

Mitigation Monitoring Annual Report Year 9 (2020): Tualatin Valley Environmental Bank

1: **Tualatin Valley Environmental Bank**

Identifiers:

DSL Permit # APP46796 Corps Permit # NWP-2009-552 Permittee: Dave Heikes Farms Inc.
 County: Washington Report Date: Dec.9, 2020 Monitoring Year: 9
 Date Removal-Fill Activity Completed: October 2011
 Date mitigation was completed: Grading- October 2011, Planting- 2011-2015
 Date(s) of data collection: August 18-24, 2020
 Report prepared by: C. Jonas Moiel

2: **Monitoring Report Purpose:**

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

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

3: **Results:**

	Performance standards (verbatim from permit)	Fully Met? (Y/N)	Comments/Reason for shortfall (mark NA if doesn't apply this year)
VEGETATION PERFORMANCE STANDARDS			
Herbaceous (PEM) Wetlands			
FACW or FAC Dominated Herbaceous Wetlands			
1.1	The combined cover of native species for Year 1 shall be 40%; Year 2 shall be 50%; and Year 3 and thereafter shall be 60%.	Y	Average cover of native species in 20 sample plots in this habitat class for Year 9 was 96%. At an 80% confidence level, the upper confidence interval (CI) was 100% and the lower CI was 93%. This meets the final standard (Year 3 & thereafter).
1.2	The cover of non-native invasive species during the 1st and 2nd years shall not exceed 30%. For year 3 and thereafter, the non-native invasive cover, excluding reed canarygrass (<i>Phalaris arundinacea</i>), shall not exceed 10%. The cover of reed canary grass shall not exceed 10% for year 3 and thereafter.	Y	Average cover of invasive species in this habitat class for Year 9 rounded to 1%. At an 80% confidence level, the upper confidence interval (CI) was 1% and the lower CI was 0%. No reed canarygrass was present in any sample plot. This meets the final standard (Year 3 & thereafter).

1.3	Bare substrate represents no more than 20% cover by the 3rd year after planting.	Y	There was a total rounded average of 3% bare substrate, which consisted of bare mineral soil or moss in this habitat. This year there was no cover of dead, sprayed non-native plants in this habitat. The upper CI was 5% and the lower CI was 1%. This meets the final standard (Year 3 & thereafter).
1.4	The standard for diversity in herbaceous wetlands is at least 6 native species, each with 5% or more average cover and occurring in at least 10% of the plots by the 3rd year after planting.	Y	This habitat is meeting the diversity standard with six native species: <i>Hordeum brachyantherum</i> , <i>Leersia oryzoides</i> , <i>Lotus unifoliatu</i> s, <i>Lycopus americanus</i> , <i>Madia glomerata</i> , <i>Carex obnupta</i> .
1.5	The hydrophytic vegetation standard is that the Prevalence Index is ≤ 3.0 and/or the vegetation passes the "50/20 rule" for dominance of hydrophytic vegetation.	Y	The average rounded Prevalence Index (PI) for the habitat class this year was 2 (FACW). This meets the final standard (Year 3 & thereafter).
OBL Dominated Herbaceous Wetlands			
2.1	The standard for native cover for Year 1 shall be 10%; Year 2 shall be 20%; and Year 3 and thereafter shall be 40%.	Y	Average cover of native species in 5 herbaceous plots in this habitat class for Year 9 was 82%, which exceeds the final (Year 3 and thereafter) standard. At an 80% confidence level, the upper confidence interval (CI) was 96% and the lower CI was 69%.
2.2	The cover of non-native invasive species during the 1st and 2nd years shall not exceed 30%. For year 3 and thereafter, the non-native invasive cover, excluding reed canarygrass, shall not exceed 10%. The cover of reed canary grass shall not exceed 10% for year 3 and thereafter.	Y	The average invasive species cover in this habitat class was 0%; no invasive species were present in any plots. Thus, at an 80% confidence level, the upper confidence interval (CI) and the lower CI were both 0%. This meets the final standard (Year 3 & thereafter).
Forested (PFO) Wetlands, Shrub dominated (PSS) Wetlands and Buffers			

3.1	The combined cover of native species for Year 1 shall be 40%; Year 2 shall be 50%; and Year 3 and thereafter shall be 60%.	PFO: Y PSS: Y Buffer: Y	<p>PFO: Average cover of native species in the 34 herbaceous plots for this habitat class for Year 9 was 75% (upper CI = 82%, lower CI = 69%). There was an average of 62% cover of native woody species in the 18 woody sample plots (upper CI = 70%, lower CI = 53%). Combining the herb & woody averages gives a total of 137% native cover, which meets the final standard (Year 3 & thereafter).</p> <p>PSS: Average cover of native species in the 41 herbaceous plots for this habitat class for Year 9 was 24% (upper CI = 31%, lower CI = 18%). There was an average of 93% cover of native woody species in the 20 woody sample plots (upper CI = 98%, lower CI = 88%). Combining the herb & woody averages gives a total of 117% native cover, which meets the final standard (Year 3 & thereafter).</p> <p>Buffer: Average cover of native species in the 28 herbaceous plots for this habitat class was 51% (upper CI = 60%, lower CI = 42%). There was an average of 41% cover of native woody species in the 14 woody sample plots (upper CI = 46, lower CI = 35). Combining the herb & woody averages gives a total of 92% native cover, which meets the Year 3 standard (this is Year 5 for the buffers).</p>
3.2	The combined cover of non-native invasive species will not exceed 30% by Year 3 and thereafter.	PFO:Y PSS:Y Buffer: Y	<p>PFO: The average cover of invasives in the herb plots for this class rounded to 1% (upper CI = 1%, lower CI = 0%); invasive cover in the woody plots was 0% (upper & lower CI = 0). This meets the final standard (Year 3 & thereafter).</p> <p>PSS: The average cover of invasives in the herb plots for this class was 8% (upper CI = 10%, lower CI = 6%); invasive cover in the woody plots rounded to 0% (upper & lower CI = 0%). This meets the final standard (Year 3 & thereafter).</p> <p>Buffer: The average cover of invasives in the herb plots rounded to 7% (upper CI = 9%, lower CI = 5%) and average invasive cover in the woody plots rounds to 0% (upper CI & lower CI = 0%).</p>
3.3	Bare substrate represents no more than 40% cover by the 3rd year.	PFO:Y PSS:Y Buffer: Y	<p>PFO: The average is 9% in the herbaceous plots (upper CI = 12%, lower CI = 5%).</p> <p>PSS: the average is 18% in the herbaceous plots (upper CI = 26%, lower CI = 9%).</p> <p>Buffer: The bare substrate averages 10% (upper CI = 14%, lower CI = 6%).</p> <p>Note: As of 2015 and thereafter, any herbaceous plot having $\geq 60\%$ shade from woody species is excluded from the bare substrate criteria.</p>

3.4	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.	PFO:Y PSS: Y Buffer: N	PFO: 10 native species (<i>Deschampsia cespitosa</i> , <i>Leersia oryzoides</i> , <i>Eleocharis palustris</i> , <i>Hordeum brachyantherum</i> , <i>Lotus unifoliatum</i> , <i>Polygonum hydropiperoides</i> , <i>Sparganium emersum</i> [herbs] and <i>Fraxinus latifolia</i> , <i>Salix hookeriana</i> & <i>Salix lucida</i> var. <i>lasiandra</i> [<i>lasiandra</i>] [woody species]) met the criteria. PSS: 8 species (<i>Impatiens capensis</i> , <i>Scirpus microcarpus</i> [herbs], and <i>Cornus sericea</i> ssp. <i>sericea</i> , <i>Fraxinus latifolia</i> , <i>Populus balsamifera</i> , <i>Salix hookeriana</i> , <i>Salix sitchensis</i> , <i>Salix lucida</i> var. <i>lasiandra</i> and [woody species]) met the criteria. Buffer: 5 native species, including 3 herb species (<i>Elymus glaucus</i> , <i>Hordeum brachyantherum</i> and <i>Festuca rubra</i> and 2 woody species (<i>Mahonia aquifolium</i> , <i>Pseudotsuga menziesii</i>) met the criteria.
3.5	The density of woody vegetation is at least 1,000 native plants (shrubs) and/or stems (trees) per acre, including native volunteers. After the areal canopy cover (<i>including</i> shrub cover) is 50% or greater, there will be no minimum number of plants/stems. Woody vegetation standards should be met for two successive years without irrigation.	PFO: Y PSS: Y Buffer: Y	PFO: There was an average of 1,386 plants or stems/acre in 18 woody plots, which meets the standard. Average percent woody cover was 62% (upper CI=70% & lower CI= 53%). PSS: There was an average of 1,342 plants or stems/acre in 20 woody plots, which meets the standard. Average percent woody cover was 93% (upper CI= 98%, lower CI= 88%). Buffers: There was an average of 1,477 plants or stems/acre in 14 woody plots. Average percent woody cover was 41% (upper CI= 46%, lower CI = 35%).
3.6	The hydrophytic vegetation standard for PSS and PFO wetlands is that the Prevalence Index is ≤ 3.0 and/or the vegetation passes the "50/20 rule" for dominance of hydrophytic vegetation.	PFO: Y PSS: Y	PFO: The average rounded Prevalence Index (PI) from the herbaceous and woody plots were both 2 (FACW). PSS: The average rounded Prevalence Index (PI) from the herbaceous and woody plots were both 2 (FACW).
Notes: All the above cover percentages represent absolute areal cover. In all cases, the "Year" refers to the number of years after that portion of the site was first planted. All habitat classes <i>except</i> the buffers are Year 9; the buffers are Year 7. Bare substrate includes areas of bare soil and areas covered by moss, water, or dead herbaceous plants.			

