FOSTER CREEK WETLAND MITIGATION BANK

2021 VEGETATION MONITORING REPORT

CLACKAMAS COUNTY, OREGON

Wetland Systems, LLC
2016 SE Henkle Road
Corbett, Oregon 97019

December 2021

Table of Contents

List of Tables

List of Figures

Appendices

1 PROJECT OVERVIEW

Status and Location
Foster Creek Wetland Mitigation Bank is owned and operated by Wetland Systems, LLC. The Foster Creek Wetland Mitigation Bank was authorized with approval of the Instrument in June 2006 (Corps File Number: 200500621, and DSL Permit 36499-RF). Comments or questions concerning this report may be directed to the report's author: Mark Vlahakis at mvlahakis@q.com.

The site is located on S. Eaden Road near Barton in Clackamas County, Oregon. The Foster Creek Wetland Mitigation Bank (Bank) serves the Clackamas River basin below 1,200 feet, all of the Johnson Creek basin, all of the Abernathy Creek basin, and limited portions of the Willamette basin (around Oregon City and Milwaukie). Urban areas served by this bank include Damascus, Oregon City, portions of Gresham, Milwaukie, Portland, and Sandy; and unincorporated Clackamas County.

The Foster Creek Wetland Mitigation Bank provides Slope/Flats and Depressional wetlands according to the Hydrogeomorphic classification, and Palustrine Emergent and Palustrine Forested wetlands according to the Cowardin classification. The habitat focus of the Bank is seasonal wet prairie (55.4 acres) with a lesser amount of forested wetland (13.2 acres). The Bank has been approved for a total of 27.56 wetland mitigation credits, with 26.18 of those credits currently approved for release by regulatory oversight.

This is the thirteenth annual monitoring report for the Foster Creek Wetland Mitigation Bank (the 2008 annual report monitored revegetation test plots only). For purpose of discussion with this report, the site is segregated into two distinct areas related to current revegetation and vegetation monitoring activities: Wet Prairie and Forested Wetland (Figure 1).

The 68.6-acre wetland site area was fully planted in 2010, with grasses completed in 2009; forbs completed in 2010. Trees/shrubs were fully installed within the forested wetland in 2011 to complete the planting of the entire 68.6-acres. In addition, approximately 6.4 acres of existing wet prairie were converted to forested wetland in 2020 (see Section 5 for details).

Summary of 2021 Credit Activity
The Foster Creek Bank is currently authorized for release of 95% (26.18) of the Bank's total credits (27.56). There were 0.46 credits sold in 2021. The total number of credits sold to-date is 26.12, with 0.06 credits currently available for transaction. A copy of the Bank's ledger is attached as Appendix A.

2 PERFORMANCE REQUIREMENTS

Summary of Vegetation Performance Standards
In 2014 a revision to the herbaceous diversity and tufted hairgrass performance standards for wet prairie were proposed by DSL/Corps and accepted by the Foster Creek Bank. The new standards replace the vegetation diversity and tufted hairgrass standards in the Bank Instrument (Table 16 of the Instrument) and are as follows:

1. **Vegetation Diversity Standard**:
   Delete the 2 standards under "Number of Native Species" and replace with the following: Number of native species: For Years 3-5, the wet prairie will contain a minimum of 6 native species, or groupings of native species, each with at least 5% cover averages across all wet prairie plots. To qualify as one of the species or groupings to be counted, the species or group will occur in at least 10% of the prairie plots and have at least 1% average cover.
2. **Tufted Hairgrass Standard**:
   In the two standards for Percent Cover of Native Species, delete the 2nd clause "with tufted hairgrass/camas >15% in years 1-2", and the clause with "tufted hairgrass/camas >20% in years 3-5".

Vegetation performance standards and the on-going performance status for the wet prairie and forested wetland habitats are presented in Tables 1 and 2. Refer to the "*Monitoring Results*" Section in Section 4 (Page 4) for details on the individual performance criteria results based on the 2021 monitoring. A table summarizing the percent cover and occurrence of all species within wet prairie plots is presented in Appendix B.

