actively managed.

Scrub-Shrub Wetland Summary

	Bank	Reference	Target	Target Achieved (Y/N)
Aggregate species Composition (by species)	4 trees 9 shrubs	4 trees 7 shrubs	80% of species found at reference	Y
Average tree stems/acre	198/acre	incomplete data	150-300	Y
Average shrub stems/acre	1716/acre	incomplete data	1200-1300	Y
Total stem density (stems/acre)	1914/acre	incomplete data	1350-1600	Y
Avg. invasive stems/acre (not included in stem counts)	0	no data	≤5%	Y
Aggregate herbaceous species composition (by species)	20% (reed canarygrass & Watson's willowherb)	10 species	80% of species found at reference	N
Average relative herbaceous plant cover (by species)	11.6% native 3.4% invasive	5-41% native 5-17% invasive	≥55% native, ≤20% invasive	Native: N Invasive: Y
Prevalence Index	3.16	no data	<3	N

Upland Transects (Included for reference only)

Four block transects (total of 3600 square feet) were evaluated in areas outside the wetland boundary (Transects 21, 22, 23, 24). These areas were planted with 5 tree species (black cottonwood, black hawthorn, Oregon ash, cascara, ponderosa pine) and 8 shrub species (red-osier dogwood, Indian plum, Pacific ninebark, clustered rose, Douglas spirea, Piper's willow, Sitka willow). Upland transects contained 15 trees (182 stems/acre) and 34 shrubs (411 stems/acre) and were dominated by Oregon ash (6), Ponderosa pine (4), black cottonwood (3), red-osier dogwood (12), Pacific ninebark (9), and willow (8). All plants showed high vigor. These transects did not contain any non-native or invasive woody species. Herbaceous cover was dominated by Queen Anne's lace (36.8%), Italian ryegrass (12.8%), and prickly lettuce (9%). Native herbaceous cover was 2.1% and was dominated by Watson's willowherb and hoary aster. Invasive species cover was 4.9% and included Canada thistle, field morning glory, and reed canarygrass. The Prevalence Index was 3.87

Upland Summary

	Bank Site	Reference	Target
Aggregate species composition (by species)	5 trees; 7 shrubs	NA	NA
Average tree stems/acre	182/acre	NA	NA
Average shrub stem/acre	411/acre	NA	NA
Total stem density (stem/acre)	593/acre	NA	NA
Avg. invasive stems/acre	0	NA	NA
Aggregate herbaceous spp composition (by spp)	see upland data table	NA	NA
Average relative herbaceous plant cover (by spp)	2.1% native; 4.9% invasive	NA	NA
Prevalence Index	3.87	NA	NA

Successional Trajectory

Most of the successional trajectory data will be collected on even-numbered monitoring years. The data below indicates progress with the best available data. The extent of shade-tolerant herbs and the Coefficient of Community measures were artifacts of the original monitoring instrument (1/14/05). Unfortunately, the level of data available from the inception of the original instrument does not allow for analysis of these parameters. The original planting range of shade-tolerant herbs was not mapped and the data required for a Coefficient of Community analysis is not available from the reference wetland data. Relative plant cover will be used as the measure to determine site succession. Increases in relative plant cover are measured by comparing current cover to values assessed in previous monitoring periods.

Successional Trajectory

	Bank Site	Reference Site	Target	Target Achieved (Y/N)
Extent of shade-tolerant herbs	no data	no data	beyond planting range	incomplete data
Coefficient of Community	no data	no data	3-year increasing trend	incomplete data
Relative plant cover*				
Reed canarygrass	~8.5%	5-15%	1) ≤20% reed canary grass	1) Y
Native trees	31%	no data	2) ≥ 10% increase in cover of planted and recruited species	2) incomplete data
Native shrubs	36%	no data		
Native herbaceous	11%	no data		