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

December 9, 2020

TUALATIN VALLEY ENVIRONMENTAL BANK
MONITORING REPORT YEAR 9 (2020)

Prepared by: C. Jonas Moiel, Senior Ecologist
Green Banks LLC
14200 SE McLoughlin Blvd, Suite A
Milwaukie, Oregon 97267
(503) 477-5391

Prepared For: Dave Heikes Farms Inc.
9400 SW Heikes Drive
Hillsboro, Oregon 97123

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MAPS AND FIGURES:

- Figures 1a-1c: Monitoring Location Maps (Finalized 2017)
- Figure 3: Credit Determination Map 2017

Note: There is no Figure 2 this year and the maps included are from the Year 6 (2017) monitoring report.

APPENDICES:

- APPENDIX A: Vegetation Data
- APPENDIX B: Photographic Documentation
- APPENDIX C: Vegetation Monitoring Transect Location Table
- APPENDIX D: Credit Ledger (2019)

1.0 MITIGATION PLAN PURPOSE AND OVERVIEW

1.1 LOCATION

The Tualatin Valley Environmental Bank (TVEB) is located on 105.95 acres at the confluence of the Tualatin River, Christensen Creek and several unnamed surface and sub-surface drainages. The TVEB is located near 9400 southwest Heikes Drive in Hillsboro, Oregon, 97123; Township 1 South, Range 2 West, Section 32, utilizing portions of tax lots 1200 and 691; and Township 1 South, Range 2 West, Section 29, tax lot 601.

1.2 MITIGATION GOALS AND OBJECTIVES

At the request of DSL, starting in 2015, we have removed some portions of text that are unchanged from year to year. To review the “Mitigation Goals and Objectives” please refer to the first three monitoring reports (Green Banks LLC 2012-2014) or the Mitigation Bank Instrument (Green Bank LLC 2010).

1.3 MAINTENANCE AND MANAGEMENT ACTIONS

Green Banks uses an integrated approach to vegetation management at the TVEB. For the first few years after Bank establishment (2012-2014), the maintenance efforts focused on non-native weed control. This included multiple herbicide applications per year, mowing, cutting, and prescribed burning. For the past six years (2015-2020) there has been a substantial reduction in maintenance efforts as the native plant communities have become established.

In 2020, there was a low need for maintenance compared to previous years due to reduced non-native species cover and increased native species cover. Most of the common target weeds have been reduced to very low percent cover and small populations. This reduction in weed cover has allowed us to adjust how we manage the site, with a transition away from repeated herbicide applications and an increase in mowing and hand-pulling efforts. This trend of decreased non-native cover has been noted for the past six years. Herbicide applications were made in a few select areas targeting perennial invasive grasses and broadleaf weeds in the spring and summer.

Most of the buffer areas, except those on steep slopes or with existing mature forest, were mowed twice per year for the first few years of establishment. In 2020 (and 2019), only patch mowing of certain areas of the buffers with higher levels of non-native plants was completed. The herbaceous layer in most of the buffer areas is now dominated by native grasses and herbs, and the planted trees and shrubs are established enough to no longer require frequent maintenance mowing.

Beaver activity has increased over the last couple years and minor maintenance of the primary log-jam, including hand removal of sticks and debris, has been necessary to maintain the desired surface water elevations. Dave Heikes, the Bank Sponsor, installed a beaver “leveler” at the primary log-jam in the late summer of 2018. This included hand-installing a 12-inch corrugated pipe through the log-jam, and caging the inlet of the pipe (to keep it from being plugged by beaver). It is anticipated that the leveler will reduce the amount of log-jam maintenance and help to maintain more consistent surface water levels.

1.4 MONITORING METHODS

At the request of DSL, we have removed some portions of text that are unchanged from year to year. To completely review the “Monitoring Methods”, including the criteria for designating plant species as “non-native” and/or “invasive”, please refer to any of the first three monitoring reports (Green Banks LLC 2012-2014) or the Mitigation Bank Instrument (Green Bank LLC 2010).

The 2020 vegetation monitoring was conducted between August 18th and 24th by Senior Scientist C. Jonas Moiel with assistance from Natural Resource Technicians Justin Crissman and Brandon Leveille.

Dana Field (DSL) was provided with draft monitoring data and visited the site for an annual walk-through on August 27, 2020.

1.5 MONITORING DATA LOCATIONS

Please refer to Figures 1a-1c which display the planted habitat types (sample units), monitoring transect locations, monitoring data plots, photo monitoring locations, and hydrology monitoring pits and wells. The habitat types consist of PEM wetlands, PSS wetlands, PFO wetlands, and buffers. In the PEM wetlands, we divided the class into two sub-classes: OBL dominated and FACW/FAC dominated. This is the case because each of these sub-classes have different performance standards.

In the 2020 monitoring we had total of five herbaceous plots in the OBL PEM community, 19 herbaceous plots in the FACW/FAC PEM community, 34 herbaceous plots and 18 woody plots in the PFO community, 41 herbaceous plots and 20 woody plots in the PSS community, and 28 herbaceous and 14 woody plots in the upland buffer areas.

Over the first six years of monitoring there have been some adjustments to the number and layouts of the plots; several were skewed, moved or removed to avoid a dirt road, property lines, deep inundation, or habitat transitions. These adjustments were documented in the first six monitoring reports and are also summarized in the notes following the vegetation monitoring data tables in Appendix A.

Monitoring Transect and Plot Details

For an in-depth description of the monitoring transects and plot details please refer to the Year 5 (2016) Monitoring Report or the MBI (Green Banks LLC 2010).

The locations of the start and end points of each monitoring transect (Appendix C), the northwestern corner of each herbaceous plot, and all four corners of the woody vegetation plots were GPS surveyed when the monitoring locations were established in 2012. Any subsequent modifications have been GPS surveyed.

1.6 HYDROLOGY METHODS AND CONTEXT

Post-construction hydrology monitoring occurred between 2012-2016. The delineation lite was conducted in 2014 with additional data collected in 2016 per the request of DSL. On March 24 2017, Dana Field (DSL) met with C. Jonas Moiel and Jeff Handley to review the post-construction wetland

delineation boundary; this site visit was made in the early growing season, primarily to evaluate wetland hydrology. Following the site visit, it was determined that wetland hydrology was achieved.

2.0 RESULTS

2.1 VEGETATION STANDARDS RESULTS

The raw vegetation monitoring data for all the herbaceous and woody plots are presented in eight tables included in Appendix A. In the first three years of reporting, the verbatim text of each vegetation standard and the results were presented in this section, essentially repeating all the information that is presented in the Cover Sheet. Starting in 2015, in the interest of brevity, please refer to the Cover Sheet, which provides the *exact wording* of all the Performance Standards, the current confidence interval (CI) ranges, and minor comments, as well as the Vegetation Performance Standards Summary Tables for each habitat unit (Tables 3a through 3e) and brief discussions below. Please note that for all wetland habitat types listed below, 2020 is considered to be Year 9. However, the upland buffers are considered to be at Year 7 as this is the seventh year of monitoring since the initial planting was completed.

Criteria	1.1: Percent Native Cover		1.2: Percent Invasive Cover		1.3: Bare Substrate		1.4: Diversity		1.5: Hydrophytic Community	
Performance Standard	1.1: $\geq 60\%$ by Year 3 and thereafter		1.2: $\leq 10\%$ reed canarygrass and $\leq 10\%$ other invasive species by Year 3 and thereafter		1.3: $\leq 20\%$ by Year 3 and thereafter		1.4: Six native species with $\geq 5\%$ cover, occurring in $\geq 10\%$ of the plots.		1.5: Prevalence Index is ≤ 3.0	
	Average	Pass? Y/N	Average	Pass? Y/N	Average	Pass? Y/N	Number of species	Pass? Y/N	Average	Pass? Y/N
Results	96%	Y	1%	Y	3%	Y	6	Y	2	Y

Herbaceous Palustrine Emergent (PEM) Wetlands- FACW/FAC Dominated Community

The FACW/FAC PEM community is meeting all the performance standards. It is densely populated with many native grasses, forbs, sedges and rushes with an average of 96% native cover, which is 36% above the standard of 60% by Year 3 (Standard 1.1). Invasive cover (Standard 1.2) rounds to 1%, *Convolvulus arvensis* was the only invasive species in the plots, same as in 2018 and 2019. Cover by other non-natives is also minimal. Six native species (*Hordeum brachyantherum*, *Leersia oryzoides*, *Lotus unifoliolatus*, *Lycopus americanus*, *Madia glomerata* and *Carex obnupta*) met the diversity standard (Standard 1.4) of $\geq 5\%$ average cover and occurring in $\geq 10\%$ of the plots this year. Although the average rounded prevalence index (PI) was 2 (FACW) for this habitat class, several plots (< half) had a rounded PI of 1 (OBL).