TABLE 1 - WET PRAIRIE PERFORMANCE STANDARDS

Wet Prairie Performance Criteria	Wet Prairie Performance Criteria Benchmark	Wet Prairie Performance Criteria Time Period	Wet Prairie Performance Criteria Status: 2009-2021
Percent Cover Native Species	>50% native species	2 Years	Met for 13 Years
Percent Cover Native Species	>60% native species	3 Years	Met for 11 Years
Percent Cover Invasive Species	<20% <15% for reed canarygrass	5 Years 5 Years	Met for 13 Years Met for 13 Years
Percent Cover Trees & Shrubs	<5%	5 Years	Met for 13 Years
Number of Native Species	≥6 native species with at least 5% cover	3 Years	Met for 8 Years*

* 2014 was the first year of implementation for this criterion

TABLE 2 - FORESTED WETLAND PERFORMANCE STANDARDS

Forested Wetland Performance Criteria	Forested Wetland Performance Criteria Benchmark	Forested Wetland Performance Criteria Time Period	Forested Wetland Performance Criteria Status: 2009-2021
# Native Tree/Shrub Species	Minimum 1 native tree species Minimum 3 native shrub species	5 Years 5 Years	Met for 13 Years Met for 13 Years
Density of Native Tree Species	Minimum of 240 stems per acre	5 Years	Met for 12 Years
Density of Native Shrub Species	Minimum of 320 stems per acre	5 Years	Met for 11 Years
Percent Cover Native Herbaceous Species	>50% cover	5 Years	Met for 10 Years
Percent Cover Invasive Species	<20% <15% reed canarygrass	5 Years 5 Years	Met for 11 Years Met for 13 years

3 METHODOLOGY

Vegetation Monitoring Methodology

Vegetation data collection follows protocols described in VEMA (Marshall 2007). Vegetation monitoring was conducted in early summer (May 24-27, 2021) by GreenBanks, LLC., and categorized by the author.

Permanent monitoring transects have been laid out from a baseline transect running east to west across the property, establishing 13 monitoring transects running north and south from the baseline (Figure 1). Five transects on the north side of the baseline (T-1N to T-5N), and eight transects on the south side (T-1S to T-8S), were numbered sequentially from west to east (Transect T-8S is located slightly south of the

baseline to facilitate coverage in that area). A transect's first sample plot (S1) was located at a random distance from the baseline, with subsequent plots located at 100-foot intervals from the first plot to the end of the respective transect. GPS coordinates were recorded at transect end points and for all 102 plot points. Locations of the endpoints of the baseline and transects were field-marked with wooden stakes, and sample plot locations were marked with labeled pin flags. Capped rebar was installed at all these points to create permanent location markers.

For wet prairie monitoring, a total of 73 plots of 1m² were located along the transects to sample herbaceous vegetation within the wet prairie. For forested wetland monitoring where trees and shrubs were installed, 25 circular plots with a radius of 30-feet were sampled within seven transects (T-1N,T-2N, T-3N, T-4N, T-1S,T-7S, T-8S) to count individual stems of trees and shrubs. The flagged sample locations were used to mark the center of the circular plot. Each of the circular plots also contained a 1m² herbaceous plot nested within it, using the same flagged point to mark the lower left corner of the plot.

4 MONITORING RESULTS

Vegetation Monitoring Summary Data

Monitoring data was summarized based on the habitat type (wet prairie or forested wetland) and the performance criteria required of each. Data was summarized by averaging the results of each sample plot within each transect, and then averaging the results of all of the transects to obtain a site-wide result for each criteria. Table 3 summarizes the site-wide results for the respective performance criteria.

TABLE 3 – PERFORMANCE CRITERIA RESULTS

WET PRAIRIE HABITAT													
Criteria Performance	**Monitoring Results**												
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Native species cover >50%[1]	54%	64%	70%	74%	64%	60%	68%	78%	74%	76%	75%	64%	75%
Native species cover >60%[2]	54%	64%	70%	74%	64%	60%	68%	78%	74%	76%	75%	64%	75%
Non-native invasive species cover: <20%[3]	11%	9%	7%	16%	10%	17%	13%	6%	6%	7%	7%	14%	6%
<15% for reed canarygrass[3]	0%	<1%	<1%	0%	0%	0%	0%	0%	<1%	0%	0%	0%	0%
Tree and shrub species cover <5%[3]	0%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%
≥6 native species/groups with ≥5% cover[2]	*	*	*	*	*	6	6	6	6	7	7	7	7

* 2014 was the first year of implementation for this criterion (see Section 2)

FORESTED WETLAND HABITAT													
Performance Criteria	**Monitoring Results**												
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Minimum of 1 native tree species[3]	2	3	3	4	5	5	5	6	5	5	5	5	5
Minimum of 3 native shrub species[3]	2	6	6	7	7	7	9	9	9	9	9	9	9
Minimum tree density of 240 stems/acre[3]	189	283	480	598	636	750	658	418	861	1095	1101	1102	871
Minimum shrub density of 320 stems/acre[3]	6	240	473	602	602	549	563	370	659	708	662	668	565
>50% cover native herbaceous species[3]	49%	40%	48%	58%	54%	53%	61%	69%	65%	65%	61%	54%	55%
<20% cover non-native invasive species[3]	14%	42%	32%	15%	18%	13%	13%	12%	5%	9%	14%	18%	11%
<15% reed canarygrass[3]	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[1] required for 2 years
[2] required for 3 years
[3] required for 5 years

Discussion of Vegetation Performance

Wet Prairie – In 2021, all annual wet prairie performance categories were met (Table 3). With the change in the wet prairie vegetation diversity standard (2014) came a revised focus in vegetation management. We're now concentrating on a select group of native forb species to maintain target diversity. Native species within the monitoring plots increased from 64% in 2020 to 75% in 2021. Non-native invasive species as listed in the Instrument decreased to 6% in 2021.

Three species met the revised species cover criteria outright in 2020; *Deschampsia caespitosa*, *Sidalcea nelsonii*, and *Epilobium densiflorum*. There are four species groupings that meet the species cover criteria. The species groups include: *Carex* group (*Carex densa*, *C. pachystachya*, and *C. unilateralis*); FACW group (*Camassia quamash*, *Cardamine occidentalis*, *Galium trifidum*, *Ranunculus occidentalis*, *Veronica peregrina*, *Grindelia integrifolia*, and *Symphyotrichum subspicatum*); the FAC group (*Brodiaea hyacinthia*, *Geum macrophyllum*, and *Potentilla gracilis*); and the FACU group (*Acmispon americanus*, *Penstemon rydbergii*, *Prunella vulgaris, and Sidalcea campestris)*.

Cover of non-native forbs decreased from 13% in 2020 to 5% in 2021 and non-native grass species decreased from 9% in 2020 to 7% in 2021. Invasive forbs decreased from 13% in 2020 to 3% in 2021, while invasive grasses increased from 1% in 2020 to 3% in 2021. Listed invasive species with over 1% cover in 2021 include *Leontodon taraxacoides* at 3% and *Poa trivialis* at 2%. Other non-native species with greater than 1% cover in 2021 include *Bromus racemosus* at 1.5%, *Parentucellia viscosa* at 1.2%, and *Vulpia bromoides* at 5%. These and other non-native species of concern were targeted for control following monitoring and will continue to be targeted in 2022.

Forested Wetland – In 2021, all annual forested wetland performance categories were met (Table 3). Total native species cover of 55% was an increase from last year (50% in 2020), with non-native species increasing to 23% from 18% in 2020. Invasive cover decreased to 11% in 2021 compared to 18% in 2020.

The primary non-native species present in 2021 are: *Anthoxanthum odoratum* at 11% (versus 13% in 2020), and *Leontodon taraxacoides* at 9% cover (versus 17% in 2020).

Tree density in 2021 was recorded as 871/acre while shrub density was 565/acre, both somewhat lower than 2020 densities but still well above performance standards. This reduction is due to the addition of six new PFO plots which contain less stems than that of a typical plot that has been established for 12 years with opportunity for recruitment, two of which are located directly adjacent to other habitat borders which limited the tree/shrub density of 30-foot radius plots (T1S-S7 and T1S-S8).

5 CORRECTIVE ACTIONS AND RECOMMENDATIONS

Post monitoring corrective actions fall into two primary categories: (1) weed control to reduce the occurrence and density of targeted non-native species, and (2) native forb establishment to increase the density and occurrence of select native forb species. These two core activities are directed through an adaptive management process with numerous points of input taken into consideration, which includes formal monitoring.

Weed Control

Weed control efforts are on-going. In 2021, weed control activities concentrated primarily on spot spraying select herbicides performed with backpack applications during the growing season. There are several non-native species targeted for control. Based on monitoring and daily observations these species include, but are not limited to: *Leontodon taraxacoides, Leucanthemum vulgare, and Lotus corniculatus;* and the grasses *Vulpia bromoides, Holcus lanatus,* and *Bromus* spp. Areas of the PFO that containing weedy herbaceous cover are targeted as well, focusing especially *Leontodon taraxacoide, Daucus carota,* and *Anthoxanthum odoratum*.

Species Establishment

Establishing additional native species and increasing the density of select prairie cohort species is a core activity at the Bank. Species for establishment are selected each year based on monitoring results, seed availability, integration with weed management activities, and appropriateness for the Bank's habitats. Seeding typically takes place in the fall season.

Within the prairie, both native grasses and forbs were seeded within areas of bare ground. Bare ground exists annually primarily due to mole activity with additional disturbance caused by meadow voles. Bare ground throughout the prairie was seeded with native grasses and forbs from late autumn into late winter. In 2021 we performed supplemental grass seeding of *Deschampsia caespitosa*/*Deschampsia elongata*, along with a forb mix consisting of *Epilobium densiflorum*, *Plectritis congesta*, *Geum macrophyllum*, and *Grindelia integrifolia*. In the forested wetland there were supplemental seedings of, primarily, *Hordeum brachyantherum* and *Deschampsia caespitosa* at various spot spray locations.

New PFO Conversion

In early 2020 the Bank converted approximately 5 acres of wet prairie habitat (PEM) to forested wetland habitat based on our proposal to DSL/Corps titled: "Proposal to Change Habitat Type" (September 2019). Assessment of the planted area yielded satisfactory results with low mortality of the bare-root plantings (estimated at < 5%), despite the heat and drought challenges of the 2021 growing year.

The 2020 conversion accommodated targeted approximately 6.4 acres of PEM habitat in three locations where the wet prairie had experienced significant natural recruitment of Oregon ash trees from adjacent existing trees. Based on the success of the 2020 plantings in these locations and encouragement from the regulatory representatives to convert additional acreage, we have identified an additional 38.0 acres for a total conversion area consisting of approximately 44.4 acres of PFO. See the attached figure 2 for the locations of New PFO Areas and retained PEM.

Conversion will be performed in a manner similar to the 2020 exercise. This includes allowing natural recruitment of ash trees to establish, as well as installing additional Oregon ash trees and select forested wetland shrubs (red-ozier dogwood, crab apple, twinberry, ninebark, native hawthorne, snowberry) will be installed from bare-root stock and completed by spring 2022. Supplemental seeding of the herbaceous layer, performed where appropriate, will focus on sedge species, primarily slough sedge, and other native species.

This conversion will result in approximately 11.0 acres of existing wet prairie to remain. We still believe strongly that wet prairie deserves space on the site and have selected a sizable area (see attached Figure 2) that contain the greatest forb diversity, the highest density of *Camas*, and where a T&E forb (*Lomatium bradshawii*) is steadily increasing. Performance standards and monitoring will remain as currently established within the PEM area.

Performance standards that currently exist for established PFO elsewhere at Foster Creek will be followed for the new areas (see Table 2, Page 3). Planting/seeding of the areas will commence in late winter and be completed by spring 2022. Existing monitoring plots within the proposed PFO areas will be converted from PEM plots to PFO plots and monitoring performed in May/June 2022 under the established timeframe.

REFERENCES

Christy, John A. June 2009. 2009 Vegetation Monitoring, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon. Prepared for Wetland Systems Restoration & Conservation LLC.

Christy, John A. June 2010. 2010 Vegetation Monitoring, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon. Prepared for Wetland Systems Restoration & Conservation LLC.

Christy, John A. October 2011. 2011 Vegetation Monitoring, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon. Prepared for Wetland Systems Restoration & Conservation LLC.

Christy, John A. September 2012. 2012 Vegetation Monitoring, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon. Prepared for Wetland Systems Restoration & Conservation LLC.

Christy, John A. September 2013. 2013 Vegetation Monitoring, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon. Prepared for Wetland Systems Restoration & Conservation LLC.

Christy, John A. August 2014. 2014 Vegetation Monitoring, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon. Prepared for Wetland Systems Restoration & Conservation LLC.

Christy, John A. August 2015. 2015 Vegetation Monitoring, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon. Prepared for Wetland Systems Restoration & Conservation LLC.

Marshall, John L. April 2007. Draft Guidance for Vegetation planning and monitoring in Western Oregon Wetlands and Riparian Areas: *Using Reference Sites to Help Plan and Evaluate Vegetation Performance of Mitigation Sites.* U.S. Fish and Wildlife Service and Oregon Department of State Lands.

USFWS August 2008. Draft Recovery Plan for Prairie Species of Western Oregon and Southwestern Washington. Region 1, U.S. Fish and Wildlife Service. Portland, Oregon

Wetland Systems Restoration and Conservation, LLC. May 28, 2006. Foster Creek Wetland Mitigation Bank Instrument, Clackamas County, Oregon.

Wetland Systems Restoration and Conservation, LLC. February 2014. Amendment #1 to Foster Creek Wetland Mitigation Bank Instrument, Clackamas County, Oregon.

Wetland Systems, LLC. December, 2016. 2016 Vegetation Monitoring Report, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon.

Wetland Systems, LLC. December, 2017. 2017 Vegetation Monitoring Report, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon.

Wetland Systems, LLC. December, 2018. 2018 Vegetation Monitoring Report, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon.

Wetland Systems, LLC. December, 2019. 2019 Vegetation Monitoring Report, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon.

Wetland Systems, LLC. December, 2020. 2020 Vegetation Monitoring Report, Foster Creek Wetland Mitigation Bank, Clackamas, Oregon.