*Average cover for all PFO/PSS monitoring plots

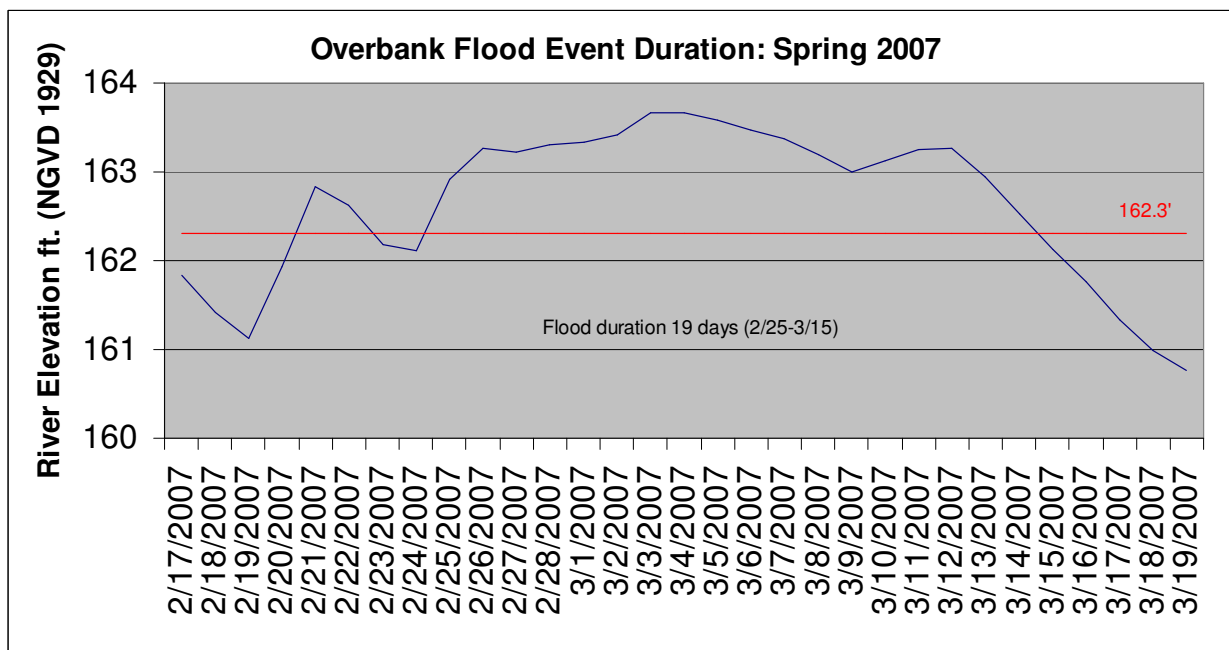
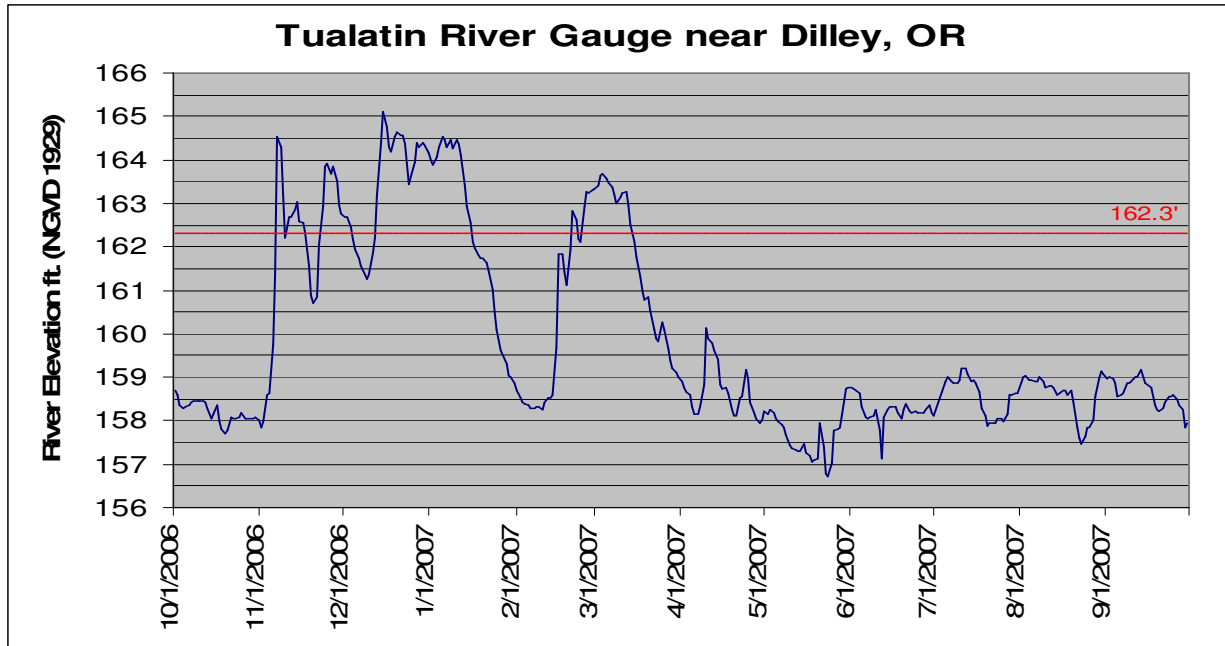
Hydrology

SWCA conducted a wetland delineation in the late winter/early spring of 2006 and 2007 to determine what portions of the mitigation bank met the 1987 Corps Wetlands Delineation Manual hydrology criterion. All wetland transects were located inside the delineated wetland boundary.

Flood Storage

Stream gauge data from the USGS Stream gauge #14203500 on the Tualatin River near Dilley were reviewed for the 2006-2007 water year (October 1, 2006 - September 30, 2007). River elevation data were recorded at 15 minute intervals at this gauge. Data were exported from <http://waterdata.usgs.gov> for use in the following graphs.

The river elevation assumed to cause an over bank flood event into the Fernhill Mitigation Bank wetlands is 162.3 feet (Cochran pers. com.), as determined in the Vigil-Agrimis, Inc. mitigation bank hydrological analysis (Cochran pers. com.). During the 2006-2007 water year there were six over bank flood events. One of these events occurred during the growing season of 2007 and inundation persisted for approximately 19 days (February 25th-March 15th).



Water Quality

Sediment accretion stakes were installed in the fall of 2007 and will be evaluated in 2008.

CONCLUSION

Tree and shrub cover at the Fernhill Mitigation Bank site is vigorous and dominated by wetland plants. Herbaceous cover is dominated by wetland and upland species and seems to be influenced by soil substrate, weedy seed sources, and the location of the sample plot. In many places of the site, soils are sandy and moderately well drained. Dynamic hydrology creates an active cycle of scour and deposition throughout portions of the wetland. These conditions provide habitat for opportunistic, quick germinating upland weed seeds that seem to be prevalent in the area. The mitigation site was seeded with native seed

in the fall of 2007, overbank flooding events of November 2007 washed most of the seed away prior to germination. Long-term plans for the mitigation site include ongoing control of upland weeds and the introduction of additional wetland species cover through installation of herbaceous plugs and/or native seed.

Sample plot data were also influenced by the location of the sample plot in the southeast corner of the block transect which was not always indicative of transect conditions and was a small sampling of the herbaceous community. In the future data collection of the herbaceous community could be improved with greater sampling (e.g. line transects). The Prevalence Index averaged for all transects inside the wetland boundary was 3.05; most likely this number will decrease to less than 3 as wetland canopy cover develops and wetland herbaceous cover increases with site management. It is recommended that monitoring occur earlier in the growing season to avoid the late season increase in upland weedy species.

REFERENCES

- Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Wetlands Research Program Technical Report Y-87-1 (on-line edition).
<http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf>
- US Army Corps of Engineers. 2006. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. ERDC/EL TR-06-16.
http://www.oregon.gov/DSL/PERMITS/docs/aridwest_manual_supp.pdf

2007 Fernhill Wetland Mitigation Bank: PFO Herbaceous Cover and Prevalence Index

Species & Transect No.	Index	8	9	10	11	13	14	15	16	18	19	20	25	26	AVG
Total Percent Cover of Sample Plot		75	61	95	90	10	62	80	100	100	86	60	55	95	74.5
** <i>Abies grandis</i>	4	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1
<i>Agrostis capillaris</i>	3	0	40	0	2	0	35	0	33	0	10	0	25	0	11.2
** <i>Alnus rubra</i>	3	0	0	0	0	30	0	15	0	0	0	0	25	0	5.4
** <i>Bidens frondosa</i>	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0.1
<i>Convolvulus arvensis</i> *	5	0	2	0	0	0	1	0	1	5	3	0	1	0	1.0
<i>Conyza canadensis</i>	4	0	1	5	0	0	0	0	0	0	0	0	0	0	0.5
** <i>Cornus sericea</i>	2	5	67	15	15	1	1	3	1	7	0	5	2	2	9.5
** <i>Crataegus douglasii</i>	3	0	5	0	0	1	0	0	10	25	0	0	0	0	3.2
<i>Daucus carota</i>	5	50	15	55	35	10	25	50	33	5	7	5	2	0	22.5
<i>Dipsacus sylvestris</i> *	3	0	0	5	0	0	0	0	0	0	0	0	0	0	0.4
** <i>Epilobium watsonii</i>	2	0	1	0	25	0	0	1	0	0	0	0	0	0	2.1
** <i>Fraxinus latifolia</i>	2	3	1	2	12	1	5	0	0	0	0	0	1	5	2.3
<i>Hypericum perforatum</i>	5	0	0	0	0	0	0	0	0	0	0	0	2	0	0.2
<i>Lactuca serriola</i>	4	0	0	0	0	0	1	0	0	0	1	1	25	5	2.5
<i>Lolium multiflorum</i>	5	10	0	0	0	0	0	0	0	45	0	13	0	0	5.2
<i>Lolium perenne</i>	4	0	0	0	0	0	0	0	0	0	0	0	0	5	0.4
** <i>Lonicera involucrata</i>	3	0	0	0	0	0	0	0	1	0	0	1	0	0	0.2
** <i>Lupinus polyphyllus</i>	3	0	0	0	0	0	0	0	0	45	0	0	0	0	3.5
** <i>Machaeranthera canescens</i>	5	0	0	0	0	0	0	25	0	0	0	0	0	0	1.9
** <i>Madia glomerata</i>	4	5	0	0	0	0	0	0	0	0	0	2	0	25	2.5
** <i>Mahonia aquifolium</i>	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1
** <i>Oemleria cerasiformis</i>	4	0	0	0	0	0	0	0	0	0	0	1	2	0	0.2
<i>Phalaris arundinacea</i> *	2	10	0	0	20	0	5	5	33	1	65	15	0	10	12.6
** <i>Physocarpus capitatus</i>	2	2	0	2	0	15	15	0	5	0	5	0	5	2	3.9
** <i>Pinus ponderosa</i>	4	0	0	1	0	0	1	0	0	0	0	0	0	1	0.2
<i>Plantago lanceolata</i>	3	0	0	10	0	0	0	0	0	0	0	0	0	0	0.8
** <i>Populus trichocarpa</i>	3	40	4	25	0	65	75	80	0	0	65	75	35	5	36.1
** <i>Pyrus (Malus) fusca</i>	2	0	0	0	0	0	0	1	10	0	0	0	0	0	0.8
<i>Raphanus sativus</i> ²	NA	5	0	5	3	0	0	0	0	1	0	5	0	10	2.2
** <i>Rhamnus purshiana</i>	3	0	0	0	0	0	0	0	1	0	0	0	1	1	0.2
** <i>Rosa pisocarpa</i>	3	0	5	5	0	0	1	0	0	0	1	0	0	0	0.9
<i>Rubus discolor</i> *	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1
** <i>Salix lasiandra</i>	2	0	0	0	15	0	0	0	0	0	0	0	0	0	1.2
** <i>Salix species</i>	2	0	0	0	25	0	0	25	50	12	20	0	0	5	10.5
** <i>Salix piperi</i>	2	0	0	5	0	0	0	0	0	0	0	1	50	30	6.6
** <i>Salix sitchensis</i>	2	0	0	15	0	5	0	0	0	0	0	0	0	10	2.3
** <i>Sambucus racemosa</i>	4	1	3	0	0	0	0	0	0	0	2	1	0	0	0.5
<i>Sonchus oleraceus</i>	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0.4
** <i>Spiraea douglasii</i>	2	1	0	1	15	0	0	0	0	5	0	2	2	3	2.2
** <i>Symphoricarpos albus</i>	4	0	0	1	0	0	0	0	0	1	1	0	0	1	0.3
<i>Trifolium pratense</i>	4	10	0	0	0	0	0	0	0	0	0	0	0	0	0.8
<i>Trifolium repens</i>	3	0	2	5	1	0	0	0	0	0	0	20	0	0	2.2
unknown grass seedling ¹	NA	0	0	10	0	0	0	0	0	0	0	0	0	0	0.8
Total Cover (sum)		142	147	158	173	128	165	206	178	152	180	148	178	120	160
Prevalence Index***		3.8	2.8	3.5	2.7	1.3	3.2	3.6	2.8	3.5	2.6	3.1	2.9	2.7	2.97

* =invasive; **=native; ***Prevalence Index: OBL=1, FACW=2, FAC=3, FACU=4, UPL=5

¹ Unknown species, could not determine indicator status;not incorporated into prevalence index calculations.

² Listed as NO in all regions except region 9, were it is NI; cannot be used in prevalence index calculations.

2007 Fernhill Wetland Mitigation Bank: PFO Herbaceous Cover and Prevalence Index

Invasive Species %Cover and Bareground on Entire Block Transect

Species & Block Transect No.	8	9	10	11	13	14	15	16	18	19	20	25	26	AVG
<i>Cirsium arvense</i>	0	1	1	0	0	1	0	0	0	5	1	1	5	1.2
<i>Convolvulus arvensis</i>	0	0	3	1	0	1	1	5	20	0	0	0	1	2.5
<i>Crataegus monogyna</i>	0	0	0	0	1	0	0	0	0	0	0	1	0	0.2
<i>Dipsacus sylvestris</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	0.1
<i>Phalaris arundinacea</i>	10	5	5	20	0	1	0	10	20	5	1	10	60	11.3
<i>Rubus discolor</i>	0	0	0	0	1	1	0	1	0	1	3	5	1	1.0
<i>Rubus lacianatus</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1
<i>Solanum dulcamara</i>	0	0	0	0	0	0	0	0	0	0	0	1	0	0.1
Total Maximum Invasive %Cover	10	6	10	21	2	4	1	16	40	11	6	18	67	16.3
Total %Bareground	5	5	0	5	70	15	30	2	0	2	2	15	2	11.8

2007 Fernhill Wetland Mitigation Bank - PSS Herbaceous Cover and Prevalence Index

Species & Transect No.	Index	1	2	3	4	5	6	7	12	17	AVG
Total Percent Cover of Sample Plot		95	100	100	75	52	70	97	7	49	71.7
<i>Agrostis capillaris</i>	3	10	25	0	3	3	1	0	0	5	5.2
** <i>Agrostis exarata</i>	2	5	30	0	0	0	0	0	0	2	4.1
<i>Chenopodium album</i>	3	0	0	0	0	0	1	0	0	0	0.1
<i>Convolvulus arvensis</i> *	5	0	0	0	0	0	0	0	0	1	0.1
** <i>Cornus sericea</i>	2	5	20	0	0	15	15	0	10	5	7.8
<i>Daucus carota</i>	5	50	35	65	5	15	25	0	0	20	23.9
** <i>Epilobium watsonii</i>	2	5	0	1	0	0	0	0	0	0	0.7
** <i>Equisetum arvense</i>	3	0	0	0	0	0	0	2	0	0	0.2
** <i>Fraxinus latifolia</i>	2	0	2	15	3	0	0	0	0	0	2.2
** <i>Gnaphallium uliginosum</i>	3	0	0	0	0	2	0	0	0	0	0.2
<i>Hypericum perforatum</i>	5	0	0	0	5	20	0	0	0	0	2.8
<i>Hypochaeris radicata</i>	4	1	0	0	0	0	0	0	0	0	0.1
<i>Lolium multiflorum</i>	5	0	0	0	0	0	3	0	0	0	0.3
** <i>Lonicera involucrata</i>	3	0	0	0	0	0	0	0	7	1	0.9
<i>Lotus corniculatus</i>	3	0	0	0	0	0	0	90	0	0	10.0
** <i>Machaeranthera canescens</i>	5	0	1	0	0	0	0	0	0	15	1.8
** <i>Madia glomerata</i>	4	0	0	1	10	5	25	0	0	0	4.6
<i>Melilotus albus</i>	4	0	0	0	0	0	10	0	0	0	1.1
** <i>Navaretia species</i> ¹	NA	10	0	0	0	0	0	0	0	0	1.1
** <i>Panicum capillare</i>	4	0	0	0	0	2	0	0	0	0	0.2
<i>Phalaris arundinacea</i> *	2	0	0	20	0	0	1	5	2	0	3.1
** <i>Physocarpus capitatus</i>	2	10	0	5	10	0	15	0	2	15	6.3
<i>Plantago lanceolata</i>	3	0	0	0	0	0	0	0	0	5	0.6
<i>Polygonum species</i>	2	0	0	0	2	0	0	0	0	0	0.2
** <i>Populus trichocarpa</i>	3	0	2	2	2	1	0	1	0	0	0.9
<i>Raphanus sativus</i> ²	NA	0	10	15	40	0	0	0	0	0	7.2
** <i>Rosa pisocarpa</i>	3	0	0	0	0	0	0	0	3	20	2.6
<i>Rubus discolor</i> *	4	2	0	0	0	0	0	0	0	0	0.2
<i>Rumex acetosella</i>	4	2	0	0	0	0	0	0	0	0	0.2
** <i>Salix lasiandra</i>	2	0	0	0	0	0	0	1	0	15	1.8
** <i>Salix species</i>	2	0	0	15	0	5	15	0	0	0	3.9
** <i>Salix piperi</i>	2	0	0	0	0	0	0	40	0	30	7.8
** <i>Salix sitchensis</i>	2	10	0	0	0	0	6	35	70	0	13.4
** <i>Sambucus racemosa</i>	4	0	0	0	0	0	2	0	0	0	0.2
<i>Sonchus oleraceus</i>	5	0	1	0	0	0	5	0	0	0	0.7
** <i>Spiraea douglasii</i>	2	0	5	0	10	0	5	0	0	1	2.3
** <i>Symphoricarpos albus</i>	4	0	0	0	0	0	5	0	1	0	0.7
<i>Trifolium pratense</i>	4	0	0	0	10	5	0	0	0	0	1.7
<i>Trifolium repens</i>	3	10	0	0	0	0	0	0	0	1	1.2
unknown seedling ¹	NA	0	0	0	0	0	0	0	5	0	0.6
Total Cover (sum)		120	131	139	100	73	134	174	100	136	123
Prevalence Index***		3.6	3.1	3.6	NA	3.8	3.4	2.5	2.1	3	3.16

* =invasive; **=native; ***Prevalence Index: OBL=1, FACW=2, FAC=3, FACU=4, UPL=5

¹ Unknown species, could not determine indicator status; not incorporated into PI calculations.

² Listed as NO except in Region 9 is NI, so this plant cannot be used in PI calculations.

NA = Not Applicable; at least 80% of total cover is not identified and does not have indicator status

Invasive Species %Cover and Bareground on Entire Block Transect

Species & Block Transect No.	1	2	3	4	5	6	7	12	17	AVG
<i>Cirsium arvense</i>	0	0	0	7	3	0	0	0	3	1.4
<i>Cirsium vulgare</i>	0	0	0	0	0	0	0	0	3	0.3
<i>Convolvulus arvensis</i>	0	0	1	3	0	0	0	2	10	1.8
<i>Phalaris arundinacea</i>	0	1	1	0	0	20	5	7	0	3.8
<i>Rubus discolor</i>	0	0	0	0	0	0	0	0	3	0.3
<i>Rubus lacianatus</i>	0	0	0	0	0	0	0	0	1	0.1
Total Maximum Invasive %Cover	0	1	2	10	3	20	5	9	20	7.8
Total %Bareground	0	0	0	0	0	10	5	10	3	3.1

2007 Fernhill Wetland Mitigation Bank: UPL Herbaceous Cover and Prevalence Index

Species & Transect No.	Index	21	22	23	24	AVG
Total Percent Cover of Sample Plot		93	90	80	70	83.3
<i>Agrostis capillaris</i>	3	0	0	20	0	5.0
<i>Cirsium arvense</i> *	4	0	0	15	0	3.8
<i>Chrysanthemum leucanthemum</i>	5	4	0	0	0	1.0
<i>Convolvulus arvensis</i> *	5	0	0	3	0	0.8
** <i>Cornus sericea</i>	2	10	27	8	2	11.8
** <i>Crataegus douglasii</i>	3	0	2	0	0	0.5
<i>Daucus carota</i>	5	77	15	30	25	36.8
** <i>Epilobium watsonii</i>	2	0	0	0	3	0.8
** <i>Fraxinus latifolia</i>	2	3	2	0	0	1.3
<i>Holcus lanatus</i>	3	2	0	0	0	0.5
<i>Hypericum perforatum</i>	5	3	5	0	0	2.0
<i>Lactuca serriola</i>	4	1	10	5	20	9.0
<i>Lolium multiflorum</i>	5	1	50	0	0	12.8
** <i>Machaeranthera canescens</i>	5	0	5	0	0	1.3
** <i>Oemleria cerasiformis</i>	4	0	2	0	0	0.5
<i>Phalaris arundinacea</i> *	2	1	0	0	0	0.3
** <i>Physocarpus capitatus</i>	2	1	2	2	5	2.5
** <i>Pinus ponderosa</i>	4	0	0	0	8	2.0
** <i>Populus trichocarpa</i>	3	12	0	0	0	3.0
<i>Raphanus sativus</i> ²	NA	0	5	0	15	5.0
** <i>Rhamnus purshiana</i>	3	0	2	0	0	0.5
** <i>Rosa pisocarpa</i>	3	1	1	0	2	1.0
** <i>Salix species</i>	2	23	0	15	0	9.5
** <i>Salix sitchensis</i>	2	0	0	0	7	1.8
<i>Sonchus oleraceus</i>	5	0	0	0	2	0.5
** <i>Spiraea douglasii</i>	2	0	0	0	2	0.5
<i>Trifolium pratense</i>	4	0	0	2	0	0.5
<i>Trifolium repens</i>	3	5	0	0	0	1.3
unknown grass seedling ¹	NA	0	0	5	5	2.5
Total Cover (sum)		144	128	100	91	116
Prevalence Index***		3.9	4.1	3.6	NA	3.87

* =invasive; **=native; ***Prevalence Index: OBL=1, FACW=2, FAC=3, FACU=4, UPL=5

¹ Unknown species, could not determine indicator status; not incorporated into PI calculations.

² Listed as NO except in Region 9 is NI, so this plant cannot be used in PI calculations.

NA = Not Applicable; at least 80% of total cover is not identified and does not have an indicator status.

Invasive Species %Cover and Bareground on Entire Block Transect

Species & Transect No.		21	22	23	24	AVG
<i>Cirsium arvense</i>		0	2	10	5	4.3
<i>Cirsium vulgare</i>		0	1	5	0	1.5
<i>Convolvulus arvensis</i>		0	0	1	5	1.5
<i>Phalaris arundinacea</i>		0	0	3	5	2.0
<i>Senecio jacobaea</i>		1	0	0	0	0.3
Total Maximum Invasive %Cover		1	3	19	15	9.5
Total %Bareground		1	2	0	0	0.8

2007 Fernhill Wetland Mitigation Bank: UPL Herbaceous Cover and Prevalence Index

2007 Fernhill Wetland Mitigation Bank: Block Transects

Transect 1 (10' X 10'); PSS; height of stake 157.4cm; October 10, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	5	16.7	1	3	4	
<i>Physocarpus capitatus</i>	Pacific ninebark	10	33.3	2	3	3.5	up to 5'
<i>Salix sitchensis</i>	Sitka willow	10	33.3	1	3	7	
Totals		25		4		4 stems per acre=	1742
	Invasive species relative cover	0%					
	Invasive species stems	0					

Transect 2 (10' X 10'); PSS; height of stake 148.5cm; October 10, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	2	50	1	2.5	3.5	
<i>Populus trichocarpa</i>	black cottonwood	2	50	2	2	5	up to 6'
Totals		4		3		3 stems per acre=	1307
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	20	80	4	3	3.5	up to 5'
<i>Spiraea douglasii</i>	Douglas spirea	5	20	1	3	3.5	
Totals		25		5		5 stems per acre=	2178
	Invasive species relative cover	0%					
	Invasive species stems	0					

Transect 3 (10' X 10'); PSS; height of stake 156.5cm; October 10, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	15	88.2	2	2.5	8.5	
<i>Populus trichocarpa</i>	black cottonwood	2	11.7	1	3	5	
Totals		17		3		3 stems per acre=	1307
Shrubs							
<i>Physocarpus capitatus</i>	Pacific ninebark	5	25	1	3	4	
<i>Salix species</i>	willow	15	75	5	2	2	
Totals		20		6		6 stems per acre=	2614
	Invasive species relative cover	0%					
	Invasive species stems	0					

Transect 4 (10' X 10'); PSS; height of stake 140cm; October 10, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	3	60	1	3	3	
<i>Populus trichocarpa</i>	black cottonwood	2	40	2	2	7	
Totals		5		3		3 stems per acre=	1307
Shrubs							
<i>Physocarpus capitatus</i>	Pacific ninebark	10	50	1	3	6	
<i>Spiraea douglasii</i>	Douglas spirea	10	50	1	3	4	
Totals		20		2		2 stems per acre=	871
	Invasive species relative cover	0%					
	Invasive species stems	0					

2007 Fernhill Wetland Mitigation Bank: Block Transects

Transect 5 (10' X 10'); PSS; height of stake 145.5cm; October 10, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Populus trichocarpa</i>	black cottonwood	1	100	1	3	2	
Totals		1		1	stems per acre=		436
<i>Cornus sericea</i>	red-osier dogwood	15	75	1	3	8	
<i>Salix species</i>	willow	5	25	10	2	2	
Totals		20		11	stems per acre=		4792

Invasive species relative cover 0%
Invasive species stems 0

Transect 6 (30' X 30'); PSS; height of stake 125.5cm; October 10, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	15	24	10	2	2	
<i>Physocarpus capitatus</i>	Pacific ninebark	15	24	14	2.5	2	up to 3'
<i>Salix sitchensis</i>	Sitka willow	6	10	5	2.5	2	
<i>Salix species</i>	willow	15	24	8	3	4	up to 7'
<i>Sambucus racemosa</i>	red elderberry	2	3	5	2	3	up to 6'
<i>Spiraea douglasii</i>	Douglas spirea	5	8	12	3	1	
<i>Symphoricarpos albus</i>	snowberry	5	8	1	3	3	
Totals		63		55	stems per acre=		2662

Invasive species relative cover 0%
Invasive species stems 0

Transect 7 (10' X 10'); PSS; height of stake 143cm; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Alnus rubra</i>	red alder	0	0	1	3	0.5	
<i>Populus trichocarpa</i>	black cottonwood	1	2	1	3	2	
<i>Salix lasiandra</i>	Pacific willow	1	2	1	3	3	
Totals		2		3	stems per acre=		1307
Shrubs							
<i>Salix piperi</i>	Piper's willow	40	63	4	3	6	
<i>Salix sitchensis</i>	Sitka willow	35	56	3	3	6	
Totals		75		7	stems per acre=		3049

Invasive species relative cover 0%
Invasive species stems 0

2007 Fernhill Wetland Mitigation Bank: Block Transects

Transect 8 (30' X 30'); PFO; height of stake 136.8cm; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	3	7	2	3	7	up to 10'
<i>Populus trichocarpa</i>	black cottonwood	40	93	12	3	10	up to 18'
Totals		43		14	stems per acre=		678
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	5	55	3	3	3.5	
<i>Physocarpus capitatus</i>	Pacific ninebark	2	22	3	3	2	
<i>Sambucus racemosa</i>	red elderberry	1	11	1	3	5	
<i>Spiraea douglasii</i>	Douglas spirea	1	11	1	3	5	
Totals		9		8	stems per acre=		387
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 9 (30' X 30'); PFO; height of stake not measured; October 10, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Crataegus douglasii</i>	Douglas' hawthorn	5	50	2	3	4.5	
<i>Fraxinus latifolia</i>	Oregon ash	1	10	5	3	5	
<i>Populus trichocarpa</i>	black cottonwood	4	40	4	3	6	
Totals		10		11	stems per acre=		532
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	67	89	14	3	8	
<i>Sambucus racemosa</i>	red elderberry	3	4	1	3	5	
<i>Rosa pisocarpa</i>	pea-fruit rose	5	7	4	3	4	
Totals		75		19	stems per acre=		920
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 10 (30' X 30'); PFO; height of stake not measured October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	2	7.1	1	3	7	
<i>Pinus ponderosa</i>	ponderosa pine	1	3.6	1	3	3	
<i>Populus trichocarpa</i>	black cottonwood	25	89.3	8	3	17	up to 30'
Totals		28		10	stems per acre=		484
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	15	33.3	3	3	6	
<i>Mahonia aquifolium</i>	tall Oregon grape	1	2.2	2	3	2.5	
<i>Physocarpus capitatus</i>	Pacific ninebark	2	4.4	1	3	6	
<i>Rosa pisocarpa</i>	pea-fruit rose	5	11.1	3	3	3.5	
<i>Salix piperi</i>	Piper's willow	5	11.1	1	3	15	
<i>Salix sitchensis</i>	Sitka willow	15	33.3	1	3	18	
<i>Spiraea douglasii</i>	Douglas' spirea	1	2.2	1	3	3	
<i>Symphoricarpos albus</i>	snowberry	1	2.2	1	3	3	
Totals		45		13	stems per acre=		629
Invasive species relative cover		0%					
Invasive species stems		0					

2007 Fernhill Wetland Mitigation Bank: Block Transects

Transect 11 (30' X 30'); PFO; height of stake 142.8cm; October 30, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	12	44.4	1	3	16	
<i>Salix lasiandra</i>	Pacific willow	15	55.6	1	3	17	
Totals		27		2	stems per acre= 97		
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	15	27.3	5	3	6	
<i>Salix species</i>	willow	25	45.5	3	3	14	
<i>Spiraea douglasii</i>	Douglas' spirea	15	27.3	5	3	6	
Totals		55		13	stems per acre= 629		
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 12 (30' X 30'); PSS; height of stake not measured; October 30, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	10	10.8	3	3	14.5	
<i>Lonicera involucrata</i>	black twinberry	7	7.5	2	3	9.5	
<i>Physocarpus capitatus</i>	Pacific ninebark	2	2.2	1	3	4	
<i>Rosa pisocarpa</i>	pea-fruit rose	3	3.2	2	3	4.5	
<i>Salix sitchensis</i>	Sitka willow	70	75.3	5	3	19	
<i>Symphoricarpos albus</i>	snowberry	1	1.1	1	3	2	
Totals		93		14	stems per acre= 678		
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 13 (30' X 30'); PFO; height of stake 150cm; October 30, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Alnus rubra</i>	red alder	30	30.9	4	3	24	
<i>Crataegus douglasii</i>	Douglas' hawthorn	1	4.8	2	3	1.5	
<i>Crataegus monogyna</i>	English hawthorn	NA	14.3	NA	3	1	
<i>Fraxinus latifolia</i>	Oregon ash	1	1.0	1	3	3	
<i>Populus trichocarpa</i>	black cottonwood	65	67.0	5	3	43	
Totals		97		12	stems per acre= 581		
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	1	4.8	1	3	3	
<i>Physocarpus capitatus</i>	Pacific ninebark	15	71.4	6	3	6.5	
<i>Salix sitchensis</i>	Sitka willow	5	23.8	1	3	8	
Totals		21		8	stems per acre= 387		
Invasive species relative cover		14%	English hawthorn (tree stratum)				
Invasive species stems		3	English hawthorn				

2007 Fernhill Wetland Mitigation Bank: Block Transects

Transect 14 (30' X 30'); PFO; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	5	6.2	3	3	4	
<i>Pinus ponderosa</i>	ponderosa pine	1	1.2	1	3	3	
<i>Populus trichocarpa</i>	black cottonwood	75	92.6	21	3	19.5	up to 40'
Totals		81		25	stems per acre=		1210
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	1	5.9	1	3	5	
<i>Physocarpus capitatus</i>	Pacific ninebark	15	88.2	6	3	4.5	
<i>Rosa pisocarpa</i>	pea-fruit rose	1	5.9	1	3	2	
Totals		17		8	stems per acre=		387
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 15 (30' X 30'); PFO; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Alnus rubra</i>	red alder	15	15.6	1	3	30	
<i>Malus fusca</i>	crabapple	1	1.0	1	3	6	
<i>Populus trichocarpa</i>	black cottonwood	80	83.3	17	3	16	up to 45'
Totals		96		19	stems per acre=		920
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	3	10.7	4	3	5	up to 8'
<i>Salix species</i>	willow	25	89.3	4	3	13.5	
Totals		28		8	stems per acre=		387
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 16 (30' X 30'); PFO; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Crataegus douglasii</i>	Douglas' hawthorn	10	47.6	1	3	15	
<i>Malus fusca</i>	crabapple	10	47.6	3	3	8	
<i>Rhamnus purshiana</i>	cascara buckthorn	1	4.8	2	3	2	
Totals		21		6	stems per acre=		290
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	1	1.8	1	3	3	
<i>Lonicera involucrata</i>	twinberry	1	1.8	0	3		stem not in plot
<i>Physocarpus capitatus</i>	Pacific ninebark	5	8.8	1	3	7	
<i>Salix species</i>	willow	50	87.7	4	3	17	
Totals		57		6	stems per acre=		290
Invasive species relative cover		0%					
Invasive species stems		0					

2007 Fernhill Wetland Mitigation Bank: Block Transects

Transect 17 (30' X 30'); PSS; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Salix lasiandra</i>	Pacific willow	15	100.0	2	3	16	up to 20'
Totals		15		2	stems per acre=		97
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	5	6.9	6	3	6	
<i>Lonicera involucrata</i>	twinberry	1	1.4	1	3	5	
<i>Physocarpus capitatus</i>	Pacific ninebark	15	20.8	3	3	7	
<i>Rosa pisocarpa</i>	pea-fruit rose	20	27.8	10	3	5	
<i>Salix piperi</i>	Piper's willow	30	41.7	5	3	13	
<i>Spiraea douglasii</i>	Douglas' spirea	1	1.4	1	3	5	
Totals		72		26	stems per acre=		1258
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 18 (30' X 30'); PFO; height of stake not measured; October 30, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Crataegus douglasii</i>	Douglas' hawthorn	25	100.0	2	3	10	
Totals		25		2	stems per acre=		97
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	7	28.0	3	3	6.5	
<i>Salix species</i>	willow	12	48.0	3	3	8.5	
<i>Spiraea douglasii</i>	Douglas' spirea	5	20.0	1	3	6	
<i>Symphoricarpos albus</i>	snowberry	1	4.0	1	3	2	
Totals		25		8	stems per acre=		387
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 19 (30' X 30'); PFO; height of stake not measured; October 30, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Populus trichocarpa</i>	black cottonwood	65	100.0	13	3	19	
Totals		65		13	stems per acre=		629
Shrubs							
<i>Physocarpus capitatus</i>	Pacific ninebark	5	17.2	3	3	4	
<i>Rosa pisocarpa</i>	pea-fruit rose	1	3.4	1	3	1	
<i>Salix species</i>	willow	20	69.0	3	3	18	
<i>Sambucus racemosa</i>	red elderberry	2	6.9	1	3	5	
<i>Symphoricarpos albus</i>	snowberry	1	3.4	1	3	3	
Totals		29		9	stems per acre=		436
Invasive species relative cover		0%					
Invasive species stems		0					

2007 Fernhill Wetland Mitigation Bank: Block Transects

Transect 20 (30' X 30'); PFO; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Abies grandis</i>	grand fir	1	1.3	1	3	3	
<i>Populus trichocarpa</i>	black cottonwood	75	98.7	9	3	22	up to 35'; 1 sap.
<i>Crataegus monogyna</i>	English hawthorn	NA	1.3	NA	1	3	heavy browse
Totals		76		10	stems per acre=		484
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	5	38.5	1	3	15	
<i>Lonicera involucrata</i>	twinberry	1	7.7	1	3	2	
<i>Oemlaria cerasiformis</i>	Indian plum	1	7.7	1	3	6	
<i>Salix piperi</i>	Piper's willow	3	23.1	1	3	22	
<i>Sambucus racemosa</i>	red elderberry	2	15.4	1	3	15	
<i>Spiraea douglasii</i>	Douglas' spirea	1	7.7	2	3	4	
Totals		13		7	stems per acre=		339

Invasive species relative cover 1.3% English hawthorn (tree stratum)

Invasive species stems 1 English hawthorn

Transect 21 (30' X 30'); UPL; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	3	20.0	4	3	5.5	
<i>Populus trichocarpa</i>	black cottonwood	12	80.0	3	3	16	1 clump with many indiv.
Totals		15		7	stems per acre=		339
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	10	28.6	2	3	6.5	
<i>Physocarpus capitatus</i>	Pacific ninebark	1	2.9	4	3	4	
<i>Rosa pisocarpa</i>	pea-fruit rose	1	2.9	1	3	3	
<i>Salix species</i>	willow	23	65.7	3	3	9	
Totals		35		10	stems per acre=		484

Invasive species relative cover 0%

Invasive species stems 0

Transect 22 (30' X 30'); UPL; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Crataegus douglasii</i>	Douglas hawthorn	2	33.3	1	3	6	
<i>Fraxinus latifolia</i>	Oregon ash	2	33.3	2	2.5	4.5	
<i>Rhamnus purshiana</i>	cascara buckthorn	2	33.3	1	3	7	
Totals		6		4	stems per acre=		194
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	27	84.4	6	3	5.5	
<i>Oemlaria cerasiformis</i>	Indian plum	2	6.3	1	3	5	
<i>Physocarpus capitatus</i>	Pacific ninebark	2	6.3	1	3	2	
<i>Rosa pisocarpa</i>	pea-fruit rose	1	3.1	2	3	1	
Totals		32		10	stems per acre=		484

Invasive species relative cover 0%

Invasive species stems 0

2007 Fernhill Wetland Mitigation Bank: Block Transects

Transect 23 (30' X 30'); UPL; height of stake not measured October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	8	32.0	3	3	5.5	
<i>Physocarpus capitatus</i>	Pacific ninebark	2	8.0	2	3	4	
<i>Salix species</i>	willow	15	60.0	3	3	8	
Totals		25		8	stems per acre=		387
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 24 (30' X 30'); UPL; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Pinus ponderosa</i>	ponderosa pine	8	100.0	4	3	4	
Totals		8		4	stems per acre=		194
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	2	8.7	1	3	5	
<i>Physocarpus capitatus</i>	Pacific ninebark	5	21.7	2	3	4.5	
<i>Rosa pisocarpa</i>	pea-fruit rose	2	8.7	1	3	4	
<i>Salix species</i>	willow	5	21.7	1	3	5	
<i>Salix sitchensis</i>	Sitka willow	7	30.4	1	3	15	
<i>Spiraea douglasii</i>	Douglas' spirea	2	8.7	1	3	5	
Totals		23		7	stems per acre=		339
Invasive species relative cover		0%					
Invasive species stems		0					

Transect 25 (30' X 30'); PFO; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Alnus rubra</i>	red alder	25	40.3	2	3	22.5	
<i>Crataegus monogyna</i>	English hawthorn	NA	1.6	NA	3	0.5	
<i>Fraxinus latifolia</i>	Oregon ash	1	1.6	1	3	2	
<i>Populus trichocarpa</i>	black cottonwood	35	56.5	6	3	29	up to 40'
<i>Rhamnus purshiana</i>	cascara	1	1.6	2	3	4	
Totals		62		11	stems per acre=		532
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	2	3.3	5	3	4	
<i>Oemlaria cerasiformis</i>	Indian plum	2	3.3	1	3	6	
<i>Physocarpus capitatus</i>	Pacific ninebark	5	8.2	3	3	5	
<i>Salix piperi</i>	Piper's willow	50	82.0	13	3	16.5	
<i>Spiraea douglasii</i>	Douglas' spirea	2	3.3	6	3	4	
Totals		61		28	stems per acre=		1355
Invasive species relative cover		1.6% English hawthorn (tree stratum)					
Invasive species stems		4 English hawthorn					

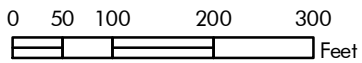
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Transect 26 (30' X 30'); PFO; height of stake not measured; October 12, 2007

SPECIES	Common Name	% Cover	Relative % Cover	2007	Avg Vig (1-3)	AVG. HT. (ft)	COMMENTS
Trees							
<i>Fraxinus latifolia</i>	Oregon ash	5	41.7	2	3	10	up to 18'
<i>Pinus ponderosa</i>	ponderosa pine	1	8.3	1	3	3	
<i>Populus trichocarpa</i>	black cottonwood	5	41.7	2	3	6	up to 10'; 2 seedlings
<i>Rhamnus purshiana</i>	cascara	1	8.3	1	3	3	heavy browse
Totals		12		6	stems per acre=		290
Shrubs							
<i>Cornus sericea</i>	red-osier dogwood	2	3.8	3	3	2	
<i>Physocarpus capitatus</i>	Pacific ninebark	2	3.8	4	3	3	
<i>Salix piperi</i>	Piper's willow	30	56.6	10	3	11.5	
<i>Salix sitchensis</i>	Sitka willow	10	18.9	4	3	13.5	
<i>Salix species</i>	willow	5	9.4	1	3	7	
<i>Spiraea douglasii</i>	Douglas' spirea	3	5.7	2	3	2.5	7 seedlings
<i>Symphoricarpos albus</i>	snowberry	1	1.9	1	3	3	
Totals		53		25	stems per acre=		1210



Invasive species relative cover 0%

Invasive species stems 0



Wetlands surveyed with GeoXT Mapping
Grade GPS Unit (accuracy +/- 1m).

KEY TO FEATURES

-  Monitoring Plots
-  Wetland Boundary
-  Project Boundary



SWCA
ENVIRONMENTAL CONSULTANTS

SWCA Project #10569

Fernhill Mitigation Bank

Monitoring Plot Locations