Criteria	2.1: Percent Native Cover		2.2: Percent Invasive Cover	
Performance Standard	2.1: $\geq 60\%$ by Year 3 and thereafter		2.2: $\leq 10\%$ reed canarygrass and $\leq 10\%$ other invasive species by Year 3 and thereafter	
	Average	Pass? Y/N	Average	Pass? Y/N
Results	82%	Y	0%	Y

Herbaceous Palustrine Emergent (PEM) Wetlands- OBL Dominated Community

The OBL PEM community is meeting all the performance standards (Standards 2.1 and 2.2). The average percent native cover (Standard 2.1) is 82%. Common native species included *Sparganium emersum*, *Polygonum hydropiperoides*, and *Lemna minor*. Cover by invasive species (Standard 2.2) averaged 0%; no invasive or other non-natives were recorded.

Table 3c: PFO Habitat (~23.8 acres, 18 Woody Plots & 34 Herb Plots, Year 9)

Criteria	3.1: Percent Combined Native Cover		3.2: Percent Invasive Cover		3.3: Bare Substrate		3.4: Diversity		3.5: Native Stem Count/ Cover		3.6: Hydrophytic Community	
Performance Standard	3.1: ≥60% by Year 3 and thereafter		3.2: ≤30% invasive species by Year 3 and thereafter		3.3: ≤40% by Year 3 and thereafter		3.4: Six native species with ≥5% cover, occurring in ≥10% of the plots.		3.5: Either ≥1,000 plants per acre or 50% aerial cover of woody species		3.6: Prevalence Index is ≤3.0	
	Average	Pass? Y/N	Average	Pass? Y/N	Average	Pass? Y/N	Number of species	Pass? Y/N	Average # Woody plants/acre	Pass? Y/N	Average	Pass? Y/N
Results	137% (75% herbs 62% woody)	Y	1% (1% herbs, 0% woody)	Y	9%	Y	10	Y	1,386	Y	2 (in both herb & woody plots)	Y

Note: As of 2015, any herbaceous plot having ≥60% shade from woody species was excluded from the bare substrate criteria.

Palustrine Forested (PFO) Wetlands

The PFO community is meeting all of the performance standards. It is densely populated with native trees, shrubs and herbs. The combined percent cover of native species (Standard 3.1) is 137% (75% herbs and 62% woody species). Invasive cover (Standard 3.2) in the herb layer was 1% due to a small population of *Convolvulus arvensis* and the woody layer invasive cover was 0%. Average bare substrate (Standard 3.3) was 9%. This year, ten native species (seven herbs and three woody species) met the diversity standard (Standard 3.4). These species were *Deschampsia cespitosa*, *Eleocharis palustris*, *Hordeum brachyantherum*, *Leersia oryzoides*, *Lotus unifolius*, *Polygonum hydropiperoides*, *Sparganium emersum*, *Fraxinus latifolia*, *Salix hookeriana* and *Salix lucida var. lasiandra*. The average density of native woody species (Standard 3.5) was 1,386 plants per acre. The average prevalence index (Standard 3.6) in both the herb and woody plots is 2 (FACW).

Table 3d: PSS Habitat (~11.6 Acres, 20 Woody Plots & 41 Herb Plots, Year 9)

Criteria	3.1: Percent Combined Native Cover		3.2: Percent Invasive Cover		3.3: Bare Substrate		3.4: Diversity		3.5: Native Stem Count/ Cover		3.6: Hydrophytic Community	
Performance Standard	3.1: ≥60% by Year 3 and thereafter		3.2: ≤30% invasive species by Year 3 and thereafter		3.3: ≤40% by Year 3 and thereafter		3.4: Six native species with ≥5% cover, occurring in ≥10% of the plots		3.5: Either ≥1,000 plants per acre or 50% aerial cover of woody species		3.6: Prevalence Index is ≤3.0	
	Average	Pass? Y/N	Average	Pass? Y/N	Average	Pass? Y/N	Number of species	Pass? Y/N	Average # woody plants /acre	Pass? Y/N	Average	Pass? Y/N
Results	117% (24% herbs 93% woody)	Y	8% (8% herbs, 0% woody)	Y	18%	Y	8	Y	1,342	Y	2 (in both herb & woody plots)	Y

Note: As of 2015, any herbaceous plot having ≥60% shade from woody species was excluded from the bare substrate criteria.

Palustrine Scrub-Shrub (PSS) Wetlands

The PSS community is meeting all of the performance standards (Standards 3.1-3.6). It is densely populated with native trees, shrubs and herbs. The combined percent cover of native species (Standard 3.1) is 117% (24% herbs and 93% woody species), which is similar to the results from the previous three years. The woody cover has continued to increase while the herbaceous cover continues to decrease, presumably from increased shade. Invasive cover (Standard 3.2) in the herb layer was 8%, and the woody layer invasive cover was at 0%. Cover by other non-natives is also generally quite minimal. Bare substrate (Standard 3.3) was 18% this year, which is a 4% decrease from previous year. This year, eight (two herbaceous and six woody) native species (*Impatiens capensis*, *Scirpus microcarpus*, *Fraxinus latifolia*, *Cornus sericea ssp. sericea*, *Salix hookeriana*, *Salix sitchensis*, *Salix lucida* var. *lasiandra* and *Populus balsamifera*) met the diversity standard (Standard 3.4). The habitat meets Standard 3.5 with 1,342 plants per acre. The average prevalence index (Standard 3.6) in both the herb and woody plots is 2 (FACW).

Table 3e: Buffer Habitat (~27.5 acres planted, 36.7 acres total; 14 Woody Plots & 28 Herb Plots, Year 7)

Criteria	3.1: Percent Combined Native Cover		3.2: Percent Invasive Cover		3.3: Bare Substrate		3.4: Diversity		3.5: Native Stem Count/ Cover	
Performance Standard	3.1: ≥ 60% by Year 3 and thereafter		3.2: ≤ 30% invasive species by Year 3 and thereafter		3.3: ≤ 40% by Year 3 and thereafter		3.4: Six native species with ≥ 5% cover, occurring in ≥ 10% of the plots		3.5: Either ≥ 1,000 plants per acre or 50% aerial cover of woody species	
	Average	Pass? Y/N	Average	Pass? Y/N	Average	Pass? Y/N	Number of species	Pass? Y/N	Average # woody plants /acre	Pass? Y/N
Results	92% (51% herbs & 41% woody)	Y	7% (7% herbs, 0% woody)	Y	10%	Y	5	Y?	1,477	Y

Note: As of 2015, any herbaceous plot having ≥ 60% shade from woody species was excluded from the bare substrate criteria.

Upland Buffers

This is Year 7 for the upland buffers and the community is meeting nearly all of its performance standards; see discussion about diversity standard 3.4 below. The combined percent cover of native species (Standard 3.1) is 92% (51% herbs and 41% woody). Invasive cover (Standard 3.2) in the herb layer was 7% and the woody layer invasive cover was 0%. The bare substrate (Standard 3.3) was met at 10%. The buffer areas met the diversity standard in 2019 (Standard 3.4) with four herb species and two woody species, but in 2020 it had 3 herb species and two woody species which met the standard. The buffer diversity standard was not achieved in 2020; however, there are many species of trees and shrubs that will meet the diversity standard in future years as some are currently at 3-4% average cover. The habitat meets Standard 3.5 with 1,477 plants per acre.

NOTES: All the above cover percentages in the preceding tables and discussions represent absolute areal cover. Bare substrate includes areas of bare soil and areas covered by moss, water, and/or dead herbaceous plants.

2.2 HYDROLOGY STANDARDS RESULTS

Standard: "The criteria for achieving wetland hydrology at the mitigation site will be met if hydrologic conditions meet or exceed the basic standard of the 1987 *US Army Corps of Engineers Wetland*

Delineation Manual, and refined in the Corp's May 2010 Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region."

Result: A wetland delineation lite was completed for the project area in 2014, with supplemental paired-plot data collected in several areas in 2016 per the request of DSL; these data can be reviewed in the 2014 and 2016 monitoring reports. Slight adjustments were made to the post-construction delineation boundary after the 2016 data were collected and are displayed in the 2016 report. After making a spring site visit to evaluate hydrology on March 24, 2017 DSL concurred with the delineated post-construction wetland boundary except for a small area of approximately 1-acre where more information was requested. This information was provided in the 2017 monitoring report (Section 2.2) and the wetland delineation boundary was finalized.

Standard met? Yes. The post-construction wetland delineation boundary was concurred in spring of 2017, with the request for additional information for a small (approximate 1-acre) area. This additional information was provided in the 2017 monitoring report and the boundary was finalized.

2.3 DELINEATION OF WETLAND ACREAGE ACHEIVED

The post-construction wetland delineation lite was completed in 2014, with supplemental data collected in 2016, resulting in minor adjustments to the delineated boundary. The final (concurred) 2016 wetland delineation identified a total of 58.4527 acres of wetland within the project area; the 2014 delineation had a slightly larger wetland acreage of 58.533 acres prior to slight boundary adjustments in 2016.

The total wetland credits produced from this project are slightly higher than predicted in the MBI due to a slight increase in wetland creation acreage; see Figure 3. The following table summarizes the post-construction acreages by credit type.

Post-Construction Credit Summary Table:

Type	Ratio	Predicted Acreage (MBI)	Predicted Credit (MBI)	Achieved Acreage (post-construction)	Achieved Credit (post-construction)
Enhancement	3:1	33.2900	11.0966	33.2900	11.0966
Restoration	1:1	4.1100	4.1100	4.1100	4.1100
Creation	1.5:1	18.2800	12.1866	18.3156	12.2104
Buffers	10:1	36.7000	3.6700	37.1502	3.7150
No Credit	NA	13.5700	NA	13.0842	NA
TOTALS		105.9500	31.0632	105.9500	31.1320

2.4 WILDLIFE OBSERVATIONS

Since construction of the TVEB, the increased extent and duration of inundated areas have improved the habitat functions for amphibians, fish, insects, waterfowl and other avian species. Numerous species of ducks and Canada geese utilize the site. Great blue herons, egrets and belted kingfishers are often present, feeding in the water. A bald eagle's nest is present in the mature forest located in the southern portion of the site. A mating pair of eagles has been observed on-site since construction of the project in 2011. They have had two offspring per year in 2012, 2013, 2016 and 2018, and one offspring in 2014 and 2015. Besides the eagles, other raptors that utilize the site include osprey, northern harriers (marsh hawks), and other hawk species. Black tailed deer are often present in portions of the site and utilize the area for

grazing and bedding. A coyote has been observed multiple times within the project area since 2011. Beaver activity has increased onsite since project construction.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 PROJECT STATUS

The mitigation wetlands are in compliance with nearly all of the performance standards for Year 9. The only standard that was not met was the diversity Standard 3.4 within the upland buffer habitat; this habitat met the diversity standard in 2019 and has many tree and shrub species that are anticipated to meet the standard in future years; no action is recommended to improve the diversity in the upland buffer areas.

The project is nearing the long-term management phase and the Bank Sponsor has been making efforts to finalize an agreement with a long-term land steward to take over management of the site in the future. Long-term management plan and conservation easement documents have been drafted and a potential Steward has been identified. It is anticipated that a long-term management agreement will be finalized in 2021.

3.2 CONCLUSIONS

In Year 9 (2020) the mitigation areas are continuing to be diverse native-dominated plant communities. The wetland areas had very low weed cover for Year 9 with an average range of 0-8% non-native invasive cover within the various wetland and upland community types. The non-native invasive cover across habitat types was similar to what was observed in 2019 and previous years. Very little reed canarygrass was present in any of the habitats; it averaged 0% cover in all habitat types except in the PSS where it averaged 6% cover.

The planting of native trees and shrubs in the form of bare root, plug and live cutting have been successful. Some mortality has been observed, but a majority of the woody plantings in all habitats have high vigor. As a result, there has been a continued increase in woody cover in these habitats.

The hydrological enhancements made through construction of the project in 2011 are performing as designed. Please review the MBI or As-Built report for more information about the hydrological enhancements. The primary log-jam was observed approximately once per month in 2020. Water flow through the log-jam was nearly perennial with very limited flows in the late summer.

The TVEB credit ledger for 2020 is included in Appendix D. The most recent credit release was on May 23rd 2019, for 0.819 credits; bringing the total number of credits released to 23.349 credits or 75% of the total anticipated for the Bank. No credits were withdrawn from the Bank in 2020. There is a total of 0.0259 credit currently released and available for withdrawal.

3.3 RECOMMENDATIONS

The TVEB is meeting nearly all of the performance standards for Year 9 and is on track to meeting the performance standards for future years. It is recommended that the current plan and strategy for vegetative community establishment continue. There has been a decrease in weed cover within the wetlands since 2012, and it is likely that this trend will continue. Non-native plant control efforts should occur when necessary.

In 2021, the project area should be observed approximately quarterly from March through October to direct maintenance efforts and ensure that the project goals are being met.

3.4 FINANCIAL SECURITY STATUS

A performance bond (Assignment of Deposit) in the amount of \$89,782 was established for the release of enhancement area credits on October 24th 2011. In the fall of 2011, \$44,891 (50%) was returned to the bank sponsor after completion of hydrological enhancements and initial planting of the enhancement area. It was reduced by \$26,935 (30%) in May of 2017 for meeting Year 5 Performance Standards; \$17,956 is currently in the account.

An irrevocable letter of credit was established for the release of restoration, creation and buffer credits in 2011 in the amount of \$196,075. In March of 2013, a partial reduction of this account was granted resulting in an account balance of to \$114,125. In May of 2017, the total amount in this account was reduced to \$39,215, or 20% of the initial account total, for meeting Year 5 Performance Standards.

The release of financial securities will generally follow the financial assurance release schedule as described in Exhibit J of the MBI.

4.0 REFERENCES

Green Banks LLC. *Tualatin Valley Environmental Bank Monitoring Report, Years 1- 8*. Submitted to the Inter-Agency Review Team, December 2011-2018.

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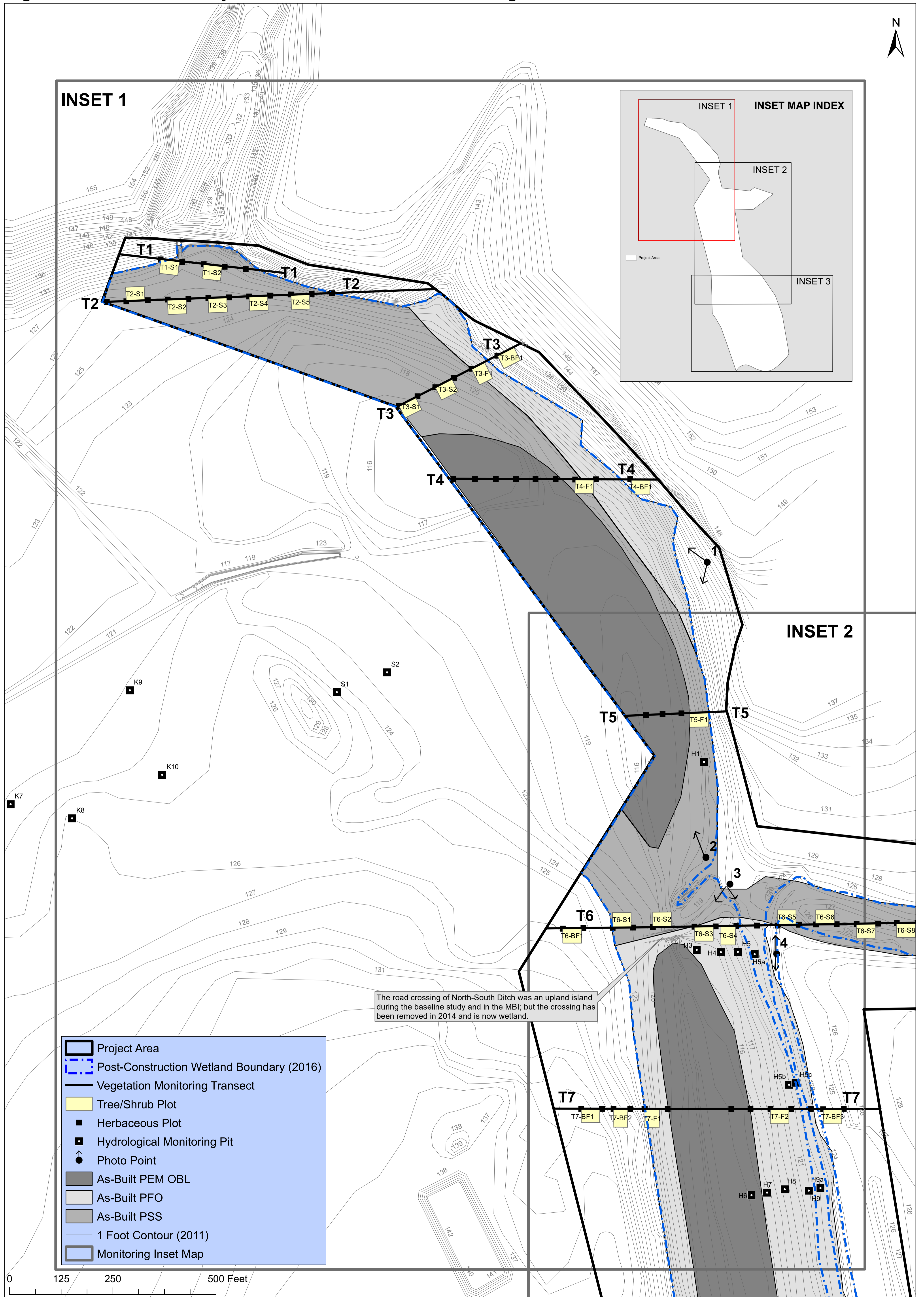
U.S. Army Corps of Engineers. 2014. *State of OREGON 2014 Wetland Plant List*; compiled from: Lichvar, R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. The National Wetland Plant List: 2014 Update of Wetland Ratings. *Phytoneuron* 2014-41: 1-42. Accessed on-line in 2014 at URL http://www.oregon.gov/dsl/WETLAND/docs/OR_2014v1.pdf

MAPS AND FIGURES:

Figure 1a-1c: Monitoring Location Maps (Finalized 2017)

Figure 3: Credit Determination Map 2017

Note: The included maps are from the Year 6 (2017) monitoring report. The post-construction wetland delineation boundary was finalized in 2017 and the maps will no longer change.



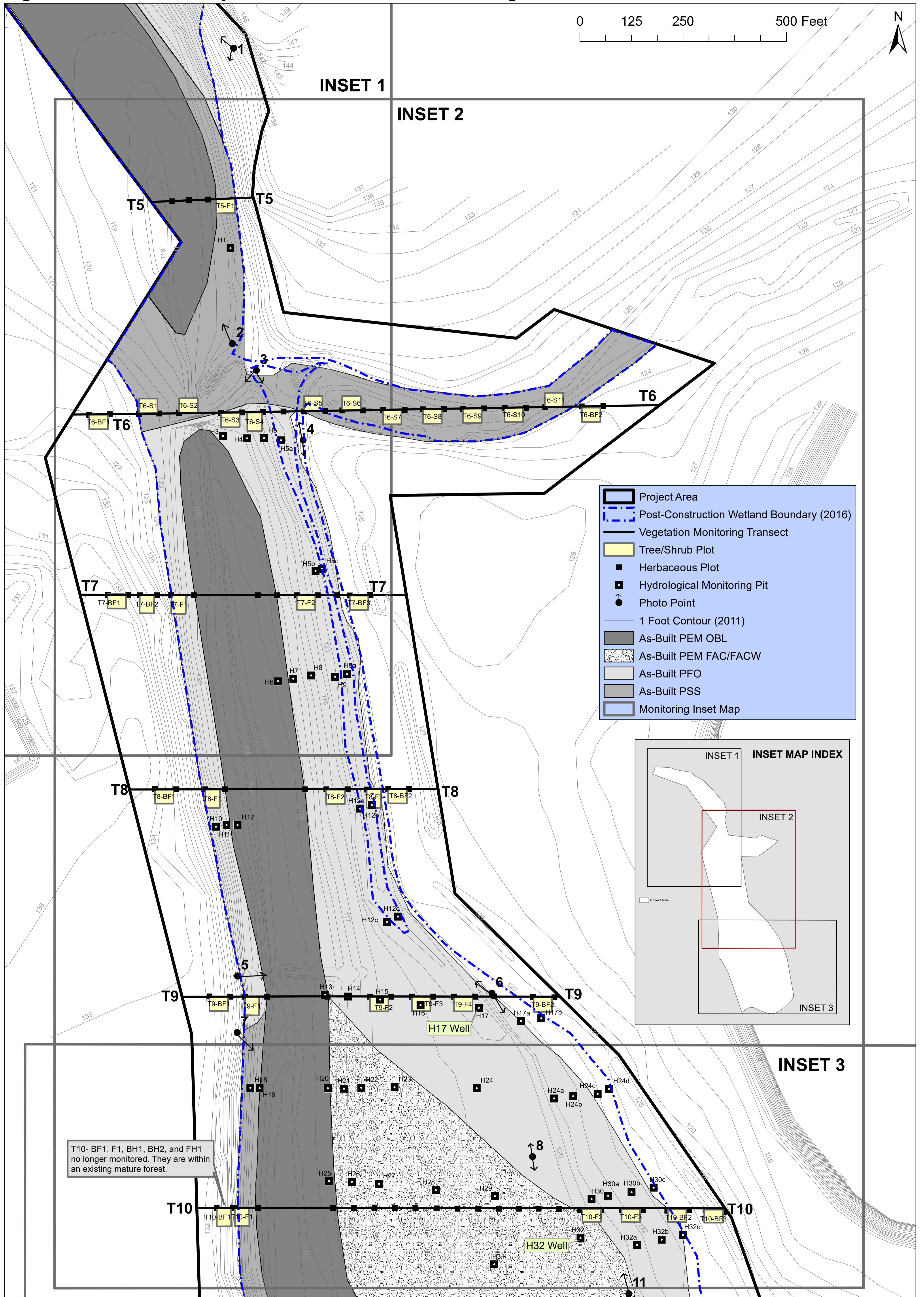
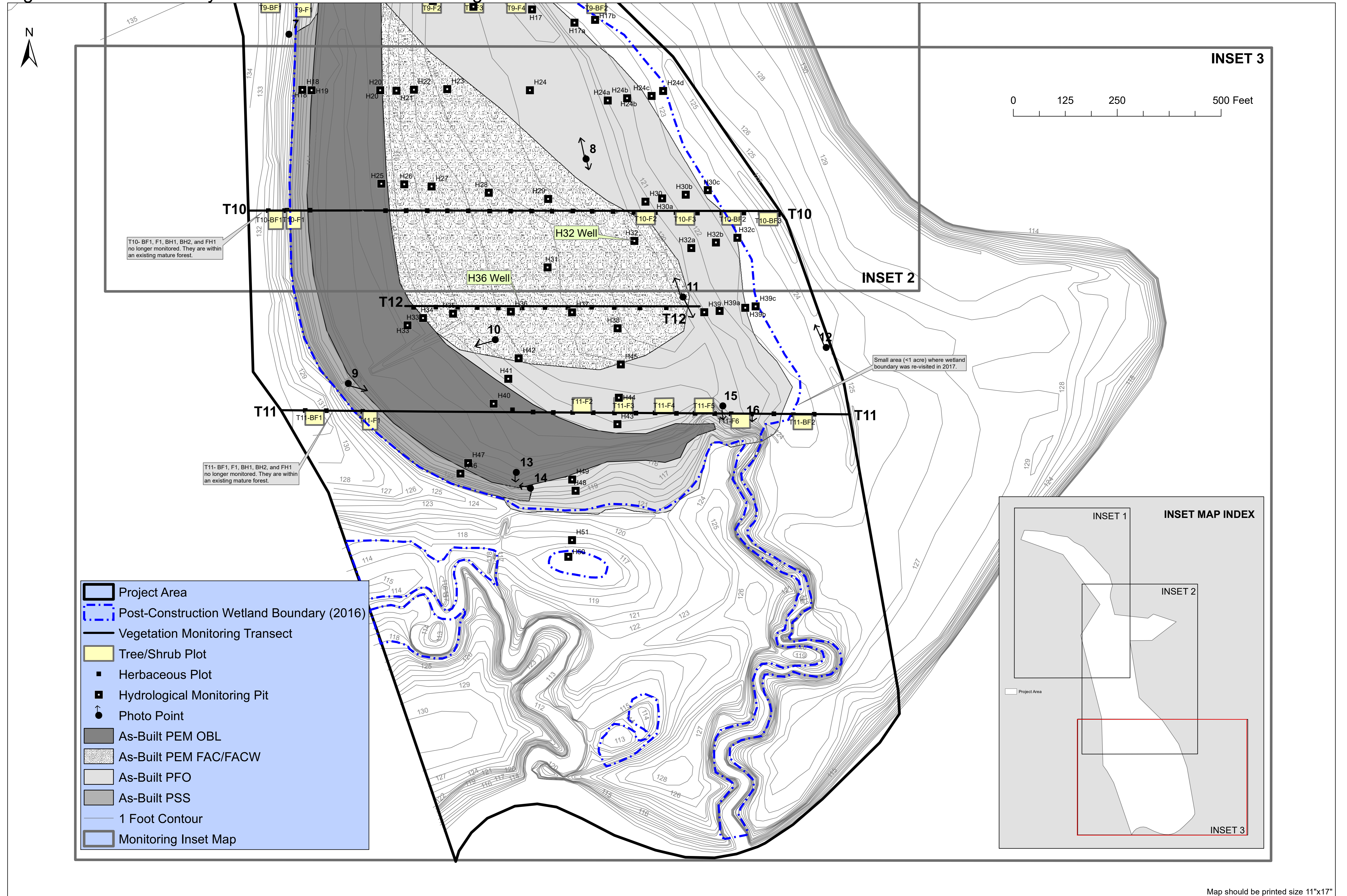
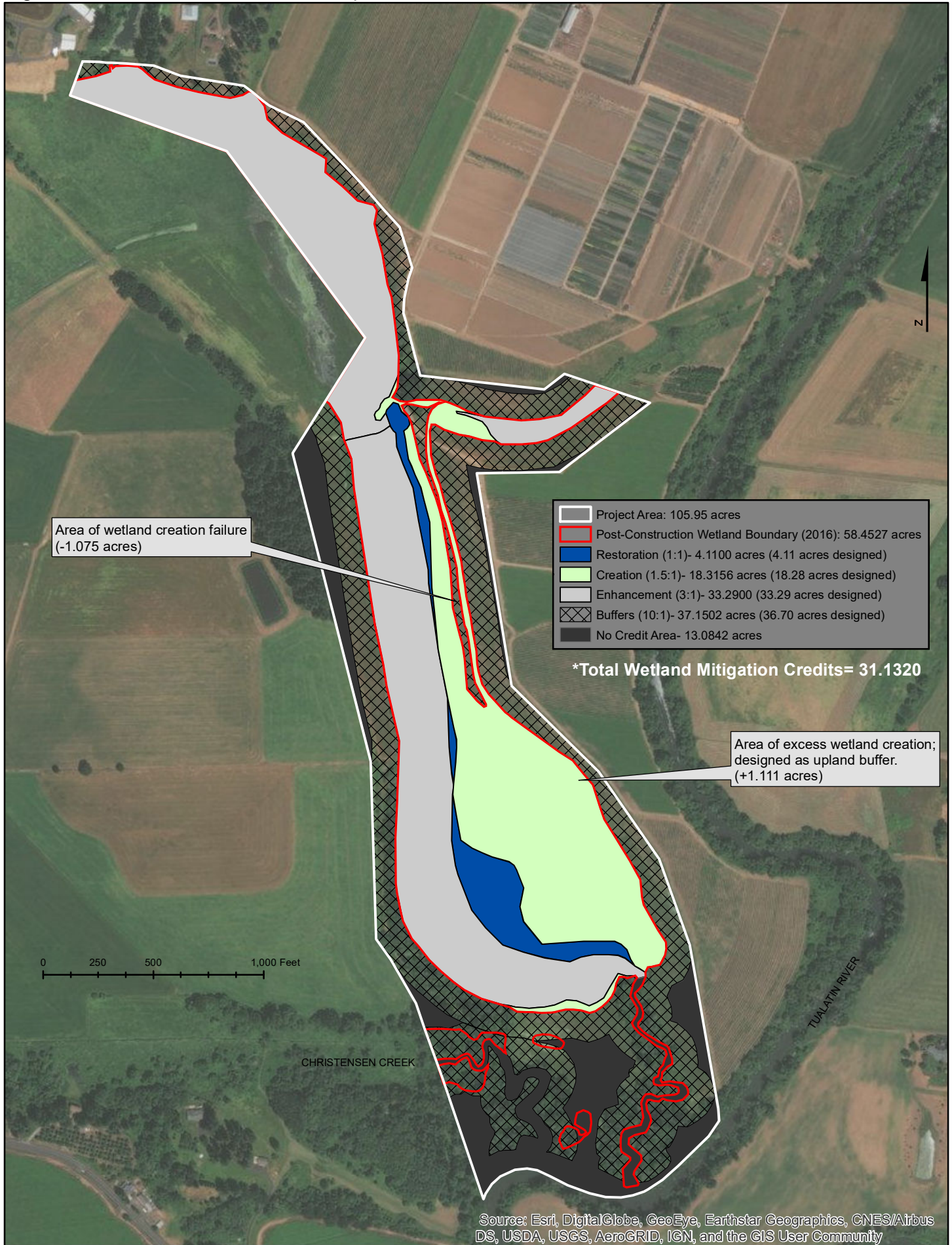


Figure 1c: Tualatin Valley Environmental Bank Monitoring Inset 3



Map should be printed size 11"x17"

Figure 3: Determination of Credits Map 2017



APPENDICES:

APPENDIX A:	Vegetation Data
APPENDIX B:	Photographic Documentation
APPENDIX C:	Vegetation Monitoring Transect Location Table
APPENDIX D:	Credit Ledger (2020)

APPENDIX A: VEGETATION DATA

Vegetation Data Tables should be printed at the size of 11"x17".

Vegetation monitoring notes are included after the tables in this appendix.

TUALATIN VALLEY ENVIRONMENTAL BANK																							
2020 Vegetation Monitoring		Sample Date(s):	Percent (%) Cover																				
FACW / FAC PEM Community			8/18/2020-8/24/20																				
Species	Origin (N, NN, I)	Wetland Status (1-5)	T10-PEM2	T10-PEM3	T10-PEM4	T10-PEM5	T10-PEM6	T10-PEM7	T10-PEM8	T10-PEM9	T10-PEM10	T12-PEM2	T12-PEM3	T12-PEM4	T12-PEM5	T12-PEM6	T12-PEM7	T12-PEM8	T12-PEM9	T12-PEM10	T12-PEM11	Average	
Native Herbaceous Species																							
<i>Agrostis exarata</i>	N	2	0	0	0	0	5	0	15	0	0	0	0	0	0	0	15	5	5	0	0	2	
<i>Beckmannia syzigachne</i>	N	1	0	0	0	15	0	4	5	0	0	0	0	0	0	0	0	0	0	0	0	1	
<i>Bidens cernua</i>	N	1	0	0	7	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	
<i>Carex densa</i>	N	1	0	0	0	25	0	0	0	0	0	0	0	0	0	0	30	0	0	0	0	3	
<i>Carex ovalis (leporina)</i>	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Carex scoparia</i>	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	5	3	12	0	0	0	1	
<i>Carex obnupta</i>	N	1	65	0	0	0	30	0	0	0	25	0	73	0	93	35	0	30	0	0	0	18	
<i>Cyperus erythrorhizos</i>	N	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Deschampsia cespitosa</i>	N	2	0	0	0	0	0	0	10	15	30	0	0	0	0	0	0	0	4	0	2	3	
<i>Eleocharis obtusa (ovata)</i>	N	1	0	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
<i>Eleocharis palustris</i>	N	1	35	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	4	
<i>Epilobium ciliatum</i>	N	2	0	0	0	0	0	0	0	1	0	0	0	0	0	20	0	0	0	0	6	1	
<i>Epilobium densiflorum</i>	N	2	0	0	0	0	0	0	0	1	7	0	0	0	0	0	0	0	1	2	2	1	
<i>Grindelia integrifolia</i>	N	2	0	0	0	0	0	25	15	0	0	0	0	0	0	0	0	0	0	0	0	2	
<i>Hordeum brachyantherum</i>	N	2	0	0	0	0	0	10	8	50	25	0	0	0	0	0	0	10	30	2	0	7	
<i>Leersia oryzoides</i>	N	1	0	20	55	35	0	0	0	0	0	5	0	95	7	20	0	0	0	0	0	12	
<i>Lemna minor</i>	N	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
<i>Lotus unifoliolatus (Acmispon americanus)</i>	N	4	0	0	0	5	10	35	8	30	40	0	0	0	0	0	35	30	5	50	51	16	
<i>Ludwigia palustris</i>	N	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Lycopus americanus</i>	N	1	0	0	0	15	35	5	20	0	0	0	0	0	0	8	20	8	0	0	0	6	
<i>Madia glomerata</i>	N	4	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	10	45	50	2	6	
<i>Plagiobothrys scouleri</i>	N	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	2	
<i>Polygonum (Persicaria) hydropiperoides</i>	N	1	0	50	0	0	0	1	0	0	0	20	6	0	0	0	0	0	0	0	0	4	
<i>Potentilla gracilis</i>	N	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	
<i>Prunella vulgaris</i>	N	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	
<i>Sparganium emersum</i>	N	1	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	1	
Invasive Herbaceous Species																							
<i>Convolvulus arvensis</i>	I	5	0	0	0	1	0	3	0	0	0	0	0	0	0	0	1	0	4	4	0	1	
<i>Elymus repens</i>	I	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	
Non-Native Herbaceous Species																							
<i>Agrostis stolonifera</i>	NN	3	0	5	7	8	15	20	5	0	0	0	0	5	0	3	5	0	0	0	0	4	
<i>Agrostis capillaris</i>	NN	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Echinochloa crusgalli</i>	NN	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<i>Lactuca serriola</i>	NN	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	
<i>Trifolium species</i>	NN		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
Bare Substrate																							
Bare ground, unvegetated water, and/or moss			0	0	0	2	10	0	4	3	0	10	20	0	0	8	0	0	1	0	0	3	
Dead sprayed weeds			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Shade, Woody Stem Cover & Water Depth																							
Shade from woody plants			25	3	0	0	0	0	0	0	0	0	0	5	0	5	0	0	0	0	0	2	
Stem cover on ground			15	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	
Approx. water depth (feet)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Summary Information																							
Cover of Native Herbaceous Species			100	100	95	95	81	80	91	97	127	90	80	95	100	90	103	112	92	104	99	96	2.6
Lower CI (80%)																						93	
Upper CI (80%)																						100	
Cover of Invasive Herbaceous Species			0	0	0	1	0	3	0	0	0	0	0	0	0	0	1	0	6	4	0	1	0.4
Lower CI (80%)																						0	
Upper CI (80%)																						1	
Bare Substrate			0	0	0	2	10	0	4	3	0	10	20	0	0	8	0	0	1	0	0	3	1.2
Lower CI (80%)																						1	
Upper CI (80%)																						5	
Native Diversity																						6 species met the criteria: HOBR, LEOR, LOUN, CAO, LYAM, MAGL	
Prevalence Index			1	1	1	1	2	3	2	3	2	1	1	1	1	1	2	2	1	2	3	2	N/A
Weighted Prevalence Index			100	115	119	139	164	295	168	254	309	90	80	110	100	124	246	233	130	228	308		
Sum of plant cover			100	105	103	104	96	103	96	97	127	90	80	100	100	94	109	112	99	108	100		

TUALATIN VALLEY ENVIRONMENTAL BANK										
2020 Vegetation Monitoring	Sample Date(s):	8/18/2020-8/24/20	Percent (%) Cover							
OBL Herbaceous Community	Origin (N, NN, I)	Wetland Status (1 - 5)	T4-PEMOBL5	T4-PEMOBL6	T8-PEMOBL2	T9-PEMOBL3	T11-PEMOBL4	Row Average		
Species										
Native Herbaceous Species										
<i>Eleocharis obtusa (ovata)</i>	N	1	0	0	0	12	0	2		
<i>Eleocharis palustris</i>	N	1	0	0	0	20	0	4		
<i>Elodea canadensis</i>	N	1	0	0	0	0	0	0		
<i>Elodea nuttallii</i>	N	1	0	0	0	0	0	0		
<i>Elodea species</i>	N	1	0	0	30	0	5	7		
<i>Juncus oxymeris</i>	N	2	0	0	0	0	0	0		
<i>Leersia oryzoides</i>	N	1	0	0	0	45	0	9		
<i>Lemna minor</i>	N	1	50	2	0	0	0	10		
<i>Ludwigia palustris</i>	N	1	0	0	0	0	0	0		
<i>Polygonum amphibium</i> var. <i>emersum</i> (<i>Persicaria amphibia</i>)	N	1	0	0	0	0	0	0		
<i>Polygonum (Persicaria) hydropiperoides</i>	N	1	30	75	0	30	0	27		
<i>Potamogeton natens</i> and/or <i>P. nodosus</i>	N	1	0	0	20	0	50	14		
<i>Schoenoplectus tabernaemontmontani</i>	N	1	0	0	0	0	0	0		
<i>Sparganium emersum</i>	N	1	8	20	10	0	0	8		
<i>Stuckenia pectinata</i>	N	1	0	0	0	0	0	0		
<i>Typha latifolia</i>	N	1	0	5	0	0	0	1		
Invasive Herbaceous Species										
<i>Phalaris arundinacea</i>	I	2	0	0	0	0	0	0		
None this year										
Non-Native Herbaceous Species										
<i>Lythrum portula</i>	NN	1	0	0	0	0	0	0		
<i>Agrostis species (assmed NN, FAC or wetter)</i>	NN	3	0	0	0	0	0	0		
<i>Potamogeton crispus</i>	NN	1	0	0	0	0	0	0		
Bare Substrate										
Bare ground			12	0	40	3	45	20		
Unvegetated water (aprox.)			0	0	0	0	0	0		
Shade, Woody Stem Cover & Water Depth										
Shade from woody plants			0	0	0	25	0	5		
Stem cover on ground			0	0	0	3 (SALA)	0	0		
Approx. water depth (feet)			1	0.5	1.5	0	1	0.8		
Summary Information								Habitat Average	Standard Error	
Cover of Native Herbaceous Species			88	102	60	107	55	82	11	
Lower CI (80%)								69		
Upper CI (80%)								96		
Cover of Invasive Herbaceous Species			0	0	0	0	0	0	0	
Lower CI (80%)								0		
Upper CI (80%)								0		
Bare Substrate			12	0	0	0	0	2	3	
Lower CI (80%)								-1		
Upper CI (80%)								6		
Native Diversity								NA- there is no diversity standard for this community		
Prevalence Index			1	1	1	1	1	1		
Weighted Prevalence Index			88	102	60	107	55			
Sum of plant cover			88	102	60	107	55	89		

VEGETATION MONITORING NOTES:

General

- Occasionally a native woody species was rooted in herbaceous plots in various habitat classes. The percent cover at ground level of “stems” as well as “rooted in” aerial cover was recorded in the tables followed by the 4-letter species code, but the woody cover recorded in herb plots was not added to the total native percent cover so as not to double up cover already captured in the woody plot data for the PFO, PSS & Buffer habitat classes.
- In the herbaceous plot data for the PFO, PSS & Buffer habitat classes, as of 2015, we started recording “shade from woody plants” i.e., aerial cover. Again this was not added to the native cover totals. *Starting in 2015, any herb plot with 60% or more aerial cover (shade) from woody plants is excluded from the bare substrate criteria.*
- Several herbaceous plots in the wetlands are listed as having *Carex scoparia* and/or *C. ovalis*. These two species are very similar looking native FACW sedges; we did not key every sample but it is likely both species are present.
- The identification of *Microsteris gracillis*, present in low percentages in a few herb plots in the FACW/FAC communities, is somewhat tentative.

PEM-OBL Herbaceous Community

- There are some disagreements re: the nativity of *Sparganium emersum*. As per the Mitigation Bank Instrument, this species will be considered a native for this project.
- Both *Potamogeton nodosus* and *P. natens* are present in this community and have similar floating leaves (the submerged leaves differ). Populations within plots identified as one or the other may include both. Both species are native OBL aquatic plants.
- Identification of *Stuckenia pectinata* (formerly *Potamogeton pectinatus*) and *Potamogeton foliosus* is somewhat tentative; no flowers were present in samples, but they matched the vegetative characteristics of these species. These species were not seen in 2016 or 2017 (possibly due to removing the deepest inundated plots) but may be seen again in future years.

PFO, PSS and Upland Buffers-Tree & Shrub Plots

- T7-F1: 50% of plot inundated
- T8-F1: 60% of plot inundated
- T8-F3: About 50% of this plot is actually in the PEM habitat/
- T11-F2: most of the plot does not support woody species due to water.
- T11-F3: currently only 70% of plot supports woody species due to water.
- T11-F4: currently only 15% of plot supports woody species due to water.-
- Willows identified as *Salix hookeriana* (aka *S. piperi*) may occasionally include *S. scouleriana* plants; the two may look very similar when young.

Removals of Plots in 2017:

- This year we removed nine more of the permanently inundated OBL plots (T4-PEMOBL1, T4-PEMOBL2, T4-PEMOBL3, T4-PEMOBL4, T5-PEMOBL2, T7-PEMOBL1, T7-PEMOBL3, T9-PEMOBL1, and T10-PEMOBL3).

Removals of Plots in 2016:

- Two PFO herb plots were removed: T11-FH8 and T11-FH9 were inundated approximately 2 and 3 feet respectively and thus were not representative of the PFO habitat.
- Nine PEMOBL plots were removed: (T5-PEMOBL1, T8-PEMOBL1, T8-PEMOBL2, T9-PEMOBL2, T10-PEMOBL1, T10-PEMOBL2, T11-PEMOBL1, T11-PEMOBL2, and T11-PEMOBL3). They were too deeply inundated (≥ 1.5 foot to about 3 or more feet) to accurately estimate cover from a distance.

Removals and Addition of Plots in 2015:

- The five PSS herbaceous plots on Transect 6 (T6-SH2, T6-SH6, T6-SH11, T6-SH12, and T6-SH14) that had been removed in 2014 due to being in total shade provided by a few scattered mature trees were added back. However these herb plots (and any others with $\geq 60\%$ aerial cover from woody plants) are now excluded from the bare substrate criteria.
- Several plots were added on the eastern side of transect 10 in 2015 to ensure full coverage of the transect. These plots were T10-F3, T10-FH5, T10-BF3, T10-BH5, and T10-BH6.
- One of the inundated OBL plots, T7-PEMOBL2 was too deep to estimate cover from a distance so it was removed.

Removals and Addition of Plots in 2014:

- PFO herb plot T5-FH2 was added; it had originally thought to have been in the buffer but it is in wetland.
- Five PSS herbaceous plots on Transect 6 (T6-SH2, T6-SH6, T6-SH11, T6-SH12, and T6-SH14) were removed due to being in total shade provided by a few scattered mature trees.
- Two PFO woody plots (T10-F1 and T11-F1) and the two associated herbaceous plots (T10-FH1 and T11-FH1) were removed because they were located in the pre-existing mature wetland forest, where no woody and herbaceous planting had occurred.
- One PFO woody plot (T11-F5) was removed from the PFO community because it was approximately 70% inundated.
- In the buffer we initially sampled but then removed two woody plots (T10-BF1 and T11-BF1) and associated herb plots (T10-BH1 and T11-BH1) because they were in the existing mature forested unplanted buffer.

Alterations of Plot Location or Orientation in 2014:

- PFO woody plot T4-F1 and associated herb plot T4-FH1 were moved approximately 20 feet to the east to the plant community break because the woody plot had previously been partially within the PEM OBL habitat.
- PSS woody plot T6-S4 was moved and skewed (as in 2013) and the associated herb plot T6-SH6 was moved to the west to avoid placement in the road, however the resulting placement varied from slightly from the 2013 location.

- Buffer woody plot T7-BF2 and associated herb plot T7-BH3 were placed only about 30 feet east of the previous herb plot (rather than the usual 50 feet) so that the woody plot would fit within the mitigation buffer; the rectangular woody plot was also skewed so that the short edge was parallel to the transect for the same reason. Buffer woody plot T9-BF2 was similarly skewed.

Removal or Re-Labeling of Plots in 2013:

- Herb plot T10-PEM1 (initially placed in the FAC/FACW community) was re-labeled as T10-OBL3 since it was actually in the OBL community.
- Herb plot T12-PEM1 (also initially placed in the FAC/FACW community) was inundated on August 1, 2013 and was discarded.

Alterations of Plot Location or Orientation in 2012 or 2013:

- PSS herb plot T2-SH1 started 15 ft from property line because of bisecting property line (the 1st shrub plot was not associated with this herb plot for the same reason (it was with T2-SH2 instead))
- PFO woody plot T5-F1 was moved approximately 10 feet to the east of its original location because a portion of it was in the OBL-dominated herbaceous habitat.
- PSS plots T6-S2 and T6-SH3 were skewed slightly because portions of them were in open water.
- PSS woody plot T6-S4 was moved approximately 25 feet west so it would be completely out of an unimproved access road, and the associated herb plot T6-SH6 was moved so it would be in the corner of the shrub plot.
- PSS woody plot T6-S11 was skewed north so that it would be entirely within one wetland habitat type.
- PFO woody plots T8-F1, T9-F1 and T10-F1 were skewed so that the short edge was parallel to the transect in order to fit within the community.

Plant Nomenclature:

-Plant nomenclature is generally up-to-date. The USDA PLANTS database (<http://plants.usda.gov/java/>) was our source for nomenclature. In cases where the latest nomenclature is different than that listed in the Corps WIS list, the name used name in the Corps' list, or closest synonymy is in parentheses. Except for a few species as noted in the Mitigation Bank Instrument, this is also our source for nativity designations.

-The Wetland Indicator Statuses (WIS) are from the 2016 list for the Western Mountains, Valleys and Coast Region as presented in the Corps' *State of OREGON 2016 Wetland Plant List*

Principal Plant Identification Resources Used For This Project

Technical Flora and Keys:

-Hitchcock, C. Leo and Cronquist. 1974. *Flora of the Pacific Northwest*. University of Washington Press.

-Hitchcock, C. Leo et. al. 1955, 1959, 1961, 1964 and 1969. *Vascular Plants of the Pacific Northwest (5 Volumes)*. University of Washington Press.

- Kozloff, Eugene N. 2005. Plants of Western Oregon, Washington and British Columbia. Timber Press.
- Meyers, Stephen C. *et. al.* 2015. Flora of Oregon- Volume 1: Pteridophytes, Gymnosperms, and Monocots. Botanical Research Institute of Texas Press.
- Various authors. 2014. The on-line Oregon Flora Project keys and plant descriptions. URL <http://www.oregonflora.org/>

Field Guides:

- Cooke, Sarah Spear (Editor). 1997. A Field Guide to the Common Wetland Plants of Western Washington and Northwestern Oregon. Seattle Audubon Society
- Guard, B. Jennifer. 1995. Wetland Plants of Oregon and Washington. Lone Pine Publishing.
- Whitson, Tom D. (editor) *et. al.* 1996. Weeds of the West. 5th Edition. University of Wyoming Press.

-Other Resources:

- John Christy, Wetland ecologist for the Institute for Natural Resources was consulted in previous years concerning the identification of several native species.
- Richard Brainerd and others from the Carex Working Group in Corvallis, Oregon were consulted in previous years concerning the identification of several native *Bromus* species.
- Stephen C. Meyers, Taxonomic Director, Oregon Flora Project, Oregon State University was contacted in 2016 to confirm our identification of atypical samples of the native *Polygonum hydropiperoides* (aka *Persicaria hydropiperoides*) that had spotted leaves, a feature that is not described for this species in any regional flora. He confirmed our ID of *P. hydropiperoides* and speculated that there may have been hybridization with *Polygonum persicaria* (aka *Persicaria maculosa*) in past generations that had subsequently back-crossed with pure strains of *P. hydropiperoides*. Because this was an unusual plant he requested that we send a pressed specimen that will now be included in their herbarium.
- USDA PLANTS database URL <http://plants.usda.gov/java/>. This site provides drawings, photos and distribution maps plus useful links to other web sites including the CalPhotos website URL <http://calphotos.berkeley.edu> etc.

APPENDIX B: PHOTOGRAPHIC DOCUMENTATION



Photo Point 1 NW: Photo displays native dominated plant communities within the wetland area and native grass dominated upland buffer.



Photo Point 1 SW: Photo displays native dominated plant communities within the wetland area and native grass dominated upland buffer



Photo Point 2 NW: Photo displays native dominated plant communities within the wetland area and vigorously-growing woody plantings.



Photo Point 3 SW: Photo displays the un-improved access road near the "north-south" ditch.



Photo Point 3 SE: Photo displays the un-improved access road which crosses the constructed swale.



Photo Point 4 N: Photo displays the head of the constructed swale, at the un-improved access road crossing.



Photo Point 4 S: Photo displays head of constructed swale, at the un-improved access road crossing.



Photo Point 5 E: Photo displays northern woody-debris jam / ditch plug.



Photo Point 6 NW: Photo displays constructed swale and wetland creation area within the PFO vegetation community and upland buffer.



Photo Point 6 SE: Photo displays constructed swale and wetland creation area.



Photo Point 7 SE: Photo displays wetland enhancement, restoration and creation areas.



Photo Point 8 NW: Photo displays wetland creation area within the PEM FAC/FACW and PFO vegetation communities.



Photo Point 8 SE: Photo displays wetland creation and restoration areas within the PEM FAC/FACW and PFO vegetation communities.



Photo Point 9 SE: Photo displays southern woody-debris jam / ditch plug.



Photo Point 10 SW: Photo displays woody-debris jam / ditch plug, and an obligate dominated PEM community.



Photo Point 11 NW: Photo displays the mouth of the constructed swale and the wetland creation area.



Photo Point 11 SE: Photo displays the mouth of the constructed swale looking toward the log jams.



Photo Point 12 NW: Photo displays upland buffer area.



Photo Point 13 SW: Photo displays the re-contoured location of the 18” culvert, ditch outfall, and adjacent hill-slope trench.



Photo Point 14 NW: Photo displays the re-contoured location of the 18” culvert and ditch outfall.



Photo Point 15 SW: Photo displays the secondary log jam.



Photo Point 16 SE: Photo displays primary log jam.

APPENDIX C: VEGETATION MONITORING TRANSECT LOCATION TABLE

TUALATIN VALLEY ENVIRONMENTAL BANK

Vegetation Monitoring Transect Locations:

Transect	Start Latitude	Start Longitude	End Latitude	End Longitude
T1	45.448	-122.968	45.448	-122.967
T2	45.448	-122.968	45.448	-122.966
T3	45.447	-122.965	45.447	-122.964
T4	45.446	-122.965	45.446	-122.963
T5	45.445	-122.963	45.445	-122.962
T6	45.443	-122.963	45.443	-122.959
T7	45.442	-122.963	45.442	-122.961
T8	45.441	-122.963	45.441	-122.961
T9	45.439	-122.962	45.439	-122.960
T10	45.438	-122.962	45.438	-122.958
T11	45.437	-122.962	45.437	-122.958
T12	45.437	-122.961	45.437	-122.959

Please refer to Section E: Monitoring Data Locations for an in depth description of plot locations. Transects ran west to east. In general, the first plot on a transect was 5 feet east of the transect start point; herbaceous plots were spaced every 50 feet and tree/shrub plots were spaced every 100 feet. Some areas were not sampled due to deep inundation, upland, or impermeable surface. The locations of the start and end points of each monitoring transect, the northwestern corner of each herbaceous plot, and all four corners of the woody vegetation plots were GPS'ed; these data are available upon request.

APPENDIX D: CREDIT LEDGER (2020)

TUALATIN VALLEY ENVIRONMENTAL BANK CREDIT LEDGER: 1/1/2019 - 12/9/20

Date	Transaction Type	Jurisdiction	Permitee	Permit Number (DSL/Corps)	Wetland Impact Type	Number of Credits (ac.)	Balance of Credits after Transaction (ac.)
1/14/2019	withdrawal	State/Federal	Brookman Development LLC	61502-FP, NWP-2018-00472	PEM; Slopes/Flats/Riverine	0.36	0.0009
5/23/2019	release	State/Federal				0.819	0.8199
6/28/2019	withdrawal	State/Federal	Washington County	62020-GP, NWP-2019-00243	PEM; Slopes/Flats	0.034	0.7859
7/16/2019	withdrawal	State/Federal	JT Smith Companies	61737-RF, NWP-2019-00035	PEM; Flats	0.34	0.4459
10/31/2019	withdrawal	State/Federal	Tualatin Hills Parks and Recreation District	61830-RF, NWP-2018-00365	PEM; Slope/Flats	0.28	0.1659
12/20/2019	withdrawal	State/Federal	Polygon Northwest	54853-FP, NWP-2013-00374	PEM; Flats	0.14	0.0259
Credits Released 2020 (ac.): 0							Credits Withdrawn 2020 (ac.): 0
Total Credits Released (ac.): 23.349						Total Credits Withdrawn (ac.): 23.3231	Balance (ac.): 0.0259