Pacific Habitat Services, Inc.
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Transmittal

Date: **December 17, 2015**

To: **US Army Corps of Engineers**
ATTN: Richard Chong / 2011-100
PO Box 2946
Portland, Oregon 97208-2946

From: **Fred Small**

RE: **Monitoring Report for Review**

PHS Project No.: **5187 – Waln Creek/Battle Creek Riparian Enhancement Project**

Richard,

Enclosed for your review is the third monitoring report for the Waln Creek/Battle Creek Riparian Enhancement Project for the City of Salem

Please call if you have any questions.

c: Patricia Farrell, City of Salem

i. Mitigation Monitoring Report Cover Sheet

Corps of Engineers

Corps Permit Number: 2011-100

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):** July 8, 10, and 16, 2015

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): Weed control activities conducted in late spring and late summer 2015

Specific Recommendations for additional corrective/remedial actions:

- Periodic weed control measures will continue throughout monitoring period

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. 2011-100) 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

Following the second year monitoring report, continuing weed control measures have been exercised across the site during 2015. These measures have primarily targeted potentially invasive species such as reed canarygrass (*Phalaris arundinacea*) and Canada thistle (*Cirsium arvense*) (among others).

Given the high densities of woody plantings persisting within the site, no remedial woody plantings have been installed. However, to help revegetate the relatively droughty and disturbed soils within the site, an additional seeding with a native grass/forb mix was applied in spring 2014. As several of the seeded species were noted during both the 2014 and 2015 field visits, no additional seeding has been warranted.

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, covering nearly 10% of the study area. 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, as well as cover by non-native and 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. Table 1 below lists the coordinates for each plot, while the sampling layout is depicted in Figure 2 (Appendix B).

Table 1. Easting and Northing Coordinates* for Sample Plots within the Waln Creek/Battle Creek Riparian mitigation site in Salem, OR

Sample Plot	Easting	Northing	Sample Plot	Easting	Northing
1	7547940.88	447345.19	15	7547804.51	446270.96
2	7547940.88	447200.81	16	7547730.85	446238.95
3	7547949.28	446927.46	17	7547724.73	446297.46
4	7547949.28	446831.41	18	7547646.11	446300.08
5	7547949.28	446774.75	19	7547721.84	446364.39
6	7547966.40	446467.48	20	7547774.03	446360.09
7	7548025.11	446302.73	21	7547833.08	446374.50
8	7548087.45	446170.07	22	7547873.33	446510.49
9	7548107.78	446048.27	23	7547873.46	446566.78
10	7548134.32	445978.97	24	7547864.28	446768.36
11	7547947.56	446059.03	25	7547864.28	446942.42
12	7547951.35	446114.48	26	7547865.28	447274.96
13	7547980.36	446183.98	27	7547865.28	447417.57
14	7547842.36	446204.46			

**Coordinate System: Oregon State Plane North NAD83 (international feet)*

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 met in the third year, when artificially bare ground is taken into account. The sampling plots provided a mean of 52% (80% CI), while the amount of ground taken up by a gravel and plastic 'mulch' used around each shrub and tree planting averaged approximately 18% of each plot. Only around 5% was truly comprised of bare soil. When the artificially 'bare ground' component is factored in, the native herbaceous stratum exceeds 60%.

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 again for the third year, with the sampling plots providing a mean of just 1.15% (80% CI) for invasive herbaceous species. No cover was recorded for invasive woody species.

Performance Standard 3 Result:

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

Summary Metric:

As previously described, this standard has been met for the third year when artificially bare substrate is taken into account. While the sampling plots provide an overall mean of 23.7% (80% CI) of bare substrate, only 5.1% of this total is bare soil. The remaining 18.6% of each plot is comprised of portions of one or more squares of gravel/plastic 'mulch' around each woody planting. This substrate value is not likely to change significantly over time.

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 met again for the third year, with the sampling plots providing an estimated density of approximately 2,741 plants per acre for the 4.78-acre planting area. This density is based on an estimated 13,103 plants overall, for a survival rate of 134% (80% CI) relative to the specified number of planted woody species.

Table 2 lists the woody plantings originally specified for the Waln Creek/Battle Creek riparian mitigation area, along with the number of plants surviving in July 2015. A more detailed breakdown of actual counts and associated statistics is included on spreadsheets in the Appendix A.

Table 2. Summary of 2015 Woody Plant Estimates for the Waln Creek/Battle Creek Riparian mitigation site in Salem, OR

Botanical Name	Common Name	Original No's Spec'd	July 2015 Sampling Estimates*	Estimated % Survival**
TREES				
Acer macrophyllum	Bigleaf maple	907	11	1
Alnus rhombifolia	White alder	1,209	808	67
Crataegus douglasii	Douglas hawthorn	302	295	98
Fraxinus latifolia	Oregon ash	1,511	1,561	103
Malus fusca	Pacific crabapple	302	120	40
Populus balsamifera spp. trichocarpa	Black cottonwood	1,209	1,420	117
Thuja plicata	Western red cedar	605	11	2
SHRUBS				
Cornus sericea	Red-osier dogwood	557	1,310	235
Lonicera involucrata	Twinberry	557	1,791	322
Physocarpus capitatus	Pacific ninebark	557	819	147
Rosa nutkana, R. pisocarpa	Nootka rose, clustered rose	668	2,009 total roses counted	301
Sambucus cerulea	blue elderberry	371	0	0
Spiraea douglasii	Douglas spirea	371	1,430	385
Symphoricarpos albus	snowberry	631	1,518	241
TOTAL WOODY PLANTINGS		**9,757**	**13,103**	**134 overall**

**Based on extrapolated values from overall mean of 44.44 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 (13,103) may vary based on the assigned confidence interval. For example, at a sampling CI of 80%, the mean could range anywhere from 12,303 to 13,959. Consequently, the overall survival rate varies from 126% to 143% 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 will ultimately be met over time, with both groundcover and woody species taken into account. Within the groundcover species, two grasses have been especially well adapted to this mesic riparian habitat: spike bentgrass (*Agrostis exarata*) and meadow barley (*Hordeum*

brachyantherum), with both meeting the frequency and cover standards. In addition, the densities of 10 or more of the planted tree and shrub species constitute an increasing diversity of cover that will help meet to meet this standard.

Currently, however, the cover values for woody plantings only address those plants that overlap the one meter^2 quadrants, despite having an average density of over 44 woody plants in each of the larger (15'-radius) plots. Unfortunately, it is not practicable to obtain accurate cover estimates across the larger plots while using our current sampling methodologies.

B. Hydrology Standards Result

Not Applicable

C. Delineation of Wetland Acreage Achieved

Not Applicable

4. CONCLUSIONS AND RECOMMENDATIONS

A. Project Status

Groundcover Development

Groundcover estimates within the riparian planting area currently fall below the standard for native cover (52% versus the >60% standard) when the artificially bare (gravel/plastic) substrate is not taken into account. However, when this artificial substrate (which accounts for over 18% of the total 23.7% bare ground average in plots) is discounted, both the native groundcover standard and the bare ground standard (<20%) are readily met.

In addition, the cover standards for both invasive herbaceous (<10%) and invasive woody (<10%) species have been met.

The dominant groundcover species are both natives, as was the case last year; spike bentgrass and meadow barley. The most common non-natives are creeping bentgrass (*Agrostis stolonifera*), hairy hawkbit (*Leontodon nudicaulis ssp taraxacoides*), and birds-foot trefoil (*Lotus corniculatus*); however, these represent relatively low overall cover.

Woody Plant Survival and Density

Woody plant survival in 2015 continues to be high relative to the number of plants specified, at 134% overall, and relatively few dead plants were encountered. More importantly, the estimated stem density was approximately 2,741 plants per acre for the 4.78-acre planting area, significantly above the performance target of 1,600 stems per acre. Since most plants persisting this year are thriving and have developed strong root systems, this standard should continue to be met in subsequent years as well.

B. Recommendations

Remedial Planting

Given the high stem densities observed in 2015 as well as in past years, no remedial woody plantings are either recommended or warranted at this time.

Weed Control

Invasive species such as reed canarygrass, Canada thistle, St. Johns' wort, and Himalayan blackberry persist in small quantities at scattered locations across the site, and do not represent infestations at this time. Weed control efforts conducted during spring 2015 targeted these species as well as birds-foot trefoil, and are keeping these plants at manageable levels. Similar efforts will continue as needed throughout the 5-year monitoring timeline. Periodic site visits will be conducted during 2016 and beyond to detect and 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

Third Year Monitoring for Waln Creek riparian corridor, Salem (data collected on July 8, 10, and 16, 2015)

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	1	0	0	0	0	0	0	0	0	0
FAC	*Alnus rhombifolia*	White alder	0	1	3	3	2	12	3	2	0	1	6	1	5	4	3
FAC	*Crataegus douglasii*	Black hawthorn	1	1	2	2	1	2	1	0	0	0	0	1	0	0	0
FACW	*Fraxinus latifolia*	Oregon ash	3	6	4	1	7	4	1	3	5	6	7	5	5	11	4
FACW	*Malus fusca*	Pacific crabapple	0	0	0	0	1	2	1	3	1	2	0	0	0	0	0
FAC	*Populus balsamifera ssp. trichocarpa*	black cottonwood	5	4	3	7	1	28	20	2	0	3	6	6	1	1	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	4	3	4	2	0	2	0	10	10	7	13	9	5	0	4
FAC	*Lonicera involucrata*	Twinberry	13	7	4	5	3	2	11	3	0	3	5	0	9	5	1
FAC	*Physocarpus capitatus*	Pacific ninebark	0	0	3	2	6	0	3	0	3	1	2	0	3	7	0
FAC	*Rosa nutkana, R. pisocarpa*	Nootka rose, swamp rose	10	4	1	10	18	16	3	12	21	15	7	5	7	0	3
FACU	*Sambucus cerulea*	Blue elderberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FACW	*Spiraea douglasii*	Douglas' spirea	4	21	1	7	1	1	4	1	2	0	3	6	9	1	0
FACU	*Symphoricarpos albus*	snowberry	2	0	20	12	2	4	2	4	0	5	2	7	6	7	2
		TOTAL LIVE	**42**	**47**	**45**	**51**	**42**	**74**	**49**	**40**	**42**	**43**	**51**	**40**	**50**	**36**	**18**

Third Year Monitoring for Waln Creek riparian corridor, Salem (data collected on July 8, 10, and 16, 2015)

R9-IND Status	Plant Species	Common Name	Quadrats 16	17	18	19	20	21	22	23	24	25	26	27	Mean (by spp.)	plants per SF	inferred plant #'s	STDEV BY SPP.
			No. of live plants															
TREES																		
FACU	*Acer macrophyllum*	Bigleaf maple	0	0	0	0	0	0	0	0	0	0	0	0	**0.04**	0.0001	11	0.19
FAC	*Alnus rhombifolia*	White alder	2	1	7	3	0	1	3	2	1	7	0	1	**2.74**	0.0039	808	2.73
FAC	*Crataegus douglasii*	Black hawthorn	0	0	1	1	0	0	3	1	1	3	3	3	**1.00**	0.0014	295	1.07
FACW	*Fraxinus latifolia*	Oregon ash	7	4	9	0	0	4	5	9	12	10	5	6	**5.30**	0.0075	1561	3.10
FACW	*Malus fusca*	Pacific crabapple	0	0	0	0	0	0	0	0	0	0	1	0	**0.41**	0.0006	120	0.80
FAC	*Populus balsamifera ssp. trichocarpa*	black cottonwood	4	3	1	10	3	0	3	2	0	9	4	3	**4.81**	0.0068	1420	6.20
FAC	*Thuja plicata*	Western red cedar	0	0	0	1	0	0	0	0	0	0	0	0	**0.04**	0.0001	11	0.19
SHRUBS																		
FACW	*Cornus sericea*	Red-osier dogwood	10	9	11	2	9	1	0	1	0	2	1	1	**4.44**	0.0063	1310	4.16
FAC	*Lonicera involucrata*	Twinberry	15	7	13	2	6	2	1	6	11	8	2	20	**6.07**	0.0086	1791	5.04
FAC	*Physocarpus capitatus*	Pacific ninebark	2	1	0	2	9	2	2	1	2	3	11	10	**2.78**	0.0039	819	3.13
FAC	*Rosa nutkana, R. pisocarpa*	Nootka rose, swamp rose	2	0	2	0	7	16	5	3	2	4	8	3	**6.81**	0.0096	2009	5.99
FACU	*Sambucus cerulea*	Blue elderberry	0	0	0	0	0	0	0	0	0	0	0	0	**0.00**	0.0000	0	0.00
FACW	*Spiraea douglasii*	Douglas' spirea	1	6	6	5	1	6	8	7	7	16	2	5	**4.85**	0.0069	1430	4.82
FACU	*Symphoricarpos albus*	snowberry	1	3	7	9	0	7	7	9	8	2	5	6	**5.15**	0.0073	1518	4.33
														Overall Mean				Overall SD
		TOTAL LIVE	**44**	**34**	**57**	**35**	**35**	**39**	**37**	**41**	**44**	**64**	**42**	**58**	44.44	0.0629	13103	10.67

Notes:

For 80% Confidence Level, mean count per sample can range from 41.73 to 47.35		41.73	0.0590	12303
For 80% Confidence Level, the extrapolated mean total of 13,103 plants can actually vary from 12,303 to 13,959 plants.		47.35	0.0670	13959

Descriptive Statistics

Mean	44.538462
Standard Error	2.1326984
Median	42.5
Mode	42
Standard Deviation	10.874671
Sample Variance	118.25846
Kurtosis	2.0380891
Skewness	0.50618
Range	56
Minimum	18
Maximum	74
Sum	1158
Count	26
Confidence Level(80.0%)	2.807367

Site: Wahn/Battle Creek Riparian Enhancement site, Salem
Shrub-Dominated and Forested Wetland Habitat Unit

Sample Date(s): 7/9, 7/10, and 7/16, 2015

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
Native Herbaceous Species																																
species-latin name																																
Agrostis exarata	N	3	3	5	8	20	5	20	5	10	5	3	0	0	0	0	0	5	5	20	30	0	5	20	10	15	0	5	2	0	5	20
Bromus carinatus	N	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
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	0
Deschampsia cespitosa	N	2	0	5	15	5	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
Deschampsia elongata	N	2	0	0	0	0	0	0	5	20	5	15	0	0	0	0	0	0	0	15	0	0	7	0	0	0	0	0	0	0	0	0
Epilobium brachycarpum (paniculatum)	N	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0
Epilobium ciliatum (watsonii)	N	2	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	0
Festuca occidentalis	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
Hordeum brachyantherum	N	2	50	25	7	5	70	15	50	30	50	55	30	60	75	75	50	55	50	25	20	20	10	0	35	25	60	50	30	35	60	50
Juncus effusus	N	2	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	2	0	0
Lupinus rivularis	N	3	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	15	0	0	0	50	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	1	0	0	0	0	0	0	0	0	0
Phalaris arundinacea	I	2	0	20	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
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	2	4	3	0.5	0	0	0	2	20	0	10	0	0	15	15	5	0
Aira caryophyllea	NN	4	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Daucus carota	NN	4	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	0
Geranium sp.	NN	4	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
Holcus lanatus	NN	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0
Hypochaeris radicata	NN	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0
Leontodon nudicaulis ssp taraxacoides	NN	5	0	0	0	10	10	0.5	1	0	2	0	0.5	15	0	0	1	0	5	15	10	5	15	3	2	5	2	5	0	20	0	0
Lepidium sp.	NN	3	0	0	0	0	0	0	0	0	0	0.5	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leucanthemum vulgare	NN	4	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
Lotus corniculatus	NN	3	0	3	0.5	2	0	40	0	0	0	0	40	0	0	0	0	0	0	0	0	35	5	0	0	15	0	0	10	0	0	0
Plantago major	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
Poa sp.	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0
Rumex acetosella	NN	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Trifolium repens	NN	3	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	0
Vicia tetrasperma	NN	5	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	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	15	0	0
Native Shrub and Tree Species																																
species-latin name																																
Alnus rhombifolia	N	3	0	0	15	0	0	10	0	0	0	0	0	25	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Cornus sericea	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	5	0	0	0	0	0	0	5
Crataegus douglasii	N	3	0	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
Fraxinus latifolia	N	2	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	10	2	0	0	0,5	0	0	2	0	0
Lonicera involucrata	N	3	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	3	0	0	0	0	10	5	0	0
Physocarpus capitatus	N	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
Populus balsamifera ssp trichocarpa	N	3	0	0	0	0	0	0	12	0	0	0	10	0	15	40	0	0	0	0	0	0	15	0	0	3	0	0	0	0	0	0
Rosa nutkana	N	3	2	0	0	20	0	0	0	20	0	0	0	0	0	0	10	0	15	0	5	0	0	0	0	0	0	0	0	0	0	0
Spiraea douglasii	N	2	0	0	20	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0
Symphoricarpos albus	N	4	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
Non-Native Shrub and Tree Species																																
species-latin name																																
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			0	0	0	0	0	0	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 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
Bare Substrate																																
gravel/plastic weed barrier			20	20	25	20	10	5	20	20	20	15	20	20	15	15	20	20	25	20	35	30	15	10	35	15	20	20	35	10	20	15
bare soil			25	10	5	0	5	0	0	0	5	3	0	0	0	5	0	0	0	5	0	0	5	0	15	10	0	5	0	0	10	0

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
Cover of Native Herbaceous Species	>=80%		63	30	30	33	75	65	63	60	60	70	30	60	75	75	50	60	57	50	51	20	54	20	40	40	101	55	32	35	65	20
Lower CI (80%)																																
Upper CI (80%)																																
Cover of Invasive Herbaceous Species	<=10%		0	20	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
Lower CI (80%)																																
Upper CI (80%)																																
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	0
Lower CI (80%)																																
Upper CI (80%)																																
Bare Substrate	<=20%		25	10	5	0	5	0	0	0	5	3	0	0	0	5	0	0	0	5	0	0	5	0	15	10	0	5	0	0	10	0
Lower CI (80%)																																
Upper CI (80%)																																
Native Diversity (all layers)	0																															
Prevalence Index--All strata	<3.0		2	2	3	3	2	3	2	2	2	2	3	3	2	2	2	2	2	2	3	3	3	2	2	3	3	2	3	3	2	2
Weighted Prevalence Index			112	130	232	266	200	285	155	140	142	132	213	262	225	275	177	192	162	188	187	190	282	178	142	188	285	185	173	295	181	170
Sum of plant cover			88	72	88	88	85	108	77	80	75	82	81	105	100	117	80	90	78	78	88	70	102	90	63	78	103	78	68	93	72	86

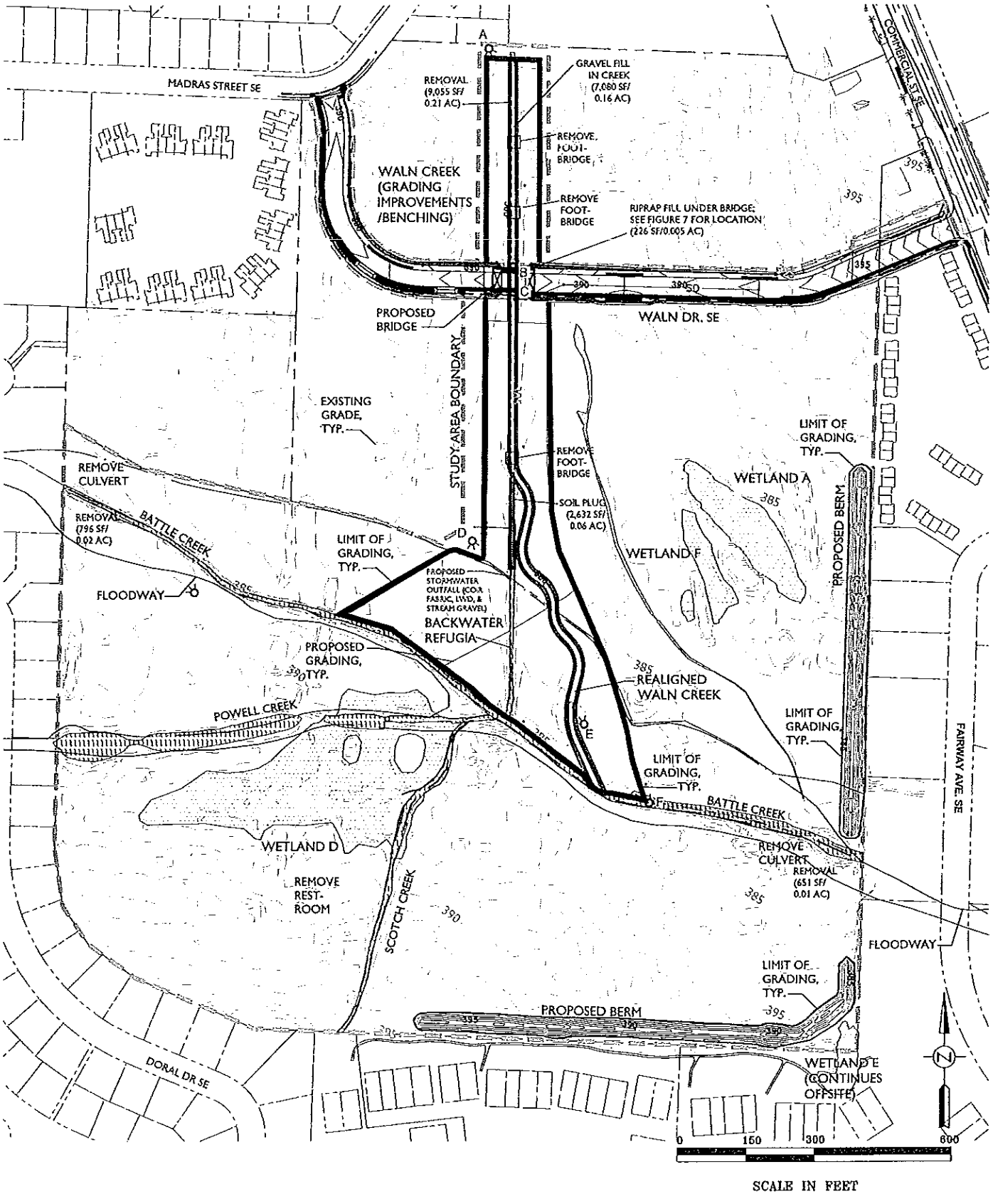
Site: Wahl/Battle Creek Riparian
Enhancement site, Salem
Shrub-Dominated and Forested Wetland Habitat Unit

Species	Origin (N, NN, I)	Wetland Status (1 - 5)	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	20	0	0	1	1	0	2	5	15	3	0	0	2	2	5	1	15	5	2	20	5	2	15	35	7.1
Bromus carinatus	N	5	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4
Carex sp.	N	2	3	0	0	0	0	0	0	0.5	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Deschampsia cespitosa	N	2	15	0	3	0	0	0	0	0	0	5	0	15	0	0	0	0	0	0	0	0	0	0	15	5	20	2.1
Deschampsia elongata	N	2	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	1.5
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	0	0	0	0	0.1
Epilobium ciliatum (watsonii)	N	2	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Festuca occidentalis	N	3	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0.5	0	0	0	0	0	0	0	0	3	0	0.1
Hordeum brachyantherum	N	2	15	55	60	55	30	55	5	5	10	15	50	10	30	30	45	45	20	15	45	15	5	20	10	15	33.9
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	0.3
Lupinus rivularis	N	3	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.2
Invasive Herbaceous Species																											
species-latin name																											
Cirsium arvense	I	3	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Phalaris arundinacea	I	2	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0.5	0.8
Non-Native Herbaceous Species																											
species-latin name																											
Agrostis stolonifera/ capillaris	NN	3	20	10	0.5	1	5	5	15	60	30	35	0	20	5	0	0	0	0	5	0	3	20	0	3	2	5.9
Aira caryophyllea	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	0.1
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	2	10	0	0.3
Geranium sp.	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
Holcus lanatus	NN	3	0	10	2	25	0	0	5	0	0	0	0	10	2	0	0	5	0	0	0	0	20	3	10	0	1.8
Hypochaeris radicata	NN	4	0	0	0	0	0	0	0	25	0	0	0	10	5	10	0	0	0	0	0	0	0	0	0	0	1.1
Leontodon nudicaulis ssp taraxacoides	NN	5	0	0	0	0	30	5	15	0	15	2	2	0	10	5	0	4	10	15	0	3	5	20	2	0.5	5.2
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	0.1
Leucanthemum vulgare	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
Lotus corniculatus	NN	3	12	0	5	0	0	0	15	0	0	0	0	0	15	0	2	0	0	0	0	0	0	15	0	5	4.0
Plantago major	NN	3	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
Poa sp.	NN	3	2	2	5	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.7
Rumex acetosella	NN	4	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0.5	0	0	0	0.5	0	0	2	0.5	0	0	0.1
Trifolium repens	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
Vicia tetrasperma	NN	5	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	15	0	0.4
Vulpia myuros	NN	4	0	3	5	3	0	0	0	0	0	0	5	0	0	0	2	0	0	0	0	0	2	0	0	0	0.6
Native Shrub and Tree Species																											
species-latin name																											
Alnus rhombifolia	N	3	0	0	0	0	0	40	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.4
Cornus sericea	N	2	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9
Crataegus douglasii	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	0.2
Fraxinus latifolia	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0.4
Lonicera involucrata	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
Physocarpus capitatus	N	3	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
Populus balsamifera ssp trichocarpa	N	3	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.0
Rosa nutkana	N	3	0	0	0	0	0	0	0	0	0	25	0	0	0	0	5	0	0	0	0	0	5	0	0	0	2.0
Spiraea douglasii	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	30	20	0	0	0	0	2.3
Symphoricarpos albus	N	4	1	5	10	0	20	0	0	0	0	0	0	10	0	2	0	0	0	0	0	0	0	5	5	0	1.1
Non-Native Shrub and Tree Species																											
species-latin name																											
			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
			0	0	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 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
Bare Substrate																											
gravel/plastic weed barrier			5	10	10	10	12	5	15	5	20	15	20	20	25	20	25	20	25	30	15	40	20	20	25	5	16.6
bare soil			5	0	0	0	0	0	0	0	0	0	5	5	5	5	20	25	30	25	10	5	10	0	0	20	5.1

Routine Performance Standards	Threshold		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	>=50%		63	60	60	56	31	60	42	11	25	48	60	25	34	32	51	46	35	20	47	35	15	37	30	70	62.46	3.5	NO
Lower CI (80%)																											47.02		
Upper CI (80%)																											67.01		
Cover of Invasive Herbaceous Species	<=10%		0	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	1		1.16	1	YES
Lower CI (80%)																											0.15		
Upper CI (80%)																											2.16		
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	0.00	0	YES
Lower CI (80%)																											0.00		
Upper CI (80%)																											0.00		
Bare Substrate	<=20%		5	0	0	0	0	0	0	0	0	0	5	5	5	5	20	25	30	25	10	5	10	0	0	20	5.60	1	YES
Lower CI (80%)																											2.11		
Upper CI (80%)																											4.69		
Native Diversity (all layers)	6																												
Prevalence Index--All strata	<3.0		2	2	2	2	4	2	3	3	3	2	2	3	3	3	2	2	3	3	2	2	3	3	3	2	2.97		YES
Weighted Prevalence Index			221	202	209	212	313	332	280	421	247	171	185	240	206	214	123	136	120	142	164	134	196	268	263	156			
Sum of plant cover			93	90	91	91	99	135	90	138	91	85	77	90	71	84	52	57	45	46	77	61	69	83	83	76			

Appendix B

Figures



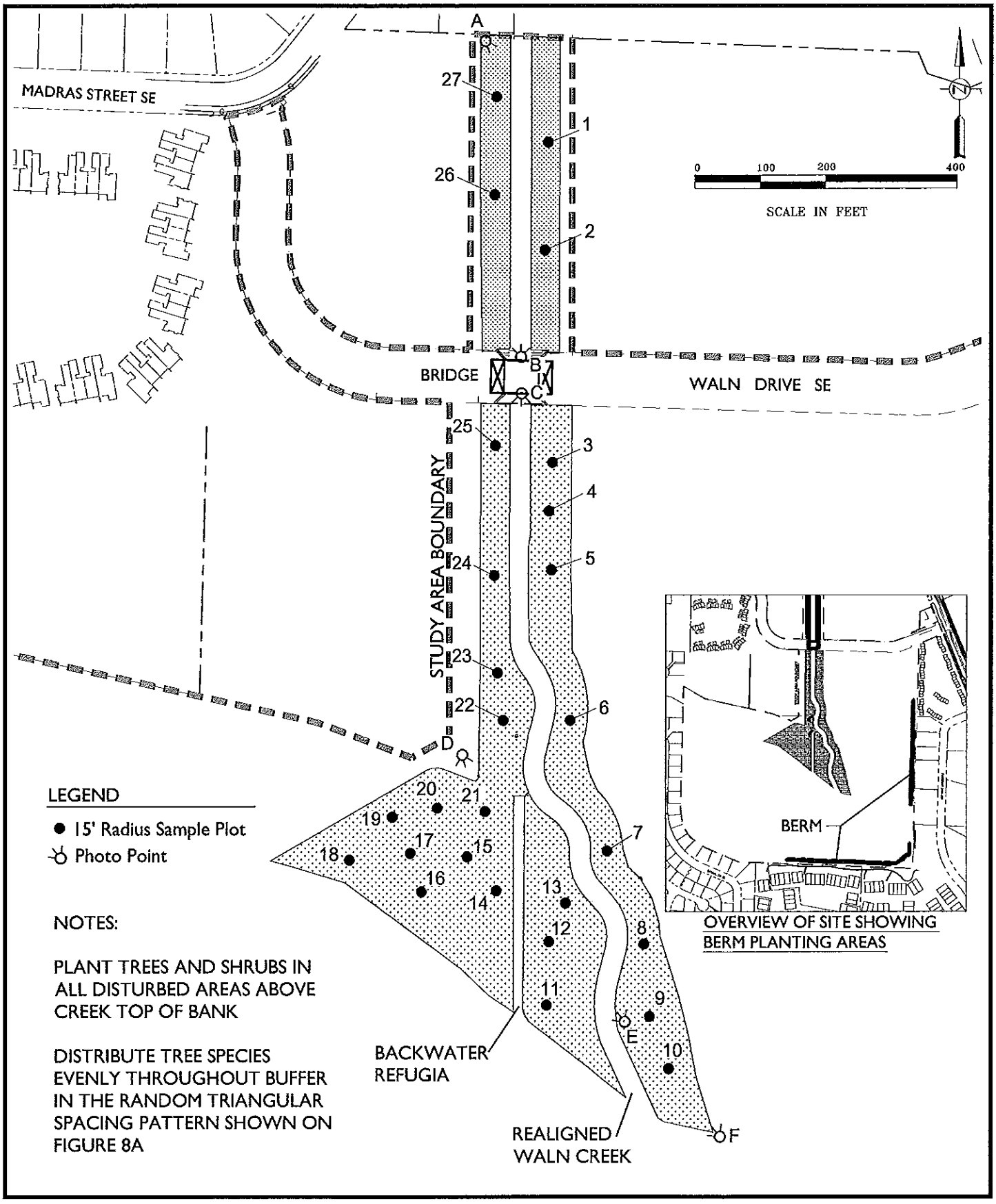
5187
12/16/13

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
9/8/2015

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.

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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

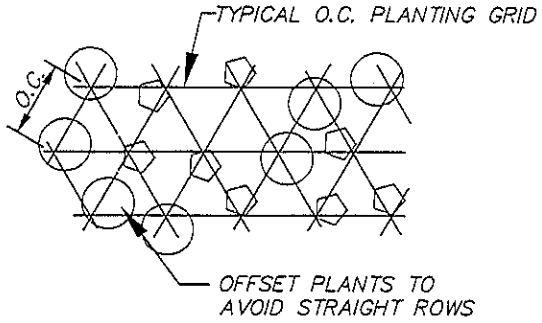

FIGURE 3

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

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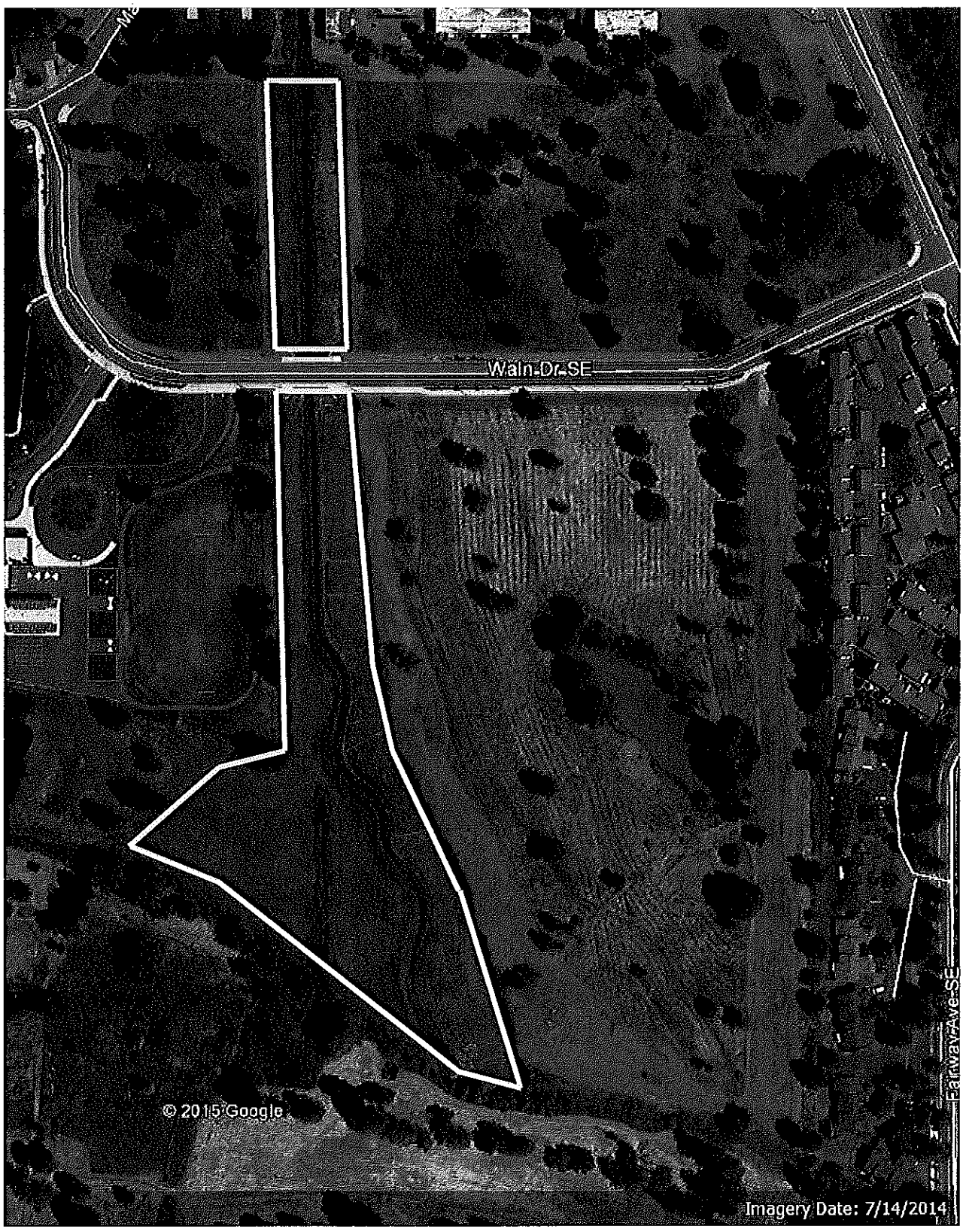

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Aerial photograph (2014)
Waln Creek-Battle Creek riparan enhancement project area in Salem, Oregon. The riparian buffer planting area is outlined in yellow.
(Photo source: GoogleEarth)

FIGURE
4

Photo A:

Looks south from northern boundary of mitigation area

Photo B:

Looks north from Waln Drive SE

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Photodocumentation

Waln Creek/Battle Creek riparian mitigation area in Salem, Oregon.
Photo A was taken on 7/16/2015; photo B on 7/8/2015.

FIGURE
5

Photo C:

Looks south from Waln Drive SE

Photo D:

Looks south from west side of mitigation area.

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Photodocumentation
Waln Creek/Battle Creek riparian mitigation area in Salem, Oregon.
Photo C was taken on 7/8/2015; photo D on 7/10/2015.

FIGURE
6

Photo E:

Looks northwest from southern portion of mitigation area

Photo F (below):

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 7/8/2015.

FIGURE
7