

Coyote Prairie North Mitigation Bank

Report for 2009, 2010, 2011



January 2012

This report was prepared by the Parks and Open Space Division
of the City of Eugene's Public Works Department



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Chapter 1. Introduction

The Coyote Prairie North Wetland Mitigation Bank operates under an agreement between the Oregon Department of State Lands (DSL), Oregon Department of Environmental Quality, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, and the City of Eugene. The Mitigation Bank Instrument establishing this Bank was signed in 2011.

Wetland enhancement work began in 2008 in the East Phase of the bank. This phase is further divided into two units known as the Wala¹han Unit (Unit 1) and the Ha-Yaba² Unit (Unit 2), both of which have different performance criteria identified in the Mitigation Bank Instrument. This is the first report required as a condition of the Mitigation Bank Instrument and includes management actions and monitoring results from 3 years, 2009 through 2011, since the Mitigation Bank Instrument was not fully signed until 2011. In future years, reports will be submitted on an annual basis in winter of the year following data collection and action implementation.

This report is organized to provide a management and monitoring summary for all 3 years first, followed by the reporting of 2009, 2010, and 2011 management and monitoring activities by year. This is followed by an assessment of progress toward meeting performance criteria. Appendix A describes monitoring methodologies in detail. Results are also being submitted electronically.

¹ Wala¹han is a Kalapuya word meaning “down below a hill or mountain” (E. Stutzman, personal communication).

² Ha-Yaba is a Kalapuya term meaning “camas” or “camas digging area” (E. Stutzman, personal communication).

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Chapter 2. Credit and Financial Summary

The Mitigation Bank Instrument (MBI) for the Coyote Prairie North Wetland Mitigation Bank was signed by the co-chairs of the Interagency Review Team in June 2011 and an initial credit release of 11.81 credits was made by the DSL in July 2011. This released for purchase 15% of the expected total credits from both the east and west phases of the bank. All credit sales for the Coyote Prairie North bank will be tracked in a ledger separate from the ledger of credit sales for the City's West Eugene Wetland Mitigation Bank, however capital costs and operations and maintenance costs are managed in combination with the West Eugene Wetlands Mitigation Bank, since lands from both banks are adjacent to one another and are managed to increase connectivity between the enhancement phases. A financial summary for the West Eugene Wetlands Mitigation Bank is available in a separate report.

No credit sales were made by the Coyote Prairie North Wetland Mitigation Bank in 2011. Credits released for purchase are reported in Table 2.1. The anticipated credit release schedule for the active phase of the bank (East Phase) is provided in Table 2.2.

	Purchase Date	Credits in Transaction	Balance
Credit balance on January 1, 2011			0.00
Credits certified during year			
East Phase		5.73	5.73
West Phase		6.08	11.81
Credits sold in 2011		0.00	11.81
Credit balance as of December 31, 2011			11.81

Release	Percentage (cumulative)	Performance Standards to be Met	Credits for East Phase (cumulative)	Year Expected
One	15% (15%)	Approval of MBI	5.73 (5.73)	2011
Two	5% (20%)	Initial grading and seeding/planting and reporting of as-builts.	1.91 (7.64)	2011
Three	Up to 10% (30%)	1 st growing season performance standards	3.82 (11.46)	2011
Four	Up to 10 % (40%)	2 nd growing season performance standards	3.82 (15.28)	2011
Five	Up to 10% (50%)	3 rd growing season performance standards	3.82 (19.10)	2012
Six	Up to 10% (60%)	4 th growing season performance standards	3.82 (22.92)	2013
Seven	15% or up to a cumulative total of 75%	5 th growing season performance standards	5.73 (28.65)	2014
Eight	25% (100%)	Approval of long term management plan and stewardship agreement by co-chairs; plan is executed/signed by steward	9.54 (38.18)	On or before 2014

wp 10
25% ??
1011 11
MBI

³ The credit release schedule for the West Phase is described on Table 12 (page 49) of the Coyote Prairie North Mitigation Bank Instrument. 6.08 credits (15%) were released in 2011 after approval of the MBI.

Chapter 3. Site Description, Management and Monitoring

Site Area: 240 Acres
 Coyote Prairie North Mitigation Bank Area: 165 acres
 Ownership: City of Eugene
 Site Timeline:

Table 3.1. Coyote Prairie Unit site timeline.

Section	Year of Construction	Enhancement Acres	Monitoring Period
East Phase	2009	84	2010 - 2014
West Phase	TBD	81	N/A

Location

Coyote Prairie North is located in the Coyote Creek drainage approximately 1.5 miles west of Eugene. The site lies on the south side of Cantrell Road and is part of the larger Coyote Prairie enhancement site that is bisected by the east branch of Coyote Creek. The south region of the 240-acre site is part of the West Eugene Wetlands Mitigation Bank and the north region of the site comprises the Coyote Prairie North Mitigation Bank. The enhancement schedule at Coyote Prairie North Wetland Mitigation Bank will be divided into an East Phase and a West Phase. The East Phase is further subdivided into the Ha-Yaba Unit (Unit 1) and the Walahan Unit (Unit 2).

Site History

The site has likely been in agricultural use since the late 1800s or early 1900s, initially as pasture, and then cropped for grass seed production beginning in the early 1970s.

Bank Goals and Objectives

The Bank has two primary goals. The first is to enhance 165 acres of slope/flat wetlands, also referred to as palustrine emergent wetlands using the Cowardin classification. The second goal is to forward conservation goals articulated in the West Eugene Wetland Plan.

Specific objectives of the Bank include:

- Provide 165 acres of compensatory wetland mitigation credits to approved applicants within its service area to offset impacts to wetland resources. All credits will be enhancement credits generated from slope/flat wetlands under the HGM classification, also referred to as palustrine emergent wetlands using the Cowardin classification. All buffer areas will be included in enhancement areas.
- Enhance site hydrology and historic surface water flow to support the establishment of wet prairie (primarily), and vernal pool, and emergent communities (secondarily) across the site meeting specific hydrologic criteria outlined in the performance standards.
- Enhance vegetation to provide highly diverse wetland communities that are resistant to invasion and resilient to disturbance that meet the specific criteria outlined in the

performance standards. Emphasis includes wetland prairie plant communities with some vernal pool and emergent plant communities. Endangered, rare and uncommon species will be included.

- Establish a diverse prairie plant community to provide food, shelter, and breeding areas for native prairie invertebrates, reptiles, amphibians, mammals and birds, including those listed as Oregon Conservation Strategy species by the Oregon Department of Fish and Wildlife (ODFW).

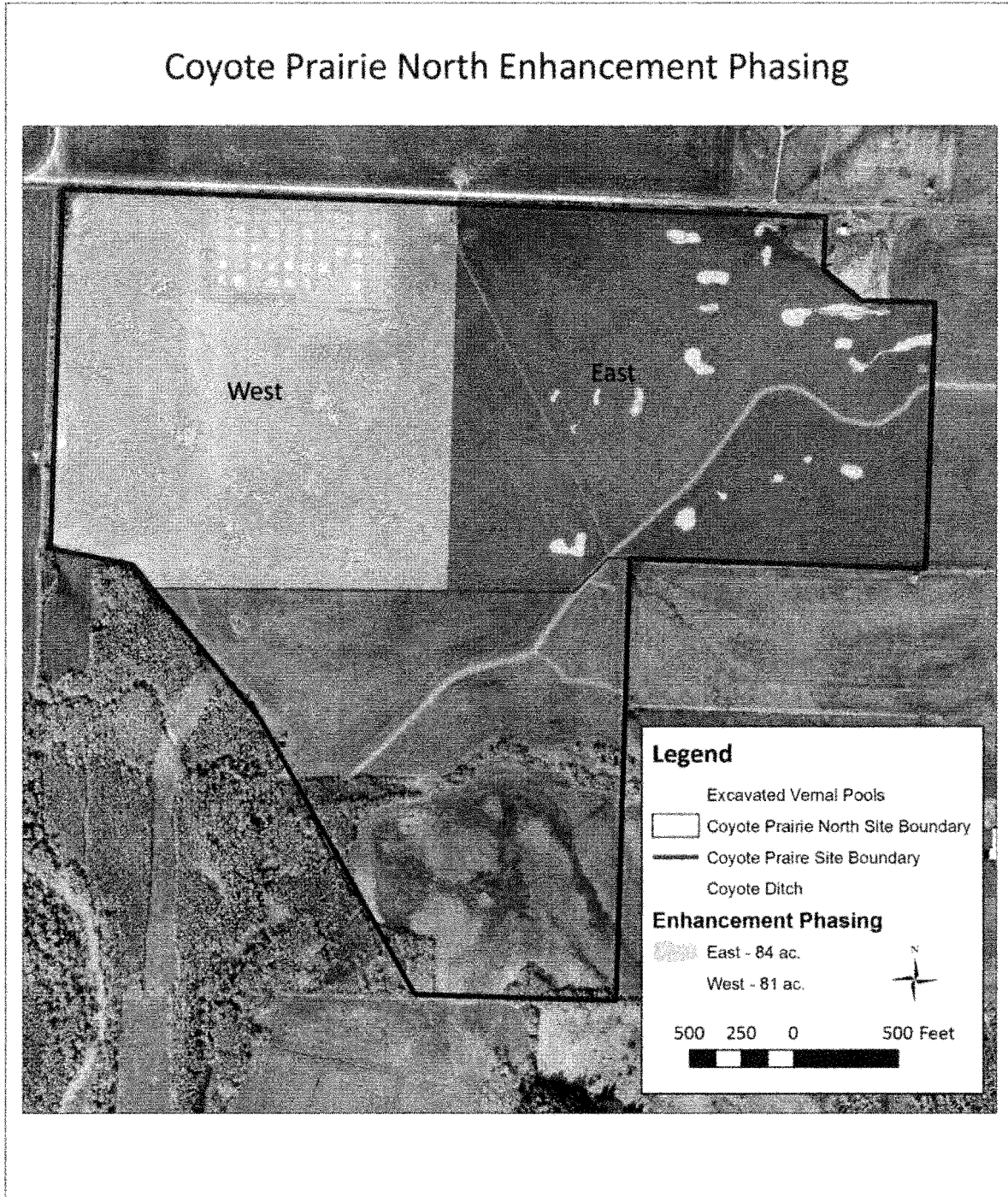


Figure 1. Coyote Prairie North Enhancement Phasing Map. The enhancement phases at Coyote Prairie are labeled with their approximate acreages.

Management and Monitoring Summary 2009 through 2011

The East Phase is the only phase currently under active enhancement and is the focus of this report.

In 2008, the City began preparing the East Phase for enhancement by eradicating the farmed crop and other non-native vegetation. The former annual ryegrass and tall fescue fields had been hayed by the grower in the summer, and the City burned the entire East Phase to remove any remaining biomass and agricultural thatch in early fall. This was followed by broadcast applications of a glyphosate-based herbicide to eliminate the previous grass crops and any weeds as they germinated or began to regrow. Subsequent herbicide applications were applied as needed through fall 2009.

In summer 2009, the City contracted for excavation of a series of shallow pools and swales to return topographic variation to the site and to redirect seasonal surface water flows across it, since the site had been leveled and ditched for agricultural use in the past. In addition, staff eliminated one of the ditches that drained the northeastern portion of the site, redirecting that water into the enhancement area. Staff also conducted minor grading to eliminate the barrier effects to surface water flow of an agricultural access road that bisected the phase. A second ditch also was allowed to block with sediments naturally at a culverted road crossing, resulting in previously channeled water backing up behind the culvert and flowing slowly across the southwestern region of the East Phase and spreading out across the relatively flat expanse of the future West phase (currently in ryegrass production). Further information on hydrologic modifications achieved and underway at Coyote Prairie North are found in the Coyote Prairie North Hydrology Report, in Exhibit K (p. 81-88) of the Coyote Prairie North Mitigation Bank Instrument.

In fall of 2009 we planted wet prairie, vernal pool, and emergent plant communities in the East Phase using 4 wet prairie and 19 vernal pool and vernal pool/emergent seed mixes that included more than 60 native species. In addition, we planted thousands of bare root plants and bulbs.

Plant community establishment and site wide hydrologic functions were assessed by staff in the 2009-2010 and 2010-2011 growing seasons, and intensive weed control began in the East Phase as the plant community developed. The City coordinated manual weed control and City staff and contract crews applied spot or broadcast applications of herbicide as needed to control *Lythrum hyssopifolia*, *Mentha pulegium*, *Rumex crispus*, *Hypochaeris radicata*, *Polygonum persicaria*, *Sonchus asper*, and patches of nonnative grasses. Logs were added to the site as amphibian refugia in summer 2010. Vernal pool stability and site-wide drainage and erosion issues were assessed and erosion control actions were taken in fall 2010 and 2011. In fall 2010 and 2011, the site was over-seeded with additional seed mixes of forb, grass, sedge, and rush species and planted with native bulbs and additional potted forbs that are hard to establish from an initial seeding.

2009 Management and Monitoring Actions

2009 Management

1. Herbicide (glyphosate) was broadcast across the phase to kill the previously grown agricultural crops of germinating ryegrass and fescue in spring 2009 and again in fall 2009, after the first rains and initial grass and weed emergence. In fall 2009, a broadleaf herbicide (triclopyr) was also broadcast in the northwestern section of this phase on extensive patches of nonnative *Rubus armeniacus*.
2. Nineteen vernal pools and swales were excavated in summer 2009 to direct and retain water on the site and to return microtopography to the site that was diminished due to decades of farming. These vernal pools will provide habitat for vernal pool plant species, aquatic invertebrates, and breeding amphibians, as well as waterfowl and other wildlife.
3. In summer 2009, the "Cantrell Ditch" was filled and water formerly directed off-site was redirected through a series of swales and vernal pools (noted above) with some water also flowing as laminar surface flow across the entire East Phase into the future West phase.

Seed mixes of diverse native forbs, rushes, and sedges were broadcast across the 84-acre area in fall 2009 (Figure 4). In addition to a more typical wet prairie seed mix, two additional seed mixes were broadly distributed: (a) one with a higher level of perennials to determine if higher seeding rates of perennials and lower rates of annuals will promote more rapid and diverse establishment of wet prairie perennial forbs, and (b) one with an emphasis on *Carex* sp. and forbs preferring more inundated soils, distributed where greater expanses of standing water appeared. Seed mixes emphasizing vernal pool species were also created and distributed in each of the vernal pools excavated in summer 2009. See Tables 3.2, and 3.4, and Figure 4 for the composition and distribution of the seed mixes.

4. Fifteen-foot wide buffers of a competitive native grass mix were broadcast along the north and south edges of this phase to provide a heavily vegetated buffer resistant to invasion by nonnative species from the roadside or adjacent properties.
5. Four 15-meter square plots were established throughout the phase to track establishment of seeded species that have been difficult to establish (e.g. Liliaceae, *Wyethia* sp.) or species for which we have small amounts of viable seed (Table 3.3). By creating a marked plot into and around which seed was introduced, we will be able to better track establishment and alert weed and monitoring crews to work with special care in these areas.
6. Over 5,500 potted and bare root plants of 8 herbaceous species, as well as bulbs of 4 species, were planted in December 2009 (Table 3.5; location in Fig. 4 "Planting Areas").

2009 Monitoring

Tracking of the initial fill dates of vernal pools is the only formal monitoring that began in fall 2009. Results are reported and discussed in the monitoring sections for 2010 and 2011.



Figure 2. Coyote Prairie, East Phase, vernal pool excavation, summer 2009.



Figure 3. Coyote Prairie, East Phase, vernal pool vegetation, summer 2010.

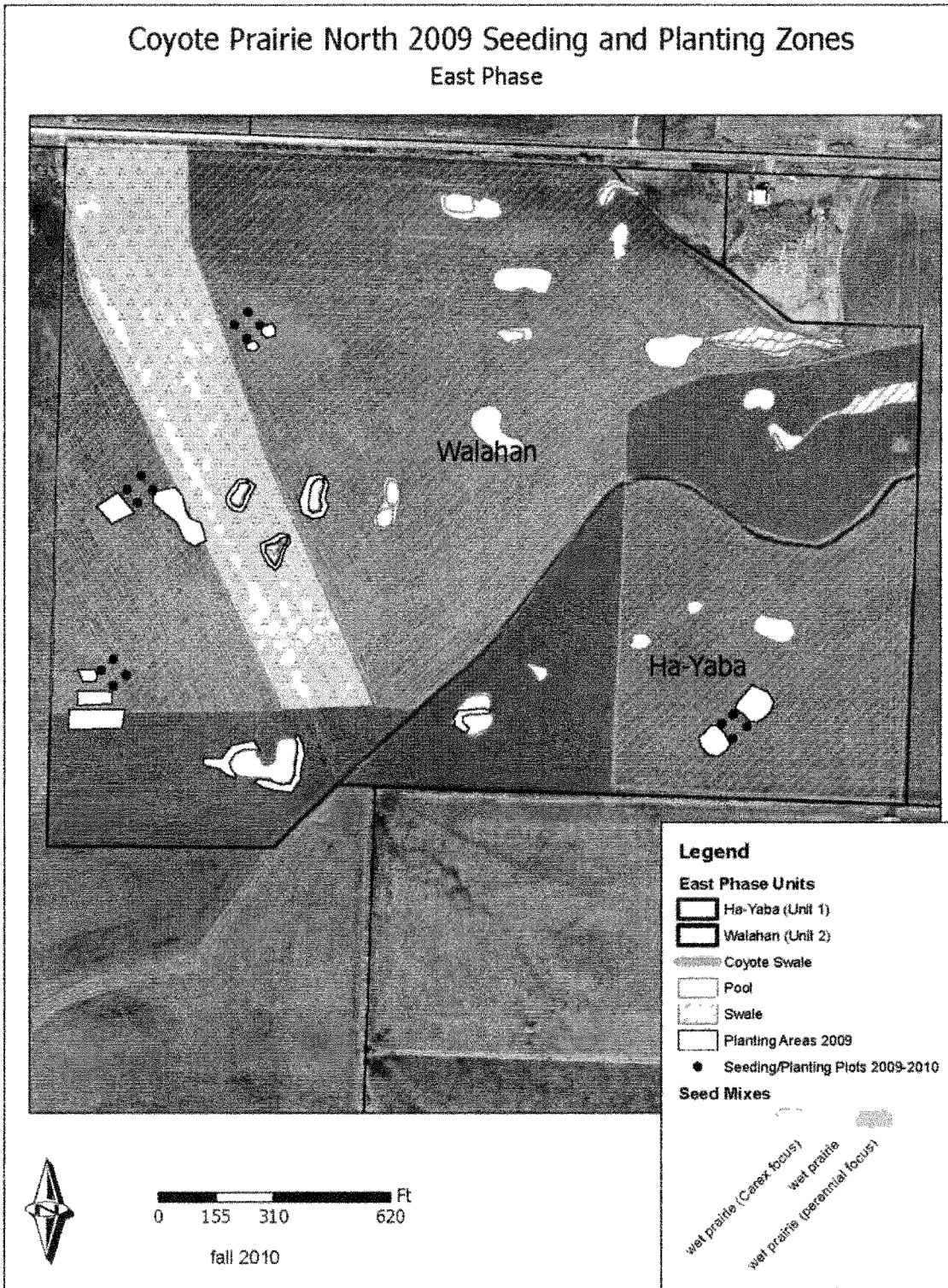


Figure 4. Coyote Prairie, East Phase, 2009 Seeding and Planting Plan. Seed mixes, as well as all bulb, plug, and bare root planting areas are labeled for the East Phase of Coyote Prairie.

Table 3.2. Coyote Prairie East Phase Wet Prairie Forb, Sedge, and Rush Seed Mixes, 2009

80 acres were seeded with forb, sedge, and rush (no grass) wet prairie seed mixes designed to quickly establish dense native cover. The table includes the species seeded and the number of grams per acre used in the various mixes. "Lights" refers to lightweight seed (i.e. potentially low viability) and seed/chaff material that was separated out during the harvest and cleaning process.

	Species	Wet Prairie	Wet Prairie (perennial emphasis)	Wet Prairie (<i>Carex</i> emphasis)
		Seeding Rate (g/acre)		
1	<i>Achillea millefolium</i>	20	37	
2	<i>Carex densa</i>			40
3	<i>Carex stipata</i>			80
4	<i>Carex unilateralis</i>			115
5	<i>Clarkia amoena/purpurea mix</i>	80	30	
6	<i>Collomia grandiflora</i>	206		
7	<i>Downingia yina</i>			30
8	<i>Epilobium densiflorum</i>			33
9	<i>Eriophyllum lanatum var. lanatum</i>	73	175	25
10	<i>Eriophyllum lanatum-lights</i>			500
11	<i>Galium trifidum</i>		30	
12	<i>Grindelia integrifolia</i>	70	40	50
13	<i>Juncus tenuis spp. congestus (J. occidentalis)</i>	8	5	
14	<i>Lomatium nudicaule</i>	150	250	104
15	<i>Lotus unifoliolatus var. unifoliolatus</i>	34	30	
16	<i>Lupinus polyphyllus</i>	28		
17	<i>Lupinus rivularis</i>	60	120	156
18	<i>Madia elegans</i>	19		30
19	<i>Microseris laciniata</i>	22	220	120
20	<i>Perideridia oregana</i>		180	120
21	<i>Perideridia oregana - lights</i>	165		
22	<i>Plagiobothrys figuratus</i>	78	20	100
23	<i>Plectritis congesta</i>		90	120
24	<i>Potentilla gracilis var. gracilis</i>	146	200	70
25	<i>Prunella vulgaris var. lanceolata</i>	102	150	140
26	<i>Psilocarphus elatior - lights</i>	350		
27	<i>Ranunculus occidentalis var. occidentalis</i>		19	
28	<i>Ranunculus orthorhynchus</i>		17	50
29	<i>Rumex salicifolius var. salicifolius</i>	33		50
30	<i>Symphotrichum hallii</i>		5	
31	<i>Veronica peregrina - rough cleaned</i>	50		
	Total	1294	1618	2393

Table 3.3. Coyote Prairie East Phase Seeding Plot Introductions

Four 15-meter square plots were established throughout the phase to track establishment of seeded species that have been difficult to establish (e.g. Liliaceae, *Wyethia* sp.) or species for which we have low amounts of viable seed. This table includes the species seeded, the total grams of the species used over and around all plots combined, and the plots to which the species was introduced.

	Species	Total grams	Plot A	Plot B	Plot C	Plot D
1.	<i>Asclepias speciosa</i>	1358	x	x	x	x
2.	<i>Brodiaea elegans</i>	316		x		x
3.	<i>Camassia quamash</i> var. <i>maxima</i>	1811	x	x	x	x
4.	<i>Castilleja tenuis</i>	67	x	x	x	x
5.	<i>Cicendia quadrangularis</i>	36		x	x	
6.	<i>Dichelostemma congestum</i>	70			x	
7.	<i>Geum macrophyllum</i> var. <i>macrophyllum</i>	7			x	
8.	<i>Griatiola ebracteata</i> - light seed and chaff	668		x	x	
9.	<i>Lotus formosissimus</i>	58		x		
10.	<i>Lotus unifoliolatus</i>	416		x		
11.	<i>Orthocarpus bracteosus</i>	75	x	x	x	x
12.	<i>Perideridia oregana</i>	178		x	x	x
13.	<i>Plectritis congesta</i> - light seed & chaff	2421	x	x	x	
14.	<i>Pyrrocoma racemosa</i> var. <i>racemosa</i>	307	x	x	x	x
15.	<i>Ranunculus occidentalis</i> var. <i>occidentalis</i>	125	x		x	x
16.	<i>Ranunculus occidentalis</i> var. <i>occidentalis</i> - light seed	56				
17.	<i>Saxifraga oreganum</i>	97	x	x	x	x
18.	<i>Sidalcea cusickii</i>	910	x		x	x
19.	<i>Sisyrinchium idahoense</i> var. <i>idahoense</i>	2				x
20.	<i>Triteleia hyacinthina</i>	104	x			
21.	<i>Wyethia angustifolia</i>	1998	x	x	x	x
22.	<i>Zigadenus venenosus</i> var. <i>venenosus</i>	27			x	

Table 3.4. Coyote Prairie East Phase Vernal Pool Seeding, 2009

3.25 acres in 19 pools or pool/swale combinations were seeded with native vernal pool forbs. Each pool got a slightly different mix, depending on expected water depth and seed availability. The table includes the species seeded, the average grams/acre seeded in those pools to which it was added, and the number of pools to which that species was introduced. "Lights" refers to lightweight seed (i.e. potentially low viability) and seed/chaff material that was separated out during the harvest and cleaning process.

	Species	# Pools Seeded	Avg Seeding Rate (g/acre)
1.	<i>Alisma triviale</i>	4	450
2.	<i>Carex densa</i>	2	220
3.	<i>Carex feta</i>	1	410
4.	<i>Carex obnupta</i> - lights	3	700
5.	<i>Carex stipata</i>	2	450
6.	<i>Carex unilateralis</i>	4	625
7.	<i>Downingia elegans</i>	4	528
8.	<i>Downingia yina</i>	15	568
9.	<i>Eleocharis obtuse</i> - lights	8	635
10.	<i>Eleocharis palustris</i>	2	340
11.	<i>Eryngium petiolatum</i>	16	492
12.	<i>Gratiola ebracteata</i>	16	244
13.	<i>Grindelia integrifolia</i>	2	26
14.	<i>Lasthenia glaberrima</i>	10	440
15.	<i>Montia linearis</i>	14	108
16.	<i>Navarretia intertexta</i> ssp. <i>intertexta</i>	17	448
17.	<i>Phlox gracilis</i>	19	365
18.	<i>Plagiobothrys figuratus</i>	14	61
19.	<i>Ranunculus alismaefolius</i> var. <i>alismifolius</i>	13	297
20.	<i>Ranunculus orthorhynchus</i>	18	420
21.	<i>Veronica peregrina</i> var. <i>xalapensis</i>	10	67
22.	<i>Veronica scutellata</i>	5	136

Table 3.5. Plants and Bulbs Installed at Coyote Prairie East Phase in Fall 2009.

Species of bulbs and bare root starts planted in Coyote Prairie East Phase are listed with the approximate number of each species or container type.

	Species	Plant Material Type	Total Number
1.	<i>Juncus oxymeris</i>	plugs	1056
2.	<i>Juncus bolanderi</i>	bare root	1000
3.	<i>Juncus acuminatus</i>	bare root	500
4.	<i>Juncus nevadensis</i>	bare root	1000
5.	<i>Frageria virginiana</i>	Bare root runners	1500
6.	<i>Allium amplexans</i>	Bulbs in flats (3 yr)	10
7.	<i>Camassia quamash</i>	Bulbs in flats (3 yr)	10
8.	<i>Camassia leichtlinii</i>	Bulbs in flats (3 yr)	15
9.	<i>Triteleia hyacinthina</i>	Bulbs in flats (3 yr)	4
10.	<i>Pyrocoma racemosa</i>	4"	65
11.	<i>Sisyrinchium idahoensis</i>	4"	317
12.	<i>Horkelia congesta</i>	4"	160

2010 Management and Monitoring Actions

2010 Management

1. Ongoing manual and chemical control of nonnative invasive plant species continued in spring 2010. Large areas, totaling 17 acres, were sprayed out with a glyphosate-based herbicide near the southwest portion of the East Phase in the spring of 2010 to control *Lythrum hyssopifolia*. Small patches of non-native grasses occurring in areas with mostly native vegetation were sprayed out with a grass-specific herbicide. City staff and contract crews applied spot applications of herbicide across the phase as needed to control *Lythrum hyssopifolia*, *Mentha pulegium*, *Rumex crispus*, *Hypochaeris radicata*, *Polygonum persicaria*, *Sonchus asper*, and other nonnative invasive species. A youth crew was contracted in late July to pull flowering patches of *Polygonum persicaria* and *Daucus carota* by hand.
2. Seed mixes of diverse native forbs, rushes, and sedges were broadcast across the 84-acre area in fall 2010 for a second year (Figure 5). Species were added based on their initial establishment as determined by the qualitative seed assessment and informal surveys. No grasses were included in the 2010 seed mix because of the presence of the Coyote ditch drainage channel, to improve the potential for native species establishment and to allow the use of grass-specific herbicide in the future. Wet prairie seed mix included species such as fescue, bluegrass, and ryegrass. Seed mixes emphasizing native species were used in each of the vernal pools. Vernal pool mixes are not similar to those of 2009 (Table 3.4). *Gentiana sceptrum* was added at the edges of pools 2 and 15. *Gentiana sceptrum* was added at the edges of pools 2 and 15. *Gentiana sceptrum* was added at the edges of pools 2 and 15.
3. Species for which we had small amounts of seed were also dispersed patchily where hydrologic conditions indicated they would best establish. Species and the amounts dispersed on the site are shown in Table 3.8.
4. We placed 27 cottonwood and oak logs at the edge of or within vernal pools and at locations throughout the East Phase to slow the water's erosive force and to provide sheltering locations for invertebrates, amphibians, reptiles and other wildlife. We had noted long-toed salamanders sheltering under wood-chip bags placed to stop erosion at the north boundary of the East Phase during the rainy season of 2009 and had observed chorus frogs sheltering under corn-cob bags briefly placed on the site during seeding.
5. Jute netting was installed in areas around the vernal pools to stabilize soils as native vegetation established.

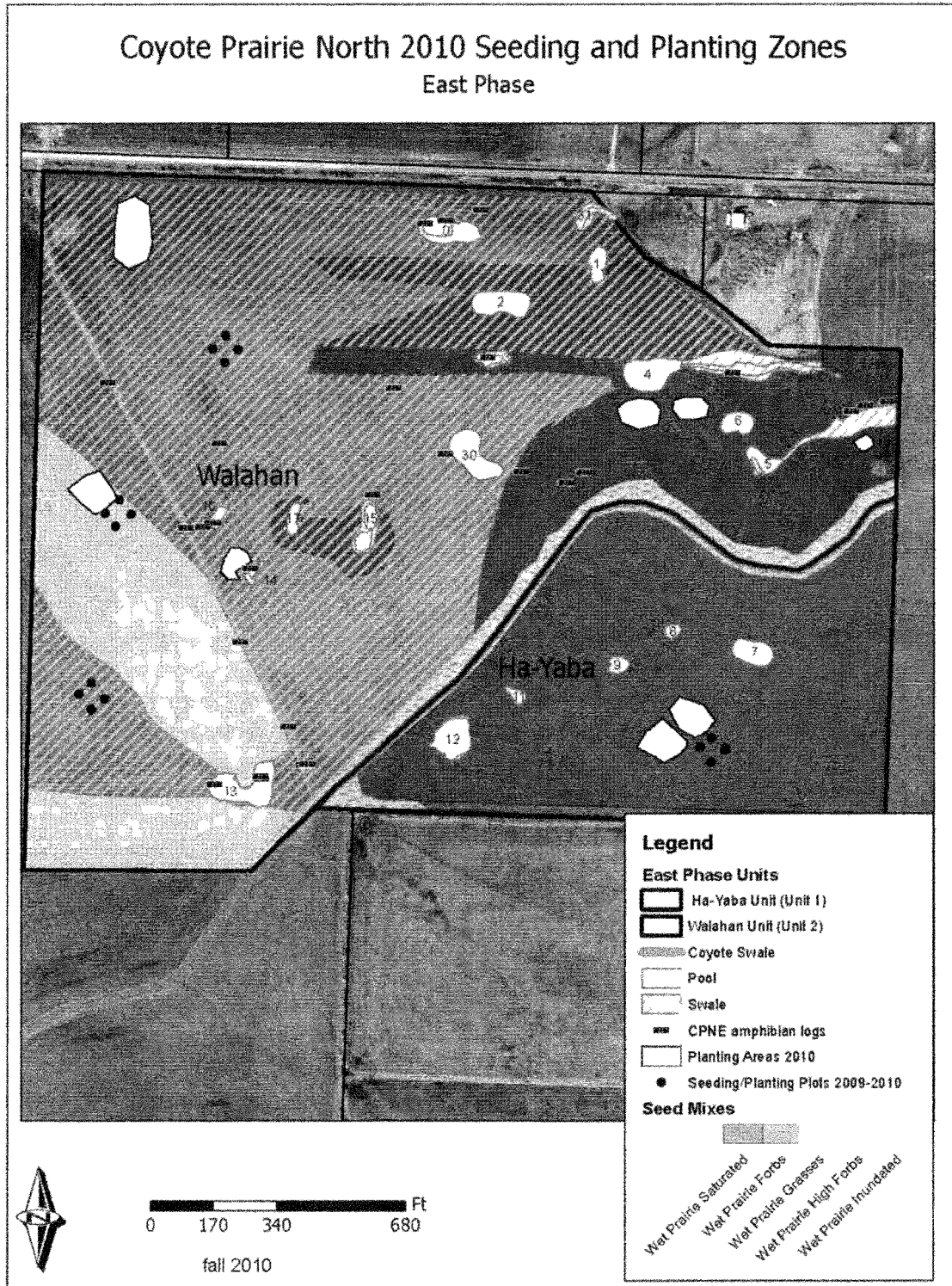


Figure 5. Coyote Prairie, East Phase, 2010 Planting Plan. Seed mixes, areas of bulb, plug, and bare root plantings, seeding plots, and amphibian sheltering logs, are labeled for the East Phase of Coyote Prairie.

6. We mowed the weedy edges of the agricultural drainage channel (Coyote Ditch), applied herbicide to control broadleaf weeds, and added native wet prairie grasses along the edge of both sides of this ditch that bisects the Coyote Prairie East Phase to compete with the nonnative forbs that occur there, especially *Daucus carota* (wild carrot), *Lythrum hyssopifolia*, and thistles. The ditch will eventually be recontoured as described in the Mitigation Bank Instrument for this site. The species and seeding rates distributed at this location are in Table 3.7.
7. To determine if additional seed of native forb species added in the second seeding year would help outcompete the invasive nonnative plant *Lythrum hyssopifolia* where it was particularly dense, we seeded 4 small plots that we established in the south end of the site with an additional 20 pounds per acre of seed of 3 wetland prairie forb species: *Grindelia integrifolia* (9 lbs/acre), *Plagiobothrys figuratus* (3 lbs/acre), and *Rumex salicifolius* (8 lbs/acre). Four paired control plots were also established that received no additional seed. Seeded and control plots will be visually compared in future years.
8. More than 950 plants of 5 herbaceous species that are slow to start as seeds, as well as bulbs of 5 additional species, were planted in November 2010 at Coyote Prairie East (Table 3.9). We included potted plants of *Horkelia congesta*, a species of special concern, to supplement those planted in 2009 in the southern region of the East Phase.

Table 3.6. Coyote Prairie East Phase Wet Prairie Forb and Sedge Seed Mixes, 2010

80 acres were seeded with forb and sedge (no grass) wet prairie seed mixes for a second year, to add or enhance populations of those species that may not have established densely initially. The table includes the species seeded and the number of grams per acre used in the various mixes.

	Species	Wet Prairie (Inundated regions)	Wet Prairie (high forbs)	Wet Prairie (saturated)	Wet Prairie (Forbs; Ha- Yaba Unit)
	Acres	30	10	20	20
1	<i>Achillea millefolium</i>			30	25
2	<i>Agoseris grandiflora</i>				30
3	<i>Carex densa</i>	14			
4	<i>Carex feta</i>	13			
5	<i>Carex stipata</i>				
6	<i>Carex unilateralis</i>	19			
7	<i>Epilobium densiflorum</i>				
8	<i>Eriophyllum lanatum</i> var. <i>lanatum</i>			120	110
9	<i>Eriophyllum lanatum</i> -lights			120	100
10	<i>Galium trifidum</i>				
11	<i>Grindelia integrifolia</i>	133	245	120	90
12	<i>Lomatium nudicaule</i>	400	220	200	132
13	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	40	41		

Table 3.6. Coyote Prairie East Phase Wet Prairie Forb and Sedge Seed Mixes, 2010

80 acres were seeded with forb and sedge (no grass) wet prairie seed mixes for a second year, to add or enhance populations of those species that may not have established densely initially. The table includes the species seeded and the number of grams per acre used in the various mixes.

	Species	Wet Prairie (inundated regions)	Wet Prairie (high forbs)	Wet Prairie (saturated)	Wet Prairie (Forbs; Ha- Yaba Unit)
14	<i>Lupinus polyphyllus</i>				
15	<i>Lupinus rivularis</i>	53		80	
16	<i>Luzula comosa</i>	10		20	19
17	<i>Madia elegans</i>	55	120	25	25
18	<i>Madia sativa</i>			8	
19	<i>Microseris laciniata</i>	120	200	80	79
20	<i>Perideridia oregana</i>	40		50	40
21	<i>Perideridia oregana</i> - lights				
22	<i>Plagiobothrys figuratus</i>	80	140	100	160
23	<i>Potentilla gracilis</i> var. <i>gracilis</i>			130	183
24	<i>Prunella vulgaris</i> var. <i>lanceolata</i>	10			38
25	<i>Prunella vulgaris</i> var. <i>lanceolata</i> - lights		245		
26	<i>Ranunculus occidentalis</i> var. <i>occidentalis</i>			30	20
27	<i>Ranunculus orthorhynchus</i>	24			120
28	<i>Rumex salicifolius</i> var. <i>salicifolius</i>	107	150	15	131
29	<i>Sidalcea cusickii</i>		139	20	23

Table 3.7. Coyote Prairie East Phase Drainage Channel Grass and Rush Mix, 2010

1.5 acres along the edge of the Coyote Ditch were seeded with competitive native grasses and rushes to assist with control of invasive nonnative species.

	Species	Seeding Rate (g/acre)
1.	<i>Agrostis exarata</i>	600
2.	<i>Deschampsia cespitosa</i>	600
3.	<i>Elymus glaucus</i>	600
4.	<i>Hordeum brachyantherum</i>	1,200
5.	<i>Juncus tenuis</i> ssp. <i>congestus</i> (<i>J. occidentalis</i>)	10

Table 3.8 Coyote Prairie East Phase Seeding of Less Common Species, Fall 2010

Seed of the following less common species represented in our plant materials program were dispersed by hand to patches of appropriate habitat throughout the site. These species were typically not included in the seed mixes, because the small amount of available seed was more likely to result in a population if it was dispersed in clusters. In a few cases, very small seed amounts remained from partially used collections.

	Species	Total grams
1.	<i>Asclepias speciosa</i>	300
2.	<i>Brodiaea elegans</i>	163
3.	<i>Camassia leichtlinii</i> var. <i>suksdorfii</i>	300
4.	<i>Camassia quamash</i> var. <i>maxima</i>	1615
5.	<i>Cardamine penduliflora</i>	8
6.	<i>Carex feta</i>	55
7.	<i>Carex pellita</i>	2
8.	<i>Carex vesicaria</i>	25
9.	<i>Castilleja tenuis</i>	47
10.	<i>Dichelostemma congestum</i>	141
11.	<i>Galium trifidum</i>	1068
12.	<i>Juncus effuses</i> var. <i>pacificus</i>	100
13.	<i>Juncus oxymers</i>	2
14.	<i>Juncus patens</i>	454
15.	<i>Madia glomerata</i>	300
16.	<i>Myosotis laxa</i>	54
17.	<i>Myosurus minimus</i>	38
18.	<i>Orthocarpus bracteosus</i> – lights	85
19.	<i>Pyrrocoma racemosa</i> var. <i>racemosa</i>	249
20.	<i>Saxifraga oregonum</i>	32
21.	<i>Sisyrinchium idahoense</i> var. <i>idahoense</i>	76
22.	<i>Symphyotrichum hallii</i> – lights	60
23.	<i>Triteleia hyacinthine</i>	200
24.	<i>Wyethia angustifolia</i>	400

Table 3.9. Plants and Bulbs Installed at Coyote Prairie East Phase in Fall 2010.

Species of bulbs and bare root starts planted in Coyote Prairie East Phase are listed with the approximate number of each species or container type.

	Species	Plant Material Type	Total Number
1.	<i>Horkelia congesta</i>	4"	160
2.	<i>Saxifraga oregano</i>	4"	135
3.	<i>Sidalcea cusickii</i>	4", 1 gallon, 3 gallon	112
4.	<i>Sisyrinchium idahoensis</i>	4"	217
5.	<i>Wyethia angustifolia</i>	4", 1 gallon	362
6.	<i>Allium amplexans</i>	Bulbs in flats (3 yr)	20 flats
7.	<i>Camassia quamash</i>	Bulbs in flats (3 yr)	15 flats
8.	<i>Camassia leichtlinii</i>	Bulbs in flats (3 yr)	15 flats
9.	<i>Triteleia hyacinthine</i>	Bulbs in flats (3 yr)	4 flats
10.	<i>Zigadenus venonosus</i>	Bulbs in flats (3 yr)	25 flats

2010 Monitoring

Hydrology:

Staff assessed sitewide hydrologic functions and aerial photographs that were taken by a contractor to document seasonal hydrology in both phases of Coyote Prairie North in January 2010.

Staff monitored western marsh cucumber throughout the East Phase in summer 2010 and curviped yellowcress continued through the 2009-10 and 2010-11 rain year ().

Vegetation

Qualitative assessments of vernal pool plant establishment in spring and summer 2010 included assessments of weed assessments, observations on plant establishment of the site with varying hydrology.

The vernal pool plant establishment are reported in Table 3.10. Seed mixes and further planting in fall 2011. See these assessments.

Native species during spring season, rapidly creating high cover by the end of the season. Most common native species observed during walking surveys throughout the phase were not seeded. Most likely these species emerged from the soil seedbank: *Gnaphalium palustre*, *Rorripa curvisiliqua*, *Plagiobothrys scouleri*, *Epilobium brachycarpum*, and *Juncus bufonius*. Seeded species showing strong

establishment in the initial year were *Juncus occidentalis* (previously *Juncus tenuis* ssp. *congestus*), *Grindelia integrifolia*, *Microseris laciniata*, and *Prunella vulgaris* ssp. *lanceolata*.

In the vernal pools, *Downingia yina*, *Gratiola ebracteata*, *Plagiobothrys figuratus*, and *Navarretia* species established in more than 85% of the pools to which they were initially introduced (Table 3.11). Notably, two species, *Montia linearis* and *Ranunculus alismaefolius* var. *alismifolius*, were each introduced as seed to over 10 pools of varying depths, but did not establish in any of them.

Table 3.10. Assessment of Coyote Prairie, East Phase, Wet Prairie Forb, Sedge, and Rush Establishment, 2010

80 acres were seeded with forb, sedge, and rush (no grass) wet prairie seed mixes designed to quickly establish dense native cover. The table includes the species seeded and the number of grams per acre used in the various mixes. The "Assessment" column provides the results of the qualitative assessment of establishment, based on a site-wide ocular estimate of cover, where D=dominant ($\geq 40\%$), C=common (10 – 39%), O=occasional (2 – 9%), and T = trace (<2%).

	Species	Wet Prairie Mix (g/ac)	Assess-ment	Wet Prairie (perennial emphasis) Mix (g/ac)	Assess-ment	Wet Prairie (Carex emphasis) Mix (g/ac)	Assess-ment
	Acres	50	50	20	20	10	10
Seeding Rate (g/acre)							
1	<i>Achillea millefolium</i>	20	T	37	O		
2	<i>Carex densa</i>					40	O
3	<i>Carex stipata</i>					80	?
4	<i>Carex unilateralis</i>					115	O
5	<i>Clarkia amoena/purpurea</i> mix	80	O	30	T		
6	<i>Collomia grandiflora</i>	206	O				
7	<i>Downingia yina</i>					30	T
8	<i>Epilobium densiflorum</i>					33	
9	<i>Eriophyllum lanatum</i> var. <i>lanatum</i>	73	O	175	O	25	C
10	<i>Eriophyllum lanatum</i> -lights					500	T
11	<i>Galium trifidum</i>			30	-		
12	<i>Grindelia integrifolia</i>	70	C	40	O	50	O
13	<i>Juncus tenuis</i> spp. <i>congestus</i> (<i>J. occidentalis</i>)	8	D	5	D		
14	<i>Lomatium nudicaule</i>	150	T	250	O	104	-
15	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	34	O	30	O		
16	<i>Lupinus polyphyllus</i>	28	T				

Table 3.10. Assessment of Coyote Prairie, East Phase, Wet Prairie Forb, Sedge, and Rush Establishment, 2010

80 acres were seeded with forb, sedge, and rush (no grass) wet prairie seed mixes designed to quickly establish dense native cover. The table includes the species seeded and the number of grams per acre used in the various mixes. The "Assessment" column provides the results of the qualitative assessment of establishment, based on a site-wide ocular estimate of cover, where D=dominant ($\geq 40\%$), C=common (10 – 39%), O=occasional (2 – 9%), and T = trace (<2%).

	Species	Wet Prairie Mix (g/ac)	Assess-ment	Wet Prairie (perennial emphasis) Mix (g/ac)	Assess-ment	Wet Prairie (Carex emphasis) Mix (g/ac)	Assess-ment
	Acres	50	50	20	20	10	10
17	<i>Lupinus rivularis</i>	60	T	120	-	156	-
18	<i>Madia elegans</i>	19	T			30	O
19	<i>Microseris laciniata</i>	22	C	220	C	120	O
20	<i>Perideridia oregana</i>			180	-	120	-
21	<i>Perideridia oregana</i> - lights	165	-				
22	<i>Plagiobothrys figuratus</i>	78	O	20	O	100	O
23	<i>Plectritis congesta</i>			90	T	120	T
24	<i>Potentilla gracilis</i> var. <i>gracilis</i>	146	T	200	O	70	T
25	<i>Prunella vulgaris</i> var. <i>lanceolata</i>	102	O	150	O	140	T
26	<i>Psilocarphus elatior</i> - lights				-	350	-
27	<i>Ranunculus occidentalis</i> var. <i>occidentalis</i>			19	T		
28	<i>Ranunculus orthorhynchus</i>			17	T	50	-
29	<i>Rumex salicifolius</i> var. <i>salicifolius</i>	33	C			50	O
30	<i>Symphotrichum hallii</i>		T	5	-		
31	<i>Veronica peregrina</i> - rough cleaned					50	T
	Total	1294		1618		2393	

Table 3.11. Assessment of Coyote Prairie East Phase Vernal Pool Plant Establishment from Seed, 2010

3.25 acres in 19 pools or pool/swale combinations were seeded with native vernal pool forbs. Each pool got a slightly different mix, depending on expected water depth and seed availability. The table includes the species seeded, the average grams/acre seeded in those pools to which it was added, the number of pools to which that species was introduced, and the number of pools in which the species was present and observable in summer 2010. NA refers to plants that were very small and not identifiable to species. "Lights" refers to lightweight seed and seed/chaff material that was separated out during the harvest and cleaning process and has low viability.

	Species	Avg Seeding Rate (g/acre)	# Pools Seeded	# Pools in which this sp was present and identifiable in 2010
1.	<i>Alisma triviale</i>	450	4	2
2.	<i>Carex densa</i>	220	2	NA
3.	<i>Carex feta</i>	410	1	NA
4.	<i>Carex obnupta</i> - lights	700	3	NA
5.	<i>Carex stipata</i>	450	2	NA
6.	<i>Carex unilateralis</i>	625	4	NA
7.	<i>Downingia elegans</i>	528	4	3
8.	<i>Downingia yina</i>	568	15	15
9.	<i>Eleocharis obtuse</i> - lights	635	8	8
10.	<i>Eleocharis palustris</i>	340	2	1
11.	<i>Eryngium petiolatum</i>	492	16	4
12.	<i>Gratiola ebracteata</i>	244	16	14
13.	<i>Grindelia integrifolia</i>	26	2	0
14.	<i>Lasthenia glaberrima</i>	440	10	1
15.	<i>Montia linearis</i>	108	14	0
16.	<i>Navarretia intertexta</i> ssp. <i>intertexta</i> and/or <i>Navarretia willamettensis</i>	448	17	15
17.	<i>Phlox gracilis</i>	365	19	12
18.	<i>Plagiobothrys figuratus</i>	61	14	12
19.	<i>Ranunculus alismaefolius</i> var. <i>alismiifolius</i>	297	13	0
20.	<i>Ranunculus orthorhynchus</i>	420	18	5
21.	<i>Veronica peregrina</i> var. <i>xalapensis</i>	67	10	6
22.	<i>Veronica scutellata</i>	136	5	2

2011 Management and Monitoring Actions

2011 Management

1. In early spring, staff completed installing and flagging posts on a one-acre grid pattern to assist with site orientation and monitoring during the next several years.
2. Staff scouted and mapped locations of nonnative invasive plant species and implemented ongoing manual and chemical control throughout 2011. *Lythrum hyssopifolia* was not as dominant as it was in the spring of 2010, but still occurred in dense patches that were controlled with a glyphosate-based herbicide by a crew with backpack sprayers. Control of this species was prioritized where it occurred in the upper reaches of the site and in vernal pools where native plant species were establishing well. *Polygonum persicaria* and *Echinochloa crus-gali* occurred in patches in the lower regions of the site, but were largely restricted to narrow ranges with suitable hydrology. Control of these species continued, as well as of perennials such as *Mentha pulegium*, and *Hypochaeris radicata*. *Rumex crispus* was widespread, but not dense, and *Daucus carota* occurred mainly in dense patches or scattered plants in the vicinity of Coyote ditch. A hand-weeding crew was hired to pull and remove both of these species as the plants bolted. In some locations flowering patches of *Daucus carota* and thistles were mowed and then spot sprayed later. The handweeding crew pulled *Echinochloa crus-gali* where it occurred adjacent to seasonal flows and in some vernal pools.
3. Staff mapped areas of erosion and in fall 2011 added small amounts of cobble to reinforce the outflows of some vernal pools to further stabilize them. The 2 - 4 inch round rock was also placed in areas of higher gradient where it was apparent that seasonal drainage channels were beginning to actively erode. Coir (coconut fiber) logs were installed to redirect and spread the flow of water into well-vegetated areas.
4. By fall 2010, it was clear that ^{Western} *Juncus occidentalis* (aka *Juncus tenuis* ssp. *congestus*) established at a much higher rate across the East Phase enhancement than anticipated from prior seedings in other enhancement areas. To test methods to reduce its dominance, staff mowed an area dominated by *J. occidentalis* in June, prior to seed maturation and mowed an additional comparison area in fall to facilitate establishment of native seed. A native seed mix was broadcast across the mowed areas and into surrounding vegetation to allow a visual comparison in 2012 of the effects of mowing and seeding on the developing vegetation.
5. Second year forb-rich mixes of native seed were broadcast in the 15-acre area of the Ha-Yaba Unit (Unit 1; Figure 6) where control of *Lythrum* had occurred in spring 2010. The less competitive and low-growing native grasses, *Danthonia californica* and *Dichanthelium acuminatum*, were added to the enhancement in this area (Table 3.13). In the Walahan Unit (Unit 2) about 13 acres of vegetation was mowed in a meandering pattern and seeded with a mix of primarily grasses to increase diversity (Table 3.14; Figure 6).
6. Four additional plots were installed in the Ha-Yaba Unit (Unit 1; Figure 6) to facilitate establishment of slow-growing species that likely require low-competition environments

to become established (e.g. *Wyethia angustifolia*, *Camas leichtlinii* var. *suksdorfii*, *Galium trifidum*, *Saxifraga oregonum*; Table 3.15). The wet prairie broadcast seed mixes placed elsewhere in the Ha-Yaba Unit were not placed in these plots.

7. Over 5,000 1.5 to 3 year old bulbs of *Camassia* species, other bulb-forming species, and bare root *Symphiotrichum hallii* (Hall's aster) plants were planted in the Ha-Yaba Unit (Unit 1) in fall 2011 to increase native plant diversity (Table 3.16).

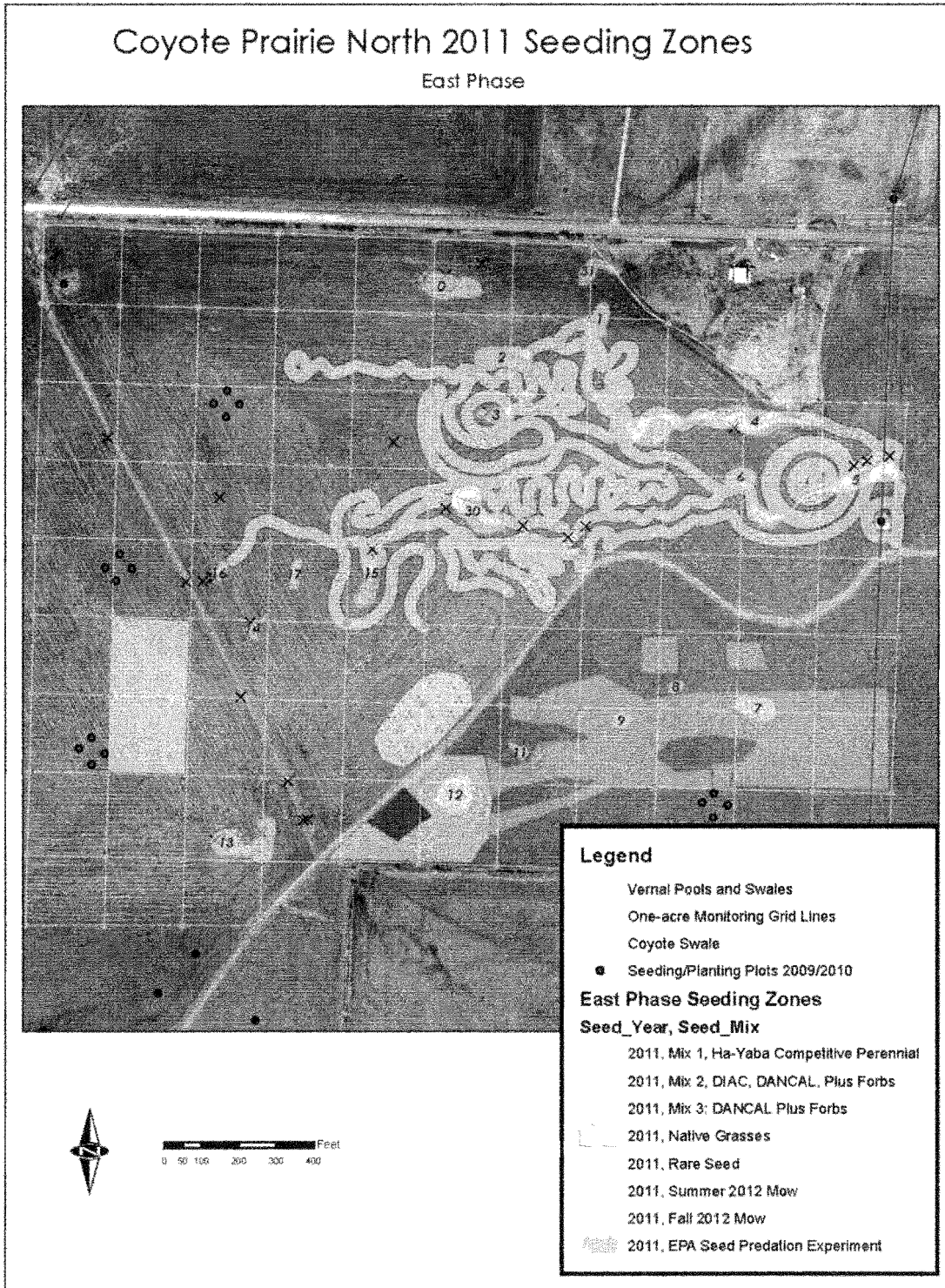


Figure 6. Coyote Prairie, East Phase, 2011 Seeding Plan. Seed mixes, seed plots, mowed plots, and monitoring grid lines are labeled for the East Phase of Coyote Prairie.

Table 3.13. Coyote Prairie East Phase, Ha-Yaba Unit (Unit 1) Wet Prairie Seed Mixes, 2011

14 acres were seeded with wet prairie seed mixes for a second year. The table includes the species seeded and the number of grams per acre used in the various mixes.

	Species	Ha-Yaba WP Mix 3 (<i>Danthonia</i> emphasis)	Ha-Yaba WP Mix 2 (<i>Dichanthelium</i> emphasis)	Ha-Yaba WP Mix 1 (Competitive)
	Acres	5	7	2
1	<i>Achillea millefolium</i>		20	
2	<i>Camassia leichtlinii</i> var. <i>suksdorfii</i>	15	20	
3	<i>Camassia quamash</i> var. <i>maxima</i>	100	60	
4	<i>Carex unilateralis</i>			80
5	<i>Clarkia amoena/purpurea</i> mix		30	
6	<i>Danthonia californica</i>	400	60	
7	<i>Dichanthelium acuminatum</i> var. <i>fasciculatum</i>	30	100	
8	<i>Epilobium densiflorum</i>		10	60
9	<i>Eriophyllum lanatum</i> var. <i>lanatum</i>	250	200	
10	<i>Grindelia integrifolia</i>	80	40	300
11	<i>Hordeum brachyantherum</i>	20	20	
12	<i>Lomatium nudicaule</i>	400		
13	<i>Lomatium nudicaule</i>		200	800
14	<i>Lotus formosissimus</i>	31	40	
15	<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	40		
16	<i>Lupinus rivularis</i>	40	30	60
17	<i>Luzula comosa</i>	20		
18	<i>Madia elegans</i>	20	30	40
19	<i>Madia sativa</i>			20
20	<i>Microseris laciniata</i>	300	300	160
21	<i>Plagiobothrys figuratus</i>	50	50	200
22	<i>Potentilla gracilis</i> var. <i>gracilis</i>	150	200	
23	<i>Prunella vulgaris</i> var. <i>lanceolata</i>			100
24	<i>Rumex salicifolius</i> var. <i>salicifolius</i>			800
25	<i>Sisyrinchium idahoense</i> var. <i>idahoense</i>	40	20	
26	<i>Wyethia angustifolia</i>	300		
	TOTAL	2286	1430	2620

Table 3.14. Coyote Prairie East Phase, Walahan Unit (Unit 2) Wet Prairie Seed Mix, 2011

13 acres were seeded with primarily wet prairie grasses, in the Walahan Unit's third year of seeding. The table includes the species seeded and the number of grams per acre used in the mix.

	Species	Walahan WP Mix (g/acre)
1	<i>Agrostis exarata</i>	80
2	<i>Carex stipata</i>	190
3	<i>Danthonia californica</i>	600
4	<i>Deschampsia cespitosa</i> (med wt)	39
5	<i>Hordeum brachyantherum</i>	512
6	<i>Luzula comosa</i>	215
7	<i>Rumex salicifolius</i> var. <i>salicifolius</i>	600
	TOTAL	2236

Table 3.15. Coyote Prairie East Phase, Ha-Yaba Unit (Unit 1) Rare Plot Seeding, 2011

Four approximately 0.25-acre plots were established in the Ha-Yaba Unit to track establishment of seeded species that have been difficult to establish (e.g. Liliaceae, *Wyethia* sp.) or species for which we have small amounts of viable seed. This table includes the species seeded and the total grams used throughout the 4 plots.

	Species	Amount (g/ac)
1	<i>Allium amplexans</i>	200
2	<i>Asclepias speciosa</i>	300
3	<i>Brodiaea elegans</i>	325
4	<i>Camassia leichtlinii</i> var. <i>suksdorfii</i>	644
5	<i>Camassia quamash</i> var. <i>maxima</i>	3,109
6	<i>Galium trifidum</i>	719
7	<i>Lomatium nudicaule</i>	800
8	<i>Pyrrcoma racemosa</i> var. <i>racemosa</i>	800
9	<i>Saxifraga oregonum</i>	145
10	<i>Sisyrinchium idahoense</i> var. <i>idahoense</i>	975
11	<i>Triteleia hyacinthina</i>	105
12	<i>Wyethia angustifolia</i>	1,600
	TOTAL	9,722

Table 3.16. Plants and Bulbs Installed at Coyote Prairie East Phase, Fall 2011.

Species of bulbs and bare root starts planted in Coyote Prairie East Phase are listed with the approximate number of each species or container type.

	Species	Plant Material Type	Total Number
1	<i>Symphiotrichum hallii</i>	Clumps of bare root plants	701
2	<i>Allium amplexans</i>	Bulbs in flats (3 yr)	2 flats
3	<i>Camassia quamash</i>	Bulbs in flats (2 - 3 yr)	24 flats
4	<i>Camassia leichtlinii</i>	Bulbs in flats (1.5 - 3 yr)	24 flats
5	<i>Zigadenus venenosus</i>	Bulbs in flats (3 yr)	5 flats

2011 Monitoring

Hydrology – Performance Standards:

The first and second year hydrologic performance standards include completion of the drainage recontouring and achieving functioning vernal pools. This site has met its hydrologic performance standards for its first two years (Table 4.1). A description of vernal pool functioning follows.

Hydrology - Vernal pools summary and results:

Staff constructed 19 pools and associated swales in August 2009, totaling 3.1 acres of excavated area. These pools began to hold water at the end of October 2009, with the initiation of fall rains. Three of the nineteen pools did not continue to hold water beyond the initial few weeks in 2009, due to slope and, in some cases, sedimentation. These 3 continued to act as swales or a series of braided channels through which water flows.

Of the 16 pools that held water, some pools reached maximum water depth by mid-November of the first year (2009). Sediment movement across the phase in the first year, prior to vegetation establishment, was higher than in subsequent years, and substantially altered pool morphology throughout the first post-construction water year (October 1 – Sept. 30). By the second water year (Oct. 1, 2010 - Sept. 30, 2011) pool morphology appeared relatively stable and sediment movement into pools appeared substantially diminished, probably due to high cover of native wet prairie vegetation across the enhancement phase.

In the 2009-2010 and 2010-2011 water years, all pools reached maximum depth by late December or early January. Fall 2011 was unusually dry and many pools did not begin to hold water until late December. Maximum pool depths in the 2009 - 2010 and 2010- 2011 water years ranged from 0.3 to 0.9 foot. In 2010 - 2011, 14 pools stayed inundated from mid-November through mid-April (at least 19 weeks). Three of these 14 pools are in the Ha-Yaba Unit (Unit 1) and 11 are in the Walahan Unit (Unit 2). Two of the pools in the Ha-Yaba Unit had dried by the mid-April 2011 monitoring.

The first easily visible aquatic invertebrates to colonize the pools were backswimmers or waterboatman (families Notonectidae and Corixidae) recorded in 3 pools on November 25, 2009, about 1 month after pools began to fill for the first time. Larval amphibians were found in one pool by the end of the first rain year (spring 2010). By mid-spring of the second rain year (April 22, 2011) chorus frog larvae were found in 11 of the 16 pools that had held water that year.

Vernal pool vegetation established well in its first growing season in 17 of 19 pool or swale areas. One pool (#16) had sparse vegetation and large expanses of bare soil and another (#7) had high levels of nonnative *Lythrum hyssopifolium* and *Echinochloa crus-gali* (barnyard grass). Table 3.11 summarizes the number of pools into which a species was seeded as compared to the number of pools in which it was present and identifiable in the 2010 growing season. The five species that had the highest proportion of establishment in the pools into which they were seeded (based on proportion of pools it occurred in compared to the number into which it was seeded) were *Downingia yina*, *Eleocharis obtusa*, *Gratiola ebracteata*, *Navarettia* sp. and *Plagiobothrys figuratus*. Species with poor initial establishment (less than

one-half the number of pools seeded had plants visible) or which were not present in the first year following seeding were *Eryngium petiolatum*, *Grindelia integrifolia*, *Lasthenia glaberrima*, *Montia linearis*, *Ranunculus alismaefolius* var. *alismifolius*, *Ranunculus orthorhyncus*, and *Veronica scutellata*. Of these, *Grindelia integrifolia* established very well in the surrounding wet prairie plant community.

Additional years of data are needed to determine what species are likely to make up the vernal pool plant communities in the future.

Quantitative vegetation monitoring:

Site-wide quantitative vegetation monitoring began in June 2011, the second growing season of this enhancement phase, and will continue annually for the next three years. Quantitative sampling involved measuring plant cover using the point-intercept method, where each point was an independent sample and 679 sample points were collected systematically (with a random start) across the entire enhancement phase. Methods are described in detail in Appendix A. Results are presented in Table 3.17.

Plant cover in the East Phase is high and primarily native. Total native plant cover was 143% and nonnative plant cover was just under 10% (Table 3.17). Eight native species had cover greater than 5%. Surprisingly, of these 8 native species, only 3 were seeded. The 5 unseeded species with cover greater than 5% are annuals that must have been present in the soil seedbank, even after decades of ryegrass production. Twenty native species had cover greater than 1%, of which 12 were seeded and 8 were not. Only 6.3% of the site did not support vascular plant cover and was classified as bare ground

Only two nonnative species recorded by the point-intercept monitoring are included in the Department of State Lands (DSL) definition of invasive nonnative species: *Mentha pulegium* and *Rubus armeniacus*, neither of which exceeded 0.1% cover. After the second quantitative monitoring in 2012, the change in cover of nonnative species between years will be reviewed to determine if other species meet the definition of invasive. In 2011, no single nonnative species had cover that exceeded 5%. Only 2 nonnative species had cover greater than 1% (Table 3.17).

The enhancement has met all of its first and second year vegetation performance standards (Table 4.2), by having greater than 40% native cover, less than 40% bare ground, and nonnative invasive vascular plant cover of less than 10%.

Table 3.17. Coyote Prairie East Phase Point-intercept Monitoring Results, 2011.

Point-intercept percent cover monitoring results are presented for the entire phase (both units combined). Percent cover results are shown (with 80% binomial confidence intervals (CI)) for several guild types as well as each species detected during monitoring.

	Area Sampled	East Phase, 84 acres		
	Sample Size	679		
	Plant Community	Wet Prairie		
Origin ¹	Species or Guild (all herbaceous)	% Cover	CI Low	CI High
	Native (absolute cover)	143.2		
	All Nonnative (absolute cover; includes invasives)	9.9		
	Invasive Nonnative (absolute cover)	0.2		
	Total Plant Cover (absolute cover)	153.1		
	Bare ground (absolute cover - no vascular plants, moss may occur)	6.3		
	Native² (a relative cover value)	91.6	90.1	93.0
	All Nonnative² (a relative cover value)	8.7	7.3	10.2
Native	<i>Juncus occidentalis</i>	57.0	54.5	59.4
Native	<i>Prunella vulgaris</i> var. <i>lanceolata</i>	11.3	9.8	13.0
Native	<i>Juncus bufonius</i>	10.5	9.0	12.1
Native	<i>Gnaphalium palustre</i>	8.7	7.4	10.3
Native	<i>Plagiobothrys scouleri</i>	8.2	6.9	9.7
Native	<i>Epilobium brachycarpum</i>	6.2	5.0	7.5
Native	<i>Grindelia integrifolia</i>	6.2	5.0	7.5
Native	<i>Bidens frondosa</i>	5.4	4.4	6.7
Native	<i>Alopecurus geniculatus</i>	2.8	2.1	3.9
Native	<i>Eriophyllum lanatum</i> var. <i>lanatum</i>	2.5	1.7	3.4
Native	<i>Rorippa curvisiliqua</i>	2.4	1.6	3.2
Native	<i>Microseris laciniata</i>	2.2	1.5	3.0
Native	<i>Epilobium ciliatum</i>	1.9	1.2	2.7
Native	<i>Carex unilateralis</i>	1.8	1.1	2.5
Native	<i>Carex densa</i>	1.6	1.0	2.4
Native	<i>Lotus unifoliolatus</i>	1.6	1.0	2.4
Native	<i>Plagiobothrys figuratus</i>	1.5	0.9	2.2
Native	<i>Agrostis exarata</i>	1.2	0.7	1.9
Native	<i>Potentilla gracilis</i>	1.2	0.7	1.9
Native	<i>Madia elegans</i>	1.0	0.6	1.7
Native	<i>Epilobium densiflorum</i>	0.9	0.5	1.5
Native	<i>Achillea millefolium</i>	0.7	0.3	1.3

Table 3.17. Coyote Prairie East Phase Point-intercept Monitoring Results, 2011.

Point-intercept percent cover monitoring results are presented for the entire phase (both units combined). Percent cover results are shown (with 80% binomial confidence intervals (CI)) for several guild types as well as each species detected during monitoring.

	Area Sampled	East Phase, 84 acres		
	Sample Size	679		
	Plant Community	Wet Prairie		
Origin ¹	Species or Guild (all herbaceous)	% Cover	CI Low	CI High
Native	<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	0.7	0.3	1.3
Native	<i>Rumex salicifolius</i>	0.7	0.3	1.3
Native	<i>Deschampsia cespitosa</i>	0.6	0.3	1.1
Native	<i>Downingia yina</i>	0.6	0.3	1.1
Native	<i>Galium trifidum</i>	0.6	0.3	1.1
Native	<i>Veronica perigrina</i>	0.4	0.2	1.0
Native	<i>Panicum capillare</i>	0.3	0.1	0.8
Native	<i>Beckmannia syzigachne</i>	0.1	0.0	0.6
Native	<i>Carex ovalis</i>	0.1	0.0	0.6
Native	<i>Collomia grandiflora</i>	0.1	0.0	0.6
Native	<i>Deschampsia danthonioides</i>	0.1	0.0	0.6
Native	<i>Eloeocharis obtusa</i>	0.1	0.0	0.6
Native	<i>Eryngium petiolatum</i>	0.1	0.0	0.6
Native	<i>Gratiola ebracteata</i>	0.1	0.0	0.6
Native	<i>Hordeum brachyantherum</i>	0.1	0.0	0.6
Native	<i>Juncus bolanderi</i>	0.1	0.0	0.6
Native	<i>Juncus oxymers</i>	0.1	0.0	0.6
Native	<i>Lupinus rivularis</i>	0.1	0.0	0.6
Native	<i>Madia glomerata</i>	0.1	0.0	0.6
Native	<i>Navarretia intertexta</i>	0.1	0.0	0.6
Native	<i>Stellaria borealis</i> subsp. <i>sitchana</i>	0.1	0.0	0.6
Native	<i>Phlox gracilis</i>	0.1	0.0	0.6
Native	<i>Symphotrichum hallii</i>	0.1	0.0	0.6
Invasive	<i>Mentha pulegium</i>	0.1	0.0	0.6
Invasive	<i>Rubus armeniacus</i>	0.1	0.0	0.6
Nonnative	<i>Lythrum hyssopifolia</i>	2.7	1.9	3.6
Nonnative	<i>Lolium multiflorum</i>	1.8	1.2	2.6
Nonnative	<i>Hypochaeris radicata</i>	0.9	0.5	1.5
Nonnative	<i>Echinochloa crus-galli</i>	0.6	0.3	1.2
Nonnative	<i>Vulpia myuros</i>	0.6	0.3	1.2

Table 3.17. Coyote Prairie East Phase Point-intercept Monitoring Results, 2011.

Point-intercept percent cover monitoring results are presented for the entire phase (both units combined). Percent cover results are shown (with 80% binomial confidence intervals (CI)) for several guild types as well as each species detected during monitoring.

	Area Sampled	East Phase, 84 acres		
	Sample Size	679		
	Plant Community	Wet Prairie		
Origin ¹	Species or Guild (all herbaceous)	% Cover	CI Low	CI High
Nonnative	<i>Centaureum erythraea</i>	0.4	0.2	1.0
Nonnative	<i>Daucus carota</i>	0.4	0.2	1.0
Nonnative	<i>Geranium dissectum</i>	0.4	0.2	1.0
Nonnative	<i>Briza minor</i>	0.3	0.1	0.8
Nonnative	<i>Polygnum species</i>	0.3	0.1	0.8
Nonnative	<i>Aira caryophyllea</i>	0.1	0.0	0.6
Nonnative	<i>Alopecurus pratensis</i>	0.1	0.0	0.6
Nonnative	<i>Galium divaricatum</i>	0.1	0.0	0.6
Nonnative	<i>Juncus marginatus</i>	0.1	0.0	0.6
Nonnative	<i>Leucanthemum vulgare</i>	0.1	0.0	0.6
Nonnative	<i>Portula persicaria</i>	0.1	0.0	0.6
Nonnative	<i>Sonchus asper</i>	0.1	0.0	0.6
Nonnative	<i>Lathyrus hirsutus</i>	0.1	0.0	0.6

1 In Origin column, invasive is as defined by DSL for mitigation monitoring (Oregon Dept of State Lands, 2009. Routine Monitoring Guidance for Vegetation. Interim review draft version 1.0).

2 Native and nonnative cover data are provided here transformed to allow calculation of binomial confidence intervals appropriate for point guild data. In the transformed data, each guild can only be recorded once at each point (e.g. each point is either native, nonnative, both, or neither). Total native and nonnative cover could each equal 100%.

Wildlife Utilization at Coyote Prairie, 2009 – 2011:*Invertebrates:*

Caddisfly larvae and other aquatic invertebrates (e.g. ostracods, copepods) are present in pooled and flowing water in the East Phase of Coyote Prairie. A citizen science project has collected samples of aquatic invertebrates for 2 years from the East Phase vernal pools, although samples have not yet been analyzed. Praying mantis and spider egg sacs attached to stalks of native plants are frequently visible in Coyote Prairie East Phase vegetation. Large numbers of grasshoppers were observed throughout the fall in the East Phase. A group of North American Butterfly Association volunteers collected butterfly use data from Coyote Prairie in 2011. Although the weather resulted in an overall poor year for observing butterflies in the southern Willamette Valley, surveyors documented hundreds of individual butterflies of 12 species using the East Phase enhancement from April through September 2011. See their report at <http://www.naba.org/chapters/nabaes/>. They intend to collect additional butterfly data at the site during 2012.

Reptiles and amphibians:

Adult long-toed salamanders have been observed in the north part of the East Phase of Coyote Prairie and salamander larvae (probably long-toed salamanders, although identification was not confirmed) have been documented in the eastern tributary to Coyote Creek that flows along the north boundary of the nearby Phase 1 enhancement of Coyote Prairie. Garter snakes were observed in the East Phase enhancement in 2011. Also in 2011, Pacific chorus frog larvae were documented in at least 11 of the vernal pools created in the East Phase's.

Birds:

Raptors (e.g. hawks, kites, owls) and songbirds continue to be sighted foraging in every Coyote Prairie restoration phase. In particular, in the East Phase, raptors have been perching on the wooden grid stakes to feed, as evidenced by rodent gut piles and raptor pellets around stakes throughout the site. Bald eagles were spotted by volunteers conducting aquatic monitoring in 2010. In 2011, three short-eared owls have been observed repeatedly in the East Phase. Western meadowlark have been documented frequently singing in the East restoration phase. Ground-nesting birds, such as California quail and killdeer, were documented to nest in the East phase in 2009 and 2010 and savanna sparrow nests were found in all three phases in 2011. Waterbirds are occasionally seen feeding in the vernal pools in winter.

Mammals:

Voies appear to be present throughout the East Phase enhancement. Herds of elk occasionally cross the enhancement areas, as evidenced by tracks and scat found across the site. Bear and bear sign have been spotted in nearby enhancement Phase 1 of the Coyote Prairie site.

Chapter 4. Progress Toward Meeting Performance Standards

Monitoring and assessment to verify progress toward meeting performance standards in the East Phase, as described in the Coyote Prairie North Mitigation Bank Instrument, are summarized in Tables 4.1, 4.2 and 4.3 below. Tables 4.1 and 4.2 show progress toward meeting performance standards in the Walahan Unit (Unit 2). Table 4.3 shows progress toward meeting benchmarks in the Ya-Haba Unit (Unit 1) which will be assessed in year 5 using an HGM-based functional wetland assessment.

Table 4.1. Progress of the Coyote Prairie North, East Phase Enhancement, Walahan Unit (Unit 2), Toward Meeting the Hydrologic Performance Standards Identified in the MBI.

The most recent data for the active mitigation bank phase are compared to their relevant performance standards. The number in the 'Monitoring Yr' column indicates the year in which data will be collected to evaluate the site's success in meeting the associated standard. A corresponding year in the 'East Phase Data' column indicates the calendar year data will be collected to evaluate the site's success in meeting the associated standard.

Monitoring Yr	Hydrologic Performance Standards	Monitoring and Reporting Method	East Phase Data	Goal Met?
0, 1	PSH2, PSH5: excavate vernal pools and swales and remove Cantrell ditch	As-built report	Excavation occurred summer 2009; as-built report submitted November 2009	Y
1, 2	PSH5: ≥ 10 vernal pools are holding water for at least 8 weeks between January and April. At least 10 pools are in Unit 2.	November – May pool fill dates and depths	14 pools inundated for at least 8 weeks (2011 vernal pool data, this report)	Y
3, 4, or 5	PSH2: released flows from Cantrell Ditch cross site.	Photo documentation of released Cantrell Ditch flows and hydrologic mapping	2014 or earlier, during year of near normal rainfall	TBD
3, 4, or 5	PSH1: 84 acres exhibit wetland hydrology	Modified wetland delineation	2014 or earlier, during year of near normal rainfall	TBD

Table 4.2. Progress of the Coyote Prairie North, East Phase enhancement, toward meeting the Vegetation Performance Standards Identified in the MBI.

The most recent data for the East Phase are compared to their relevant performance standards. The number in the 'Monitoring Yr' column indicates the summer growing season in which the data will be collected to evaluate the site's success in meeting the associated standard. A corresponding year in the 'East Phase Data' column indicates the calendar year data will be collected to evaluate the site's success in meeting the associated standard.

Monitoring Year	Phase/ Unit	Vegetation Performance Standards	Monitoring method	East Phase Data (Calendar Yr Collected)	Goal Met?
1	All	Seeding assessment will document initial vegetation establishment	Qualitative seeding assessment	Tables 3.10 & 3.11, this report (2010)	Y
2	All	Native vascular plant cover > 40%	Point Intercept	Native cover = 143% (Table 3.17, this report, 2011)	Y
2	All	Bare ground < 40%	Point Intercept	Bare ground = 6% (Table 3.17, this report, 2011)	Y
2	All	Nonnative <i>invasive</i> vascular plant cover is less than 10%	Point Intercept	Nonnative invasive cover = 0.2% (Table 3.17, this report, 2011)	Y
3	All	Native vascular plant cover > 40%	Point Intercept	2012	TBD
3	All	Bare ground < 40%	Point Intercept	2012	TBD
3	All	Nonnative <i>invasive</i> vascular plant cover is less than 10%	Point Intercept	2012	TBD
3	All	6 native species have \geq 5% cover in 10% of area sampled	Point Intercept	2012	TBD

Table 4.2. Progress of the Coyote Prairie North, East Phase enhancement, toward meeting the Vegetation Performance Standards Identified in the MBI.

The most recent data for the East Phase are compared to their relevant performance standards. The number in the 'Monitoring Yr' column indicates the summer growing season in which the data will be collected to evaluate the site's success in meeting the associated standard. A corresponding year in the 'East Phase Data' column indicates the calendar year data will be collected to evaluate the site's success in meeting the associated standard.

Monitoring Year	Phase/ Unit	Vegetation Performance Standards	Monitoring method	East Phase Data (Calendar Yr Collected)	Goal Met?
4	All	Native vascular plant cover > 60%	Point Intercept	2013	TBD
4	All	Bare ground < 40%	Point Intercept	2013	TBD
4	All	Nonnative invasive vascular plant cover is less than 10%	Point Intercept	2013	TBD
4	All	6 native species have \geq 5% cover in 10% of area sampled	Point Intercept	2013	TBD
5	All	Native vascular plant cover > 75%	Point Intercept	2014	TBD
5	All	Bare ground < 20%	Point Intercept	2014	TBD
5	All	6 native species have \geq 5% cover in 10% of area sampled	Point Intercept	2014	TBD
5	All	Nonnative invasive vascular plant cover is less than 10%	Point Intercept	2014	TBD
5	All	Nonnative plant cover is less than 15% of total plant cover	Point Intercept	2014	TBD
5	All	At least 50 native vascular plant species are present	Walking surveys	2014	TBD

Table 4.3. Progress of the Coyote Prairie North, East Phase Enhancement, Ha-Yaba Unit (Unit 1), Toward Meeting Monitoring Benchmarks Identified in the MBI.

The performance of the Ha-Yaba Unit will be measured by conducting an HGM-based functional wetland assessment by the completion of year 5 to determine if the unit has achieved the level of ecological enhancement anticipated and described in the Mitigation Bank Instrument. Although the actions below are not performance criteria, the City is documenting them to ensure the unit is on track to meet anticipated enhancement levels by year 5.

Monitoring Yr	Monitoring Benchmark	Monitoring and Reporting Method	East Phase Data	Goal Met?
3	Plant at least 0.5 acre of shrub patches, with at least 3 native wetland shrub species.	Planting date, species, and mapped locations of shrub patches.	2012 reporting	TBD
5	Majority of plants in the shrub patches have new stems emerging, indicating that they are established and expanding.	Shrub survival and area occupied (all shrubs within 15 m of one another are considered to be part of the same patch).	2014 reporting	TBD
5	Place multiple logs over 6 ft in length in the Ha-Yaba Unit to provide sheltering locations for wildlife.	Location and number of logs.	2014 reporting	TBD
3, 4, or 5	At least 2 vernal pools, with a combined area of least 10,000 sq feet (0.23 acre), are inundated to no more than 6 inches for at least two weeks continuously during Dec through March. At least one pool is inundated into May.	Duration, depth, and size of vernal pools between January and May.	2012, 2013, or 2014 reporting when rainfall is at or near normal	TBD

Appendix A. Monitoring Methods

Overview

Monitoring methods for the Coyote Prairