

FOSTER CREEK WETLAND MITIGATION BANK
2009 VEGETATION MONITORING REPORT
CLACKAMAS COUNTY, OREGON

Wetland Systems Restoration and Conservation, LLC
2016 SE Henkle Road
Corbett, Oregon 97019

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1 PROJECT OVERVIEW

Status and Location

Foster Creek Wetland Mitigation Bank is owned and operated by Wetland Systems Restoration & Conservation, 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 13.78 of those credits currently approved for release by regulatory oversight.

Although this is technically the second annual monitoring report for the Foster Creek Wetland Mitigation Bank, 2009 is the first site-wide vegetation monitoring following initial revegetation events (the 2008 annual report monitored revegetation test plots only). Site preparation activities in 2009 focusing on weed control have necessitated a phased approach for revegetation of the site. For purpose of discussion with this report, the site is segregated into four distinct areas related to current revegetation and vegetation monitoring activities: Forested Wetland; Main Wet Prairie; North Wet Prairie; and Buffer (Figure 1). The Bank's buffer areas continue to undergo weed management activities with only a minor amount of plantings having been installed to-date. Therefore, buffer area vegetation monitoring did not occur in 2009.

Summary of 2009 Credit Activity

The Foster Creek Bank is currently eligible for release of 50% (13.78) of the Bank's total credits (27.56). In 2009 a total of 2.35 credits were sold for a total of 4.13 credits sold to-date, with 9.65 credits currently available (conditional upon posting of financial assurance). There was a credit release of 5.51 credits in April 2009 for successfully meeting the hydrology performance standard (50% release milestone). The next credit release will be for the successful completion of initial seeding/planting (6.89 credits) which is anticipated to be completed in early 2011. A copy of the Bank's ledger is attached to this report as Appendix A.

2 PERFORMANCE REQUIREMENTS

Summary of Vegetation Performance Standards

Vegetation performance standards and current performance status based on 2009 monitoring for the wet prairie and forested wetland habitats are presented in Tables 1 and 2. Refer to the "Monitoring Results" Section on Page 4 for details on the individual performance criteria results based on the 2009 monitoring.

TABLE 1 - WET PRAIRIE PERFORMANCE STANDARDS

Wet Prairie Performance Criteria	Wet Prairie Performance Criteria Benchmark	Wet Prairie Performance Criteria Time Period	2009 Status
Percent Cover Native	>50%; with tufted hairgrass/camas	Two Consecutive Years	Not Met

Species	>15%		
Percent Cover Native Species	>60%; with tufted hairgrass/camas >20%	Three Consecutive Years	Not Met
Percent Cover Invasive Species	<20%; except <15% for reed canarygrass	Five Consecutive Years	Met One Year (2009)
Percent Cover Trees and Shrubs	<5%	Five Consecutive Years	Met One Year (2009)
Number of Native Species	Minimum of 2 native grass species and 1 native forb species with >10% cover	Two Consecutive Years	Not Met
Number of Native Species	Minimum of 3 native grass species and 2 native forb species with >10% cover	Three Consecutive Years	Not Met

TABLE 2 - FORESTED WETLAND PERFORMANCE STANDARDS

Forested Wetland Performance Criteria	Forested Wetland Performance Criteria Benchmark	Forested Wetland Performance Criteria Time Period	2009 Status
Number of Native Tree/Shrub Species	Minimum of 1 native tree and 3 native shrub species	Five Consecutive Years	Not Met
Density of Native Tree Species	Minimum of 240 stems per acre	Five Consecutive Years	Not Met
Density of Native Shrub Species	Minimum of 320 stems per acre	Five Consecutive Years	Not Met
Percent Cover Native Herbaceous Species	>50% cover	Five Consecutive Years	Not Met
Percent Cover Invasive Species	<20%; except <15% reed canarygrass	Five Consecutive Years	Met One Year (2009)

3 METHODOLOGY

Vegetation Monitoring Methodology

Vegetation data collection follows protocols described in VEMA (Marshall 2007). Vegetation monitoring was conducted in late spring (June 4-7) by expert botanist, John Christy (Christy 2009).

Monitoring transects were 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 2). Five transects (T-1 N to T-5 N) on the north side of the baseline, and eight transects (T-1S to T-8S) on the south side, 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 transect. GPS coordinates were recorded at transect end points and for all 102 plot points. Locations of the beginning and 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 98 plots of 1m² were located along the transects to sample herbaceous vegetation within the wet prairie. In addition to the transect plots, four upland (prairie) plots of 1m² (Upland plots E, F, G, H) were also established on the south side of the baseline. For forested

wetland monitoring where trees and shrubs were installed, 20 circular plots with a radius of 30-feet were sampled within five transects (T-2N, T-3N, T-4N, 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.

Representative photographs were taken during the monitoring's data collection and are presented at the end of John Christy's report (Appendix D). The initial point of each transect was photographed for visual documentation, facing north or south toward the endpoint of each transect. Each upland plot was also photographed.

4 MONITORING RESULTS

Vegetation Monitoring Summary Data

Monitoring data was collected by John Christy, and categorized by John Christy and the author. Appendix B presents a summary list of all species encountered within the sample plots. Appendix C presents the sample plot data. John's monitoring results and conclusions have been summarized for this report, with his full report attached for reference as Appendix D. Since this is the Bank's first site-wide monitoring of vegetation, it is essentially a stand-alone analysis without discernable trends. However, it does contain important information that formed the basis for establishing necessary adaptations and corrective actions for meeting project goals.

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 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 – 2009 PERFORMANCE CRITERIA RESULTS

WET PRAIRIE HABITAT	
Performance Criteria	2009 Monitoring Results
Native species cover >50%; with tufted hairgrass/camas >15% ¹	Native species cover = 54% Tufted hairgrass/camas cover = 1%
Native species cover >60%; with tufted hairgrass/camas >20% ²	Native species cover = 54% Tufted hairgrass/camas cover = 1%
Non-native invasive species cover <20%; except <15% for reed canarygrass ³	Non-native invasive species cover = 11% Reed canarygrass cover = 0%
Tree and shrub species cover <5% ³	Tree and shrub species cover = 0%
Minimum of 2 native grass species and 1 native forb species with >10% cover ¹	Native grasses >10% cover = 0 Native forbs >10% cover = 1
Minimum of 3 native grass species and 2 native forb species with >10% cover ²	Native grasses >10% cover = 0 Native forbs >10% cover = 1
FORESTED WETLAND HABITAT	
Performance Criteria	2009 Monitoring Results
Minimum of 1 native tree species and 3 native shrub species ³	Native tree species = 2 Native shrub species = 2
Minimum tree density of 240 stems per acre ³	Tree density = 189 per acre
Minimum shrub density of 320 stems per acre ³	Shrub density = 6 per acre
>50% cover of native herbaceous species ³	Native herbaceous species cover = 49%
<20% cover of non-native invasive species; except <15% reed canarygrass ³	Non-native invasive species cover = 14% Reed canarygrass cover = 0%

¹ required for 2 consecutive years

² required for 3 consecutive years

³ required for 5 consecutive years

Additional Analysis

We have summarized the collected data for additional wet prairie criteria outside of those specifically required by the Bank's performance standards. Note that this additional criterion is not subject to the Bank's performance criteria as defined in the Instrument, but is summarized in order to facilitate identification of both short and long-term trends in vegetation composition which will assist site management efforts. These additional wet prairie categories include: Number of Wet Prairie Cohort Species; Vegetation Moisture Index; Native Grass Species >10% Cover; Native Forb Species >10% Cover; Native Sedge/Rush Species >10% Cover (Table 4). The number of wet prairie cohorts and the vegetation moisture index are based on the VEMA protocol for wet prairie habitat (Marshall 2007).

TABLE 4 – ADDITIONAL DATA ANALYSIS*

Number of Wet Prairie Cohort Species ¹	6	VEMA Performance Standard = 10
Moisture Index ²	2.4	VEMA Performance Standard = 2.0 – 3.0
Native Grass Species >10% Cover	0	
Native Forb Species >10% Cover	1	
Native Sedge/Rush Species >10% Cover	0	

* Results are based on the average for all wet prairie plots

¹ Wet prairie cohort species identified in: *Vascular Plants of the Prairies and associated habitats of the Willamette Valley-Puget Trough-Georgia Basin ecoregion, Present in Willamette Valley Section*

² Based on the following indices: OBL=1; FACW=2; FAC=3; FACU=4; UPL=5

Discussion of Vegetation Performance

Revegetation of the Foster Creek Wetland Bank (Bank) is in the early establishment stage, and shares a management focus with continued weed control. The early site preparation management decision to retain the large, existing populations of common camas (*Camassia quamash*) and hyacinth brodiaea (*Triteleia hyacinthine*) has resulted in an extended weed control period for the Bank's wet prairie habitat. Allowance of the camas and brodiaea to flower, set seed, and enter dormancy necessitated aggressive, micro-control of interspersed weeds. The monitoring data results show the early establishment of natives introduced at the site, as well as the persistence of some of the weed species. The monitoring guided our weed control program in 2009, and we have added substantially to the existing native population with fall seeding and planting (Appendix E). We anticipate the control process to take two to three more years before the target weeds have been satisfactorily controlled. In the meantime, we will continue to add native species to the site to build diversity and quantity to both the plant populations and the underlying seedbank.

Wet Prairie - At the time of monitoring the Main Wet Prairie contained a mix of both native and non-native grass and forb species. Following monitoring it was decided to institute a more aggressive control regime for non-native species in summer/fall 2009, with particular focus on select non-native forbs and grasses. Currently, the Main Wet Prairie is being managed for the establishment of native prairie grasses, sedges, and rushes with continued weed control for select non-native broadleaf herbaceous species. Stands of established native wet prairie grass, sedge, and rush species currently populate this area. We have delayed of installation of native forbs in order to facilitate potential broadleaf herbicide application in 2010, if necessary. It is anticipated that control of non-native forbs will continue through spring and

summer of 2010 with native forb installation taking place in fall/winter 2010 to complete the initial seeding/planting in this area.

At the time of monitoring the North Wet Prairie contained a mix of both native and non-native grass and forb species. Like the Main Wet Prairie, this area received an aggressive control regime targeting non-native grasses and forbs in 2009. An assessment of control efforts in fall 2009 determined that the North Wet Prairie was ready to receive a full complement of native forbs to be introduced, and this was accomplished with seeding and planting performed later in the fall and early winter of 2009.

As stated in John Christy's report: "*In general, vegetation in the herbaceous plots is still too young and it is too early to know how these plots will develop over time or how well they will meet targets for performance standards. Plots currently indicate an expected range of moisture types across the site. Species diversity is high in most transects and is expected to decline in subsequent years as competing vegetation matures*" (Christy, June 2009). Continuing: "*The wettest plots are identifiable by high values for bare ground, Eleocharis acicularis, Eleocharis ovata, Gnaphalium palustre, Gratiola ebracteata, Rorippa curvisiliqua, and the exotic Lythrum portula. In general, these plots are scarce and represent depressions where water pools or flows in the early part of the growing season. Plots with intermediate moisture are widespread and currently support relatively high values of Epilobium densiflorum, Deschampsia elongata, Plagiobothrys figuratus, and lesser amounts of Plagiobothrys scouleri. It is difficult to predict how these plots will develop in coming years, because much depends on how well grasses become established. The composition of drier plots approaches those sampled in the four upland plots, where the exotic Myosotis discolor and Vicia hirsuta have high cover value*". The low cover values for *Deschampsia cespitosa* is of concern, but established plants were only small tufts at monitoring and these will be mature plants in 2010. Additional *Deschampsia cespitosa* was seeded in fall 2009 (Appendix E). Those species with greater than 50% frequency (all plots) include: *Deschampsia elongata* (57%), *Epilobium densiflorum* (60%), *Hypochaeris radicata* (73%), *Juncus bufonius* (65%), *Lotus corniculatus* (83%), *Montia linearis* (54%), moss (82%), and *Parentucellia viscosa* (54%). The non-native species *Leucanthemum vulgare* and *Anthoxanthum odoratum* were added to the list of non-native invasive species due to their persistence.

Weed control was a major management activity in 2009 with concentrated effort on the following species: *Holcus lanatus*, *Leucanthemum vulgare*, *Lotus corniculatus*, *Anthoxanthum odoratum*, *Hypochaeris radicata*, and *Agrostis stolonifera* var. *palustris*. Broadleaf herbicide was broadcast-applied to the wet prairie following *Camassia* and *Tritelea* dormancy to control *Lotus*, *Leucanthemum*, *Hypochaeris*, and *Trifolium*. Individuals of *Holcus* and *Agrostis* (primarily) that advanced to form flower/seed heads were manually removed to limit spread from seed. Herbicide spot spraying was employed for all target non-native species during the growing season. This overall approach will continue under adaptive management into 2010.

Forested Wetland – The Forested Wetland had been seeded with native grasses (primarily *Hordeum brachyantherum*) for two years, and contained tree (primarily *Fraxinus latifolia*) and very limited shrub (primarily *Cornus sericea*) plantings for one year. At the time of monitoring the Forested Wetland contained close to a full density of installed trees but only a small installment of shrubs in order to facilitate continued weed management within the herbaceous layer. The final compliment of both trees and shrubs will be installed this coming winter (February/March 2010) to complete planting within the Forested Wetland habitat. Select herbaceous weed control will continue in this habitat area beyond the completion of planting.

Current tree density (189/acre) is below performance criteria (240/acre) so additional trees will be installed in the winter dormancy period (Feb/March 2010). Shrub density is purposefully low (6/acre) compared to performance criteria (320/acre) in order to facilitate herbaceous weed control, with

additional shrubs to be installed in the 2010 winter dormancy period. Herbaceous growth is healthy, although some weedy species persist (*Anthoxanthum odoratum*, *Holcus lanatus*, and *Lotus corniculatus*) necessitating continued weed control within the strata. First year tree and shrub survival is excellent (>90%) with growth concentrated on establishing root systems resulting in limited top growth. Weed control within the herbaceous strata was performed with spot spraying.

Establishment of Listed Prairie Species

The Foster Creek Bank has coordinated with the USFWS and ODA to permit the introduction of appropriate federal and state listed prairie species within the Bank's wet prairie habitat. The Bank is currently permitted for specific introduction of *Lomatium bradshawii* and *Sidalcea nelsoniana*. In the fall of 2008, 100 seeds of *Lomatium bradshawii* were placed in 4 test plots. To-date, none of the seeds has produced plants, though the plots continue to be checked for germination. It was later advised by others that growing out seedlings would perhaps be a more reliable process for introduction of *Lomatium bradshawii* due to the small and delicate first growth stages and the relative sparse supply of viable seed. In fall of 2009, approximately 4 pounds of *Sidalcea nelsoniana* seed were broadcast within the North Prairie area, with some seeds placed in containers as a first year grow-out. The source-identified seed was purchased from Heritage Seedlings in Salem, Oregon. Currently, first year plants of *Sidalcea campestris* are established at the site and there was some concern of potential hybridization of the two *Sidalcea* species. This potential may be further investigated in the future.

5 CORRECTIVE ACTIONS AND RECOMMENDATIONS

Post monitoring corrective actions fall into two primary categories: weed control to reduce the occurrence and density of targeted species, and native species establishment to increase the density and occurrence of select species. These two core activities are directed through an adaptive management process with numerous points of input taken into consideration, including formal monitoring. The monitoring effort and results have been satisfactory to allow for an adequate assessment of overall site vegetation conditions.

Weed Control

Weed control efforts were increased post-monitoring. The primary control activity was spot spraying individual weeds, although a broadcast spray for broadleaf weeds was performed, as well as some hand pulling in later months to prevent seed dispersal. Weed control was performed throughout the growing season and will continue in 2010 in much the same fashion. Wet prairie forbs were not seeded or planted in the Main Wet Prairie in 2009 in order to allow broadcast application of broadleaf herbicide if needed. Grasses, sedge, and rush species are not affected by the selective broadleaf application.

Vegetation Establishment

Establishing additional native species and increasing the density of select cohort species is a core activity at the Bank. Species for establishment are selected each year based on monitoring results, availability, integration with weed management activities, and appropriateness for the Bank's habitats. We realize the vegetation makeup of the Bank will vary year-to-year, especially the herbaceous strata during these first years of establishment. Our goal is to establish as many native prairie species as feasible for site conditions. For 2010, we anticipate focusing on the following for vegetation establishment:

1. Focus only on native grass, sedge, and rush species within the Main Wet Prairie in order to facilitate additional broadleaf weed control (if necessary).
2. Continued establishment of native grass species within the wet prairie, with an emphasis on increasing the density of *Deschampsia cespitosa*.

3. Increase the quantity and density of native wet prairie sedge and rush species focusing on the following: *Carex unilateralis*, *Carex densa*, *Carex feta*, *Carex pachystachya*, *Juncus tenuis*, and *Juncus patens*.
4. Retain the existing populations of remnant native forbs, particularly *Camassia*, *Tritelea*, *Montia*, *Plagiobothrys*, and *Cardamine*.
5. Increase the number and density of native forbs species in the North Wet Prairie.
6. Increase the species and density of native trees and shrubs in the Forested Wetland area to performance standard levels.
7. Introduce select native forbs to the grass-dominated herbaceous strata of the Forested Wetland, starting with *Geum macrophyllum*.

On a final note, one of the Bank's partners (Mark Vlahakis) has become a full-time (daily) on-site manager for the Bank's operations and maintenance (since July 2009). This development was deemed necessary to facilitate the level of effort required to move site conditions towards meeting vegetation performance standards. This level of involvement will continue into 2010.

REFERENCES

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