i. Mitigation Monitoring Report Cover Sheet

Corps of Engineers

Corps Permit Number: 2011-00100

Contact Information:

Permittee:	**City of Salem**	**Consultant:**	Pacific Habitat Services, Inc.
	Attn: Patricia Farrell		9450 SW Commerce Circle, Suite 180
	555 Liberty Street SE, Rm. 325		Wilsonville, OR 97070
	Salem, OR 97301-3513		503-570-0800

Responsible Party for Monitoring and Date(s) of Inspection:

Name: Pacific Habitat Services (Fred Small) **Date(s):** August 27 and September 6, 2013

Summary Paragraph: (purpose of approved project, acreage & type of aquatic resources impacted, & mitigation acreage and type of aquatic resources authorized to compensate for the aquatic impacts)

The Waln Creek/ Battle Creek riparian enhancement mitigation site is intended to replace the functions and values lost over many years as a result of channelization and vegetation manipulation associated with its previous land uses, most recent as a golf course. This permit authorized the placement of up to 516 cubic yards and removal of up to 900 cubic yards of material below the Ordinary High Water line of Waln Creek and Battle Creek. The fill and removal activities enabled the relocation of the Waln Creek channel to enhance local riparian functions. In addition, riparian buffer planting efforts along the existing and relocated channel sections were to help mitigate for the fill and removal activities.

Written Description of Compensatory Mitigation Site (include identifiable landmarks, including information to locate the site perimeters):

The mitigation work extends both north and south of the Waln Street crossing of Waln Creek. Plantings extend northward to a residential subdivision in strips ~50 feet to either side of the creek, as well as southward to Battle Creek, where the planting area widens to nearly 400 feet.

Directions to the Mitigation Site:

The site can be reached via Commercial Street SE (Business Route 99) south of its intersection with Kuebler Boulevard. Continue south to Waln Street, and turn right (heading west). The Waln Creek channel is crossed approximately 1000 feet west of Commercial Street.

Commencement of Compensatory Mitigation: Fall 2012
Completion of Compensatory Mitigation: n/a

Statement of Performance Standards Being Met:

None specified in Corps permit; report below addresses DSL standards

Dates of Recent Corrective / Maintenance Activities (since last report submission): n/a; 1st report

Specific Recommendations for additional corrective/remedial actions:

- Periodic weed control measures will continue throughout monitoring period

	Performance Standards	Fully Met? (Y/N)	Comments/Reason for shortfall (mark NA if doesn't apply this year) *
#33	**Bare Substrate Cover**: Bare substrate represents no more than 20% cover.	Y/N	Sampling of 1^{m2} quadrats indicates that as much as 28.5% of site is bare substrate. However, this is primarily due to the gravel 'mulching' around each new planting, which occupies a significant portion of nearly all plots. This is NOT bare soil that simply hasn't been revegetated.
#34	**Woody Vegetation:** The density of woody vegetation is at least 1,600 live native plants (shrubs) and/or stems (trees) per acre OR the cover of native woody vegetation on the site is at least 50%. Native species volunteering on the site may be included, dead plants do not count, and the standard must be achieved for 2 years without irrigation.	Y	Sampling of 15'R plots indicates an estimated density of 2,826 plants per acre. In addition, current numbers indicate nearly 138% of the number of plants originally specified.
#35	**Species Diversity:** By Year 3 and thereafter, there are at least 6 different native species. To qualify, a species must have at least 5% average cover in the habitat class, and occur in at least 10% of plots sampled.	Y/N	Not applicable at this stage.

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 ☒

** see report for detailed information*

2. WALN CREEK/BATTLE CREEK MITIGATION PLAN PURPOSE AND OVERVIEW

A. Location

The mitigation site is located at:

- T8S, R3W, Section 23B; Tax lots 100, 101, 200, 300, and 400
- Lat: 44.864813^0 Long: -123.023656^0
- The site can be reached via Commercial Street SE (Business Route 99) south of its intersection with Kuebler Boulevard. Continue south to Waln Street, and turn right (heading west). The Waln Creek channel is crossed approximately 1,000 feet west of Commercial Street.

B. Mitigation Goals and Objectives

The Waln Creek/ Battle Creek riparian enhancement mitigation site is intended to replace the functions and values lost over many years as a result of channelization and vegetation manipulation associated with its previous land uses, most recent as a golf course. The permits issued by DSL (No. 47781-RF) and the Corps (NWP No. 201100100)) authorized the placement of up to 516 cubic yards and removal of up to 900 cubic yards of material below the Ordinary High Water line of Waln Creek and Battle Creek. The fill and removal activities enabled the relocation of the Waln Creek channel to enhance local riparian functions. In addition, riparian buffer planting efforts along the existing and relocated channel sections were to help mitigate for the fill and removal activities.

Following the channel relocation and riparian buffer soil preparation activities, seven species of trees and nine species of shrubs were planted, and the site was seeded with a diverse native grass seed mix.

The DSL permit stipulated that several success criteria be met by the mitigation activities; the Corps permit did not specify performance standards. The DSL standards to be met are:

No.	Condition	DSL Performance Standard
30	Establishment of Permanent Monitoring locations required	Permanent plots must be established…in sufficient number and locations to be representative of the site.
31	Native Species Cover	The cover of native species, as defined in the USDA Plants Database, in the herbaceous stratum is at least 60%.
32	Invasive Species Cover	The cover of invasive species is no more than 10% [*includes further details on what may constitute an invasive*]
33	Bare Substrate Cover	Bare substrate represents no more than 20% cover.
34	Woody Vegetation	The density of woody vegetation is at least 1,600 live native plants (shrubs) and/or stems (trees) per acre OR the cover of native woody vegetation on the site is at least 50%...standard must be achieved for 2 years without irrigation.
35	Species Diversity	By Year 3 and thereafter, there are at least 6 different native species. To qualify, a species must have at least 5% average cover in the habitat class, and occur in at least 10% of the plots sampled.

C. Maintenance and Management Actions

Since this is the first year of monitoring following the initial site construction and planting, no special maintenance actions have been conducted. Instead, this report will provide recommendations for any upcoming maintenance needs.

D. Monitoring Methods

Vegetation monitoring followed the routine methods specified in the DSL Removal-Fill Guidelines (as laid out in the *Routine Monitoring Guidance for Vegetation* (interim draft 2009).

A total of twenty-seven 15-foot radius circular plots were sampled to determine woody plant survival and density, which provided nearly 10% of area sampled. Groundcover development was also assessed using two 1-meter square quadrats positioned at opposite ends of each circular plot.

Data collected in the woody plant sampling plots was then tabulated in an MS Excel spreadsheet (Appendix A), and the mean, standard error, standard deviation, and confidence interval (for an 80% confidence level) of the sampled population were calculated for the total live count for all plots.

Similarly, the groundcover plots were tabulated and analyzed for relative success per the routine DSL performance standards for groundcover development. These standards include cover by native woody and herbaceous species, and by non-native invasive species.

E. Monitoring Data Locations

Data plots were established by first generating a randomized, self-avoiding series of points distributed across the site. A shapefile was created using this list of Easting and Northing coordinates, which was then used in a GPS unit to locate each point in the field. Plot centers were then staked with white PVC tubing for permanence and visibility. The sampling layout is depicted in Figure 2 (Appendix B).

F. Hydrology Methods and Context

The intent of the vegetation enhancement measures along the Waln Creek riparian corridor was primarily to improve its water quality and wildlife functions through dense tree and shrub plantings and invasive vegetation management. As such, hydrologic monitoring is not pertinent to this project.

3. RESULTS

A. Vegetation Standards

Performance Standard 1 Result:

Native Species Cover: *The cover of native species, as defined in the USDA Plants Database, in the herbaceous stratum is at least 60%.*

Summary Metric:

This standard was not quite met in the first year; the sampling plots provided a mean of 56.22% (80% CI). However, the overall cover in each plot has also been influenced significantly by the area taken up by the gravel and fabric 'mulch' used around each shrub and tree planting.

Performance Standard 2 Result:

Invasive Species Cover: *The cover of invasive species is no more than 10%. A plant species should automatically be labeled as invasive if it appears on the current ODA noxious weed list, plus known problem species including Phalaris arundinacea, Mentha pulegum, Holcus lanatus, Anthoxanthum odoratum, and the last crop plant if it is non-native. Non-native plants should be labeled as such if they are listed as non-native on the USDA Plants Database. Beginning in Year 2 of monitoring, DSL will consider a non-native plant species invasive if it comprises more than 15% cover in 10% or more of the sample plots in any habitat class, and increases in cover or frequency from the previous monitoring period. Plants that meet this definition will be considered invasive for all successive years of monitoring. After they site has matured to the stage when desirable canopy species reach 50% cover, the cover of invasive understory species may increase but may not exceed 30%*

Summary Metric:

This standard has been met for the first year, with the sampling plots providing a mean of just 0.46% (80% CI) for herbaceous species. No cover was recorded for any invasive woody species. Nevertheless, an increase of any non-native species sufficient to change their status to invasive (per the above standard) may affect these results.

Performance Standard 3 Result:

Bare Substrate Cover*: Bare substrate represents no more than 20% cover.*

Summary Metric:

This standard has not been met for the first year, with the sampling plots providing a mean of 28.52% (80% CI) of bare substrate. However, this standard must take into account the high proportion of bare cover that is directly related to the square of gravel/fabric 'mulch' around each new planting. One or more of these mulched areas typically extend into each quadrat, providing a bare area unrelated to the reasons normally associated with bare ground (e.g. poor seed germination, scour, late season ponding, etc.).

Performance Standard 4 Result:

Woody Vegetation: *The density of woody vegetation is at least 1,600 live native plants (shrubs) and/or stems (trees) per acre OR the cover of native woody vegetation on the site is at least 50%. Native species volunteering on the site may be included, dead plants do not count, and the standard must be achieved for 2 years without irrigation.*

Summary Metric:

This standard has been easily met for the first year, with the sampling plots providing an estimated density of approximately 2,825 plants per acre for the 4.78-acre planting area. This density is based on an estimated 13,507 plants overall, for a survival rate of 138% (80% CI) relative to the specified number of planted woody species.

Table 1 lists the woody plantings originally specified for the Waln Creek/Battle Creek riparian mitigation area, along with the number of plants surviving in fall 2013. A more detailed breakdown of actual counts and associated statistics is included on spreadsheets in the Appendix.

Table 1. Summary of 2013 Woody Plant Estimates for the Waln Creek/Battle Creek Riparian mitigation site in Salem, OR

Botanical Name	Common Name	Original No's Spec'd	Aug-Sept 2013 Sampling Estimates*	Estimated % Survival**
TREES				
Acer macrophyllum	Bigleaf maple	907	44	5
Alnus rhombifolia	White alder	1,209	775	64
Crataegus douglasii	Douglas hawthorn	302	306	101
Fraxinus latifolia	Oregon ash	1,511	1529	101
Malus fusca	Pacific crabapple	302	109	36
Populus balsamifera spp. trichocarpa	Black cottonwood	1,209	1299	107
Thuja plicata	Western red cedar	605	33	5
SHRUBS				
Cornus sericea	Red-osier dogwood	557	1430	257
Lonicera involucrata	Twinberry	557	1878	337
Physocarpus capitatus	Pacific ninebark	557	1136	203
Rosa nutkana	Nootka rose	334	1987 total roses counted [993.5][1]	[297][1]
Rosa pisocarpa	Clustered rose	334	[993.5][1]	[297][1]
Sambucus cerulea	Pacific willow	371	197	53
Spiraea douglasii	Douglas spirea	371	1190	321
Symphoricarpos albus	snowberry	631	1594	253
TOTAL WOODY PLANTINGS		**9,757**	**13,507**	**138% overall**

**Based on extrapolated values from overall mean of 45.81 plants per sampling unit [factor of 208,400 sf (overall area)/706 sf (sampling unit)=295.18]; individual spp. counts have been similarly inferred*

***As shown on the attached spreadsheet, the extrapolated mean (13,507) may vary based on the assigned confidence interval. For example, at a sampling CI of 80%, the mean could range anywhere from 12,697 to 14,336. Consequently, the overall survival rate varies from 130% to 147% of the original numbers planted.*

[1]Since the numerous rose plantings were typically not in flower or fruit when tallied, they were not distinguished as to species. As such, the total estimate is for Rosa spp., and the estimated total was divided equally between species.

Performance Standard 5 Result:

Species Diversity: *By Year 3 and thereafter, there are at least 6 different native species. To qualify, a species must have at least 5% average cover in the habitat class, and occur in at least 10% of plots sampled.*

Summary metric:

This standard cannot yet be addressed due to the early stage in site development.

B. Hydrology Standards Result

Not Applicable

C. Delineation of Wetland Acreage Achieved

Not Applicable

4. CONCLUSIONS AND RECOMMENDATIONS

A. Project Status

Thus far, the mitigation project is not in compliance with all performance standards, as has been described in the previous sections. However, since this is the first year of monitoring, it is certainly too soon to detect trends either toward or away from the standards.

Groundcover Development

Groundcover estimates within the riparian planting area currently fall below the standard for native cover (56% versus the >60% standard), but meet the cover standards for invasive herbaceous (<10%) and woody (<10%) species. In addition, the data collected indicates that the bare ground standard (<20%) is not being met.

The two unmet standards (native cover and bare ground) are definitely interrelated, due to the large area of bare ground (gravel/fabric mulch) around each woody planting. The mulched areas show up in virtually every plot due to the density of plantings, making both standards essentially impossible to meet at this time. During subsequent years, the mulched areas will likely be encroached into as the groundcover spreads and as fines accumulate in the gravel.

At this time, the dominant groundcover species are natives; these include spike bentgrass (*Agrostis exarata*) and meadow barley (*Hordeum brachyantherum*). The most common non-natives are creeping bentgrass (*Agrostis stolonifera*), hairy hawkbit (*Hypochaeris radicata*), and birdsfoot trefoil (*Lotus corniculatus*); however, these represent relatively low overall cover.

Woody Plant Survival and Density

Thus far, woody plant survival is high relative to the number of plants specified, at 138% overall, and relatively few dead plants were encountered. More importantly, the estimated stem density was approximately 2,825 plants per acre for the 4.78-acre planting area, significantly above the performance target of 1,600 stems per acre. Provided that most plantings continue to thrive and develop strong root systems, this standard should be met in subsequent years as well.

B. Recommendations.

Remedial Planting

Given the high stem densities at this time, no remedial woody plantings are either recommended or warranted.

Weed Control

Invasive species such as reed canarygrass (*Phalaris arundinacea*), Canada thistle (*Cirsium arvense*), St. Johns' wort (*Hypericum perforatum*), and tansy ragwort (*Senecio jacobaea*) are present as small patches or individuals only, and do represent infestations at this time. Nevertheless, it is recommended that a mid-to late-spring 2014 walkthrough be conducted to control any emerging populations through either physical removal or chemical spot treatments.

5. MAPS AND FIGURES

Figure 1 depicts the overall grading and site plan for the Waln Creek/Battle Creek riparian enhancement area. Figure 2 provides the buffer planting areas, sample plot, and photopoint locations, while Figure 3 provides the species list and typical spacing. Figure 4 includes a recent aerial of the project vicinity, and Figures 5 to 7 provide photodocumentation of the site; all figures are included the Appendix B.

Appendix A

Sampling Data

First Year Monitoring for Waln Creek riparian corridor, Salem (data collected on August 27 and September 6, 2013)

Specified Plantings			Quadrats														
R9-IND Status	Plant Species	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			No. of live plants														
TREES																	
FACU	*Acer macrophyllum*	Bigleaf maple	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
FAC	*Alnus rhombifolia*	White alder	0	1	3	3	3	10	3	1	0	1	5	1	4	3	3
FAC	*Crataegus douglasii*	Black hawthorn	1	2	1	3	0	2	1	0	0	2	1	0	0	0	0
FACW	*Fraxinus latifolia*	Oregon ash	3	6	4	1	4	3	1	3	5	5	7	5	3	15	4
FACW	*Malus fusca*	Pacific crabapple	0	0	2	0	0	1	0	4	1	1	0	0	0	0	0
FAC	*Populus balsamifera ssp. trichocarpa*	black cottonwood	4	4	0	6	1	22	18	1	1	2	7	6	2	0	1
FAC	*Thuja plicata*	Western red cedar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SHRUBS																	
FACW	*Cornus sericea*	Red-osier dogwood	3	3	5	2	0	4	0	10	14	6	11	13	5	0	4
FAC	*Lonicera involucrata*	Twinberry	18	8	4	3	3	2	11	2	0	2	5	0	8	4	3
FAC	*Physocarpus capitatus*	Pacific ninebark	0	0	3	5	10	0	4	1	3	1	1	0	4	8	0
FAC	*Rosa nutkana*	Nootka rose	14	4	4	8	17	14	3	9	11	13	6	4	5	0	3
FAC	*Rosa pisocarpa*	Swamp rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FACU	*Sambucus cerulea*	Blue elderberry	0	0	1	0	0	3	2	2	0	1	0	0	2	0	0
FACW	*Spiraea douglasii*	Douglas' spirea	1	20	1	8	1	1	5	1	1	0	1	4	8	1	0
FACU	*Symphoricarpos albus*	snowberry	1	0	17	9	2	3	2	4	0	7	2	10	2	9	3
		TOTAL LIVE	**45**	**48**	**45**	**48**	**41**	**65**	**50**	**38**	**36**	**41**	**46**	**43**	**43**	**41**	**21**

Stats 80% CI	
Mean	45.84615385
Standard Error	2.111282736
Median	44
Mode	48
Standard Deviation	10.76547187
Sample Variance	115.8953846
Kurtosis	3.464609906
Skewness	1.033446351
Range	58
Minimum	21
Maximum	79
Sum	1192
Count	26
Confidence Level(	2.779176627

Stats 95% CI	
Mean	45.84615385
Standard Error	2.111282736
Median	44
Mode	48
Standard Deviation	10.76547187
Sample Variance	115.8953846
Kurtosis	3.464609906
Skewness	1.033446351
Range	58
Minimum	21
Maximum	79
Sum	1192
Count	26
Confidence Level(9	4.348268191

First Year Monitoring for Waln Creek riparian corridor, Salem (data collected on August 27 and September 6, 2013)

Specified Plantings			Quadrats														
R9-IND Status	Plant Species	Common Name	16	17	18	19	20	21	22	23	24	25	26	27			
			No. of live plants												Mean (by spp.)	plants per SF	inferred plant #'s	STDEV BY SPP.
TREES																		
FACU	*Acer macrophyllum*	Bigleaf maple	0	0	0	2	0	0	0	0	0	1	0	0	**0.15**	0.0002	44	0.46
FAC	*Alnus rhombifolia*	White alder	3	1	6	3	0	1	3	2	2	8	0	1	**2.63**	0.0037	775	2.40
FAC	*Crataegus douglasii*	Black hawthorn	0	0	1	1	0	0	3	1	1	3	3	2	**1.04**	0.0015	306	1.09
FACW	*Fraxinus latifolia*	Oregon ash	8	2	9	0	0	4	7	11	10	11	4	5	**5.19**	0.0073	1529	3.63
FACW	*Malus fusca*	Pacific crabapple	0	0	0	0	0	0	0	0	0	0	1	0	**0.37**	0.0005	109	0.88
FAC	*Populus balsamifera ssp. trichocarpa*	black cottonwood	6	3	2	11	4	0	2	2	1	8	3	2	**4.41**	0.0062	1299	5.26
FAC	*Thuja plicata*	Western red cedar	0	0	0	1	0	0	0	0	0	1	1	0	**0.11**	0.0002	33	0.32
SHRUBS																		
FACW	*Cornus sericea*	Red-osier dogwood	10	8	15	2	9	2	0	1	0	3	0	1	**4.85**	0.0069	1430	4.72
FAC	*Lonicera involucrata*	Twinberry	15	9	13	3	8	2	1	10	11	9	1	17	**6.37**	0.0090	1878	5.26
FAC	*Physocarpus capitatus*	Pacific ninebark	2	2	0	2	10	1	5	3	5	6	18	10	**3.85**	0.0054	1136	4.27
FAC	*Rosa nutkana*	Nootka rose	2	0	2	0	6	20	5	4	2	10	6	10	**6.74**	0.0095	1987	5.34
FAC	*Rosa pisocarpa*	Swamp rose	0	0	0	0	0	0	0	0	0	0	0	0	**0.00**	0.0000	0	0.00
FACU	*Sambucus cerulea*	Blue elderberry	0	0	0	6	0	1	0	0	0	0	0	0	**0.67**	0.0009	197	1.36
FACW	*Spiraea douglasii*	Douglas' spirea	0	7	2	3	0	4	9	5	3	18	2	3	**4.04**	0.0057	1190	5.06
FACU	*Symphoricarpos albus*	snowberry	2	5	10	11	1	7	7	10	8	1	6	7	**5.41**	0.0076	1594	4.21
															Overall Mean			Overall SD
		TOTAL LIVE	**48**	**37**	**60**	**45**	**38**	**42**	**42**	**49**	**43**	**79**	**45**	**58**	45.81	0.0648	13507	10.56

Notes:

For 80% Confidence Level, mean count per sample can range from 43.07 to 48.63

43.07	0.0609	12697
48.63	0.0688	14336

At 80% level of confidence, the extrapolated mean of 13507 plants can actually vary from 12,697 to 14,336 plants.

95%), the extrapolated values could vary anywhere from 12,235 to 14,799.

For 95% Confidence Level, mean count per sample can range from 41.50 to 50.19

41.50	0.0587	12235
50.19	0.0710	14799

Site: Wahn/Battle Creek Riparian
Enhancement site, Salem Sample Date(s): 8/27/2013 and 9/6/2013
Shrub-Dominated and Forested Wetland Habitat Unit Percent Cover per sample plot

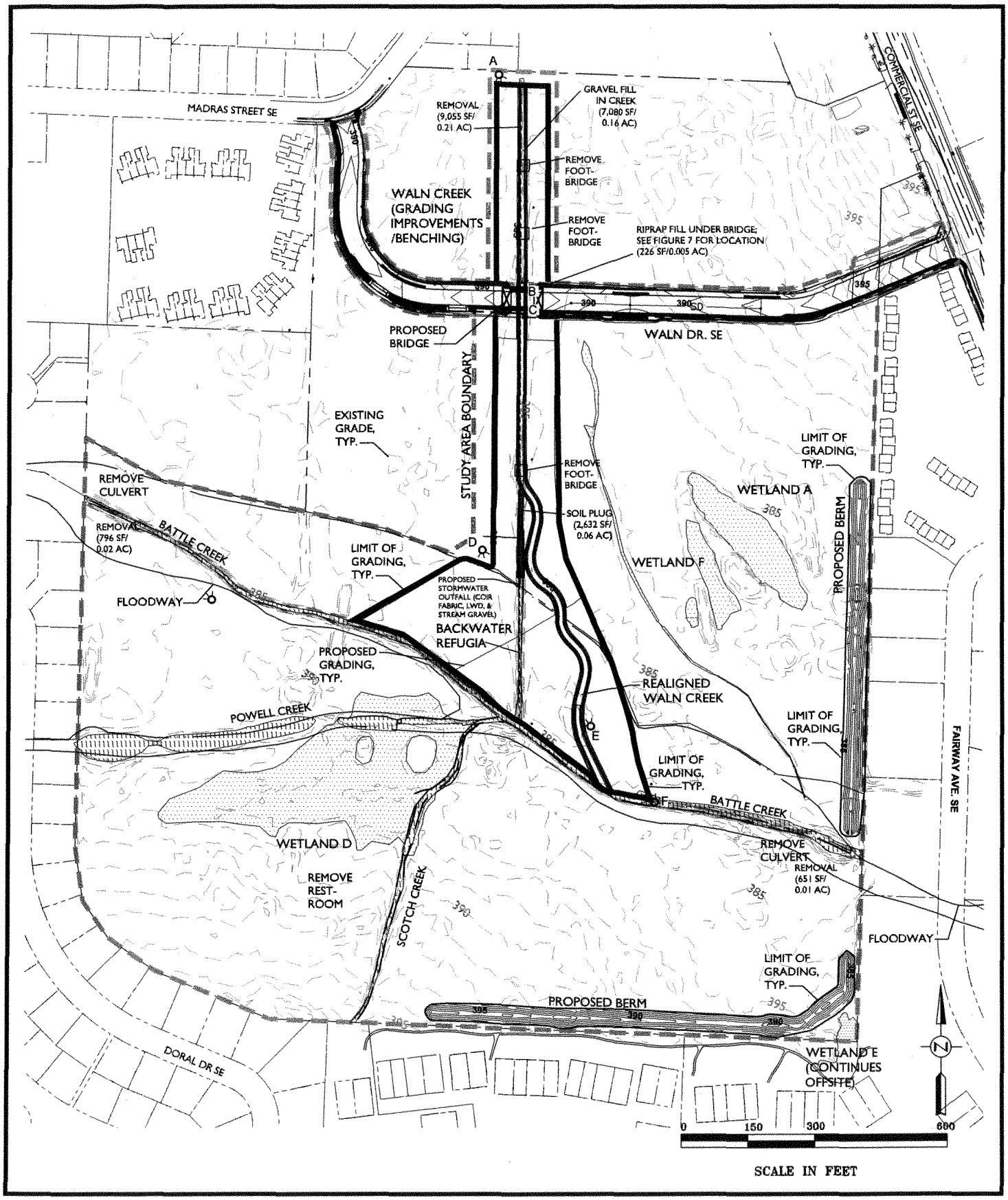
Species	Origin (N, NN, I)	Wetland Status (1 - 5)	1 NE	1 SW	2 NE	2 SW	3 NE	3 SW	4 NE	4 SW	5 NE	5 SW	6 NE	6 SW	7 NE	7 SW	8 NE	8 SW	9 NE	9 SW	10 NE	10 SW	11 NE	11 SW	12 NE	12 SW	13 NE	13 SW	14 NE	14 SW	15 NE	15 SW	16 NE	16 SW	17 NE	17 SW	18 NE	18 SW	19 NE	19 SW	20 NE	20 SW	21 NE	21 SW	22 NE	22 SW	23 NE	23 SW	24 NE	24 SW	25 NE	25 SW	26 NE	26 SW	27 NE	27 SW	Row Average
Native Herbaceous Species *species-latin name*																																																									
Agrostis exarata	N	2	30	20	4	0	40	35	20	60	40	75	40	50	50	35	40	50	60	40	35	15	0	15	15	25	0	15	5	2	5	20	2	0	15	35	5	0	0	10	0	0	0	0	12	20	5	5	25	5	0	25	35	25	25	20	20.6
Bidens frondosa	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6
Carex sp.	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Deschampsia cespitosa	N	2	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Epilobium brachycarpum (paniculatum)	N	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4
Epilobium ciliatum (watsonii)	N	2	0	1	0	0	4	1	0	0	1	2	0	5	0	0	0	0	2	5	0	5	1	20	0.5	0	0	0	5	5	10	5	10	10	5	0	0	0	15	20	3	5	0	10	0	0	0	0	0	0	0	0	5	0	1	5	3.0
Festuca occidentalis	N	3	0	15	0	0	5	2	1	0	1	1	0	2	5	0	2	2	1	0	0	0	0	5	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	5	0	2	0.5	0	0	0	5	1	2	0	1.4
Gnaphalium palustre	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Hordeum brachyantherum	N	2	20	20	5	0	5	1	50	10	20	5	20	2	10	25	20	20	12	15	20	7	3	3	25	20	75	50	15	25	10	10	15	15	25	20	20	40	5	2	0	10	20	0	10	15	15	25	15	30	60	10	0	2	10	12	16.6
Juncus bufonius	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Juncus effusus	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Lupinus rivularis	N	3	0	0	0	0	5	15	0	0	3	10	5	5	0	0	2	0	0	0	15	0	2	0	0	10	0	0	0	0.5	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	5	35	10	2.4
Rorippa curvisiliqua	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Veronica americana	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Invasive Herbaceous Species *species-latin name*																																																									
Cirsium arvense	I	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Hypericum perforatum	I	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	5	0	0	0	0	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	1	0	0	0.1
Phalaris arundinacea	I	2	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.3
Senecio jacobaea	I	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0.1
Non-Native Herbaceous Species *species-latin name*																																																									
Agrostis stolonifera/ capillaris	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	20	15	5	0	0	0	45	35	10	5	0	0	10	5	2	5	20	25	15	35	0	20	0	0	0	0	0	0	0	0	2	0	1	15	5.4
Anthemus cotula	NN	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0.1
Bromus mollis	NN	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Capsella bursa-pastoris	NN	4	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Crepis capillaris	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0.5	0	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Daucus carota	NN	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	3	5	0	0	0.2
Holcus lanatus	NN	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Hypochaeris radicata	NN	4	0	0	2	0	10	10	2	0.5	7	0	5	10	0	0	10	1	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	15	10	20	15	0	0	0	0	0	0	0	0	10	0	0	5	15	15	5	10	3.5
Lactuca serriola	NN	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4
Leontodon nudicaulis ssp taraxacoides	NN	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	30	5	0	5	0	5	0	5	5	1	0.5	0	0	0	0	0	1.4
Lepidium sp.	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0.5	0	1	0	5	1	0	15	0	0.5	0	0	0	0	0	0	0	0.5	0	0	0.5
Leucanthemum vulgare	NN	4	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Lolium perenne	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Lotus corniculatus	NN	3	10	2	60	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	0	0	0	0	0	0	15	0	0	0	0	0	15	5	0	2.1
Plantago lanceolata	NN	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0.1
Poa annua	NN	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Polygonum aviculare	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Polygonum persicaria [Persicaria maculosa]	NN	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6
Rumex acetosella	NN	4	0	0	0	0	5	10	0	0	2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0.5	0	0	0	0	0	0	0	0	2	5	5	0	0	10	0.5	5	0	0	5	0	0	0	10	5	1	0	1.3
Rumex crispus	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4
Sonchus asper	NN	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0.0
Trifolium pratense	NN	4	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Trifolium repens	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Vicia tetrasperma	NN	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Vulpia myuros	NN	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Native Shrub and Tree Species *species-latin name*																																																									
Alnus rhombifolia	N	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0.2
Cornus sericea	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Fraxinus latifolia	N	2	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0.2
Lonicera involucrata	N	3	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0.3
Physocarpus capitatus	N	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0.1
Populus balsamifera ssp trichocarpa	N	3	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	20	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9
Rosa nutkana	N	3	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0.5
Sambucus cerulea	N	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Spiraea douglasii	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	10	5	0	0	0	0	0.5
Symphoricarpos albus	N	4	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	5	15	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	5	0	0	0.8
Non-Native Shrub and Tree Species *species-latin name*																																																									
Invasive Shrub and Tree Species *species-latin name*																																																									
Rubus armeniacus	I	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6
Bare Substrate																																																									
gravel/mulch/bare ground			35	40	20	10	20	20	25	25	25	5	20	25	35	30	20	25	20	35	20	70	30	35	40	35	20	30	30	35	30	40	0	0	20	25	30	25	15	15	30	30	80	35	75	50	80	50	35	60	25	50	20	15	10	20	30.5

Plant Count (Shrubs) + Stem Count (Trees)

Routine Performance Standards	Threshold		1 NE	1 SW	2 NE	2 SW	3 NE	3 SW	4 NE	4 SW	5 NE	5 SW	6 NE	6 SW	7 NE	7 SW	8 NE	8 SW	9 NE	9 SW	10 NE	10 SW	11 NE	11 SW	12 NE	12 SW	13 NE	13 SW	14 NE	14 SW	15 NE	15 SW	16 NE	16 SW	17 NE	17 SW	18 NE	18 SW	19 NE	19 SW	20 NE	20 SW	21 NE	21 SW	22 NE	22 SW	23 NE	23 SW	24 NE	24 SW	25 NE	25 SW	26 NE	26 SW	27 NE	27 SW	Habitat Average	Standard Error	Standard Met?
Cover of Native Herbaceous Species	>=60%		50	58	9		59	54	72	70	65	93	65	64	65	60	64	72	75	60	70	27	18	43	48	60	75	65	25	33	41	55	35	26	45	55	33	45	25	32	5	21	20	10	28	40	20	32	41	35	60	35	45	33	73	47	56.22	3.7	NO
Lower CI (80%)																																																									51.43		
Upper CI (80%)																																																									61.01		
Cover of Invasive Herbaceous Species	<=10%		0	0	0		5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6	0	3	0.46	0	YES
Lower CI (80%)																																																									0.06		
Upper CI (80%)																																																									0.86		
Cover of Invasive Shrubs and Trees	<=10%		0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0	YES
Lower CI (80%)																																																											
Upper CI (80%)																																																											
Bare Substrate	<=20%		35	40	20		20	20	25	25	25	5	20	25	35	30	20	25	20	35	20	70	30	35	40	35	20	30	30	35	30	40	0	0	20	25	30	25	15	15	30	30	80	35	75	50	80	50	35	60	25	50	20	15	10	20	28.52	2	NO
Lower CI (80%)																																																									25.68		
Upper CI (80%)																																																									31.36		
Native Diversity (all layers)	6																																																										
Prevalence Index--All strata	<3.0		3	2	2	3	3	3	4	4	3	3	3	4			4	4	2	3	2		3	4	3	2		2	3	3	2	3	3	3	3	2	3	3	2	3	4	3		3	2	3		2	4	3	2	3	3	3	2	3	2.89		YES
Weighted Prevalence Index			85	18	214	15	73	104	8	2	39	8	50	43	0	0	59	12	15	15	35	6	192	125	34	20	0	10	135	111	105	15	143	104	149	68	163	108	189	185	265	157	0	205	2	51	0	70	100	11	43	45	133	187	57	101			
Sum of plant cover			25	10	134	5	26	36	2	1	13	3	20	12	0	0	17	3	10	5	16	0	63	35	10	11	0	5	45	37	70	5	42	34	51	32	53	36	78	55	72	53	0	76	1	18	0	35	25	4	21	15	45	72	23	33			

Appendix B

Figures



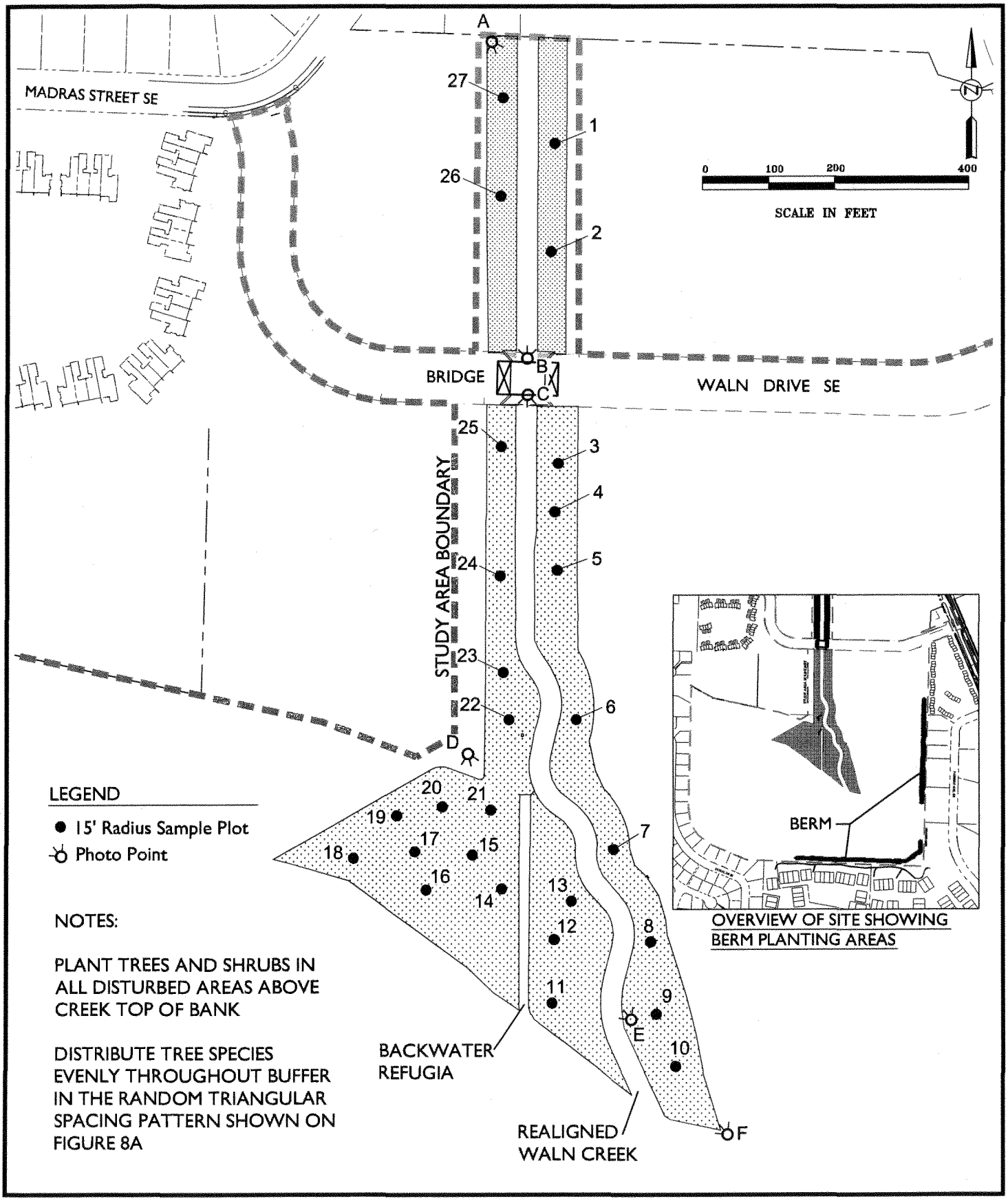
5187
12/16/13

Overall Grading and site plan at the Waln Creek and Battle Creek enhancement project in Salem, Oregon, showing limits of riparian buffer enhancement area. Provided by OTAK, Inc., 2011.

FIGURE 1

Pacific Habitat Services, Inc.

X:\Project Directories\5100\5187 Battle Creek, Salem monitoring\AutoCAD\Plot Dwgs\Fig1-Grading and Site Plan.dwg, 12/18/2013 1:22:19 PM



5187
12/16/13

Riparian planting plan overview at the Waln Creek and Battle Creek enhancement project in Salem, Oregon, showing sample plot and photo point locations.

FIGURE 2

Pacific Habitat Services, Inc.

X:\Project Directories\5100\5187 Battle Creek, Salem monitoring\AutoCAD\Plot Dwgs\Fig1-Grading and Site Plan.dwg, 1/16/2014 9:13:07 AM

TREES

QUANTITY	COMMON NAME / Botanical name:	Size and Description	Spacing
* 1,511	OREGON ASH / Fraxinus latifolia	Bare root	7.2' o.c.
1,209	WHITE ALDER / Alnus rhombifolia	Bare root	7.2' o.c.
302	DOUGLAS HAWTHORNE / Crataegus douglasii	Bare root	7.2' o.c.
302	WESTERN CRABAPPLE / Malus fusca	Bare root	7.2' o.c.
* 605	WESTERN RED CEDAR / Thuja plicata	Bare root	7.2' o.c.
* 1,209	BLACK COTTONWOOD / Populus trichocarpa	Bare root	7.2' o.c.
907	BIG LEAF MAPLE / Acer macrophyllum	Bare root	7.2' o.c.

* Plant Closer to Stream

SHRUBS

QTY	ABBREV.	COMMON NAME / Botanical name:	Size and description	Spacing
557	CORSEA	RED-OSIER DOGWOOD / Cornus sericea	Bare root	4.7' o.c.
557	LONINV	TWINBERY / Lonicera involucrata	Bare root	4.7' o.c.
371	SPIDOU	DOUGLAS SPIREA / Spiraea douglasii	Bare root	4.7' o.c.
557	PHYCAP	PACIFIC NINEBARK / Physocarpus capitatus	Bare root	4.7' o.c.
371	SAMCER	BLUE ELDERBERRY / Sambucus cerulea	Bare root	4.7' o.c.
334	ROSNUT	NOOTKA ROSE / Rosa nutkana	Bare root	4.7' o.c.
334	ROSPIS	SWAMP ROSE / Rosa pisocarpa	Bare root	4.7' o.c.
631	SYMALB	SNOWBERRY / Symphoricarpos albus	Bare root	4.7' o.c.

SEED MIX

SYMBOL	QUANTITY	COMMON NAME / Botanical name:	LBS / ACRE
	5.69 Acres	SPIKE BENTGRASS / Agrostis exarata	2.18 lbs / acre
	247,643 SF	TUFTED HAIRGRASSE / Deschampsia cespitosa	2.18 lbs / acre
		SLENDER HAIRGRASS / Deschampsia elongata.	2.18 lbs / acre
		WESTERN FESCUE / Festuca occidentalis	8.71 lbs / acre
		TALL MANNAGRASS / Glyceria elata	2.18 lbs / acre
		MEADOW BARLEY / Hordeum brachyantherum	43.56 lbs / acre
		STREMBANK LUPINE / Lupinus rivularis	13.07 lbs / acre

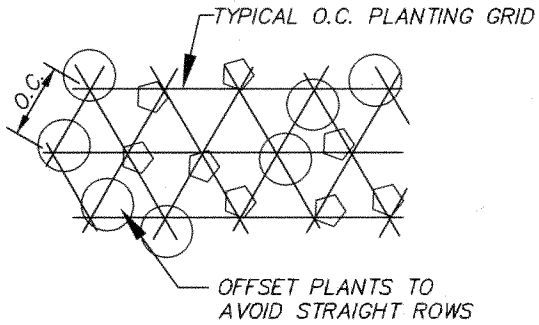


FIGURE 3

Plant list and planting grid at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

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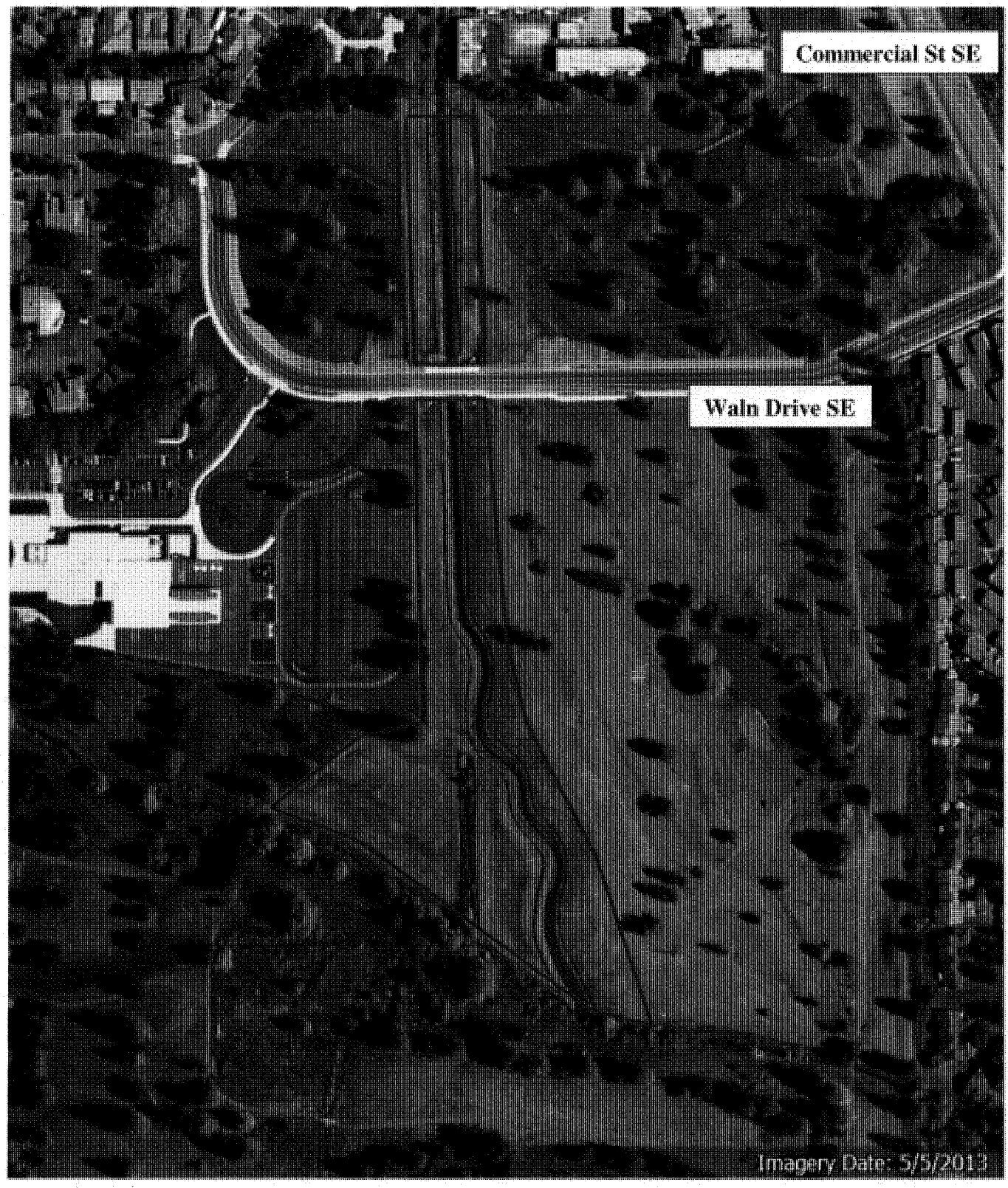

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2013 aerial photograph of the Waln Creek-Battle Creek riparan enhancement project area in Salem, Oregon. The riparian buffer planting area is outlined in red (Photo source: GoogleEarth).

FIGURE 4

Photo A:

Looks south from northern boundary of mitigation area

Photo B:

Looks north from Waln Drive SE

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Wilsonville, OR 97070

Photodocumentation
Waln Creek/Battle Creek riparian mitigation area in Salem, Oregon.
Both photos were taken on August 27, 2013.

FIGURE
5

Photo C:

Looks south from Waln Drive SE

Photo D (below):

Looks south from west side of mitigation area.

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Photodocumentation
Waln Creek/Battle Creek riparian mitigation area in Salem, Oregon.
Both photos were taken on August 27, 2013.

FIGURE
6

Photo E:

Looks northwest from southern portion of mitigation area

Photo F:

Looks northwest from southeast edge of mitigation area

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Photodocumentation
Waln Creek/Battle Creek riparian mitigation area in Salem, Oregon.
Both photos were taken on August 27, 2013.

FIGURE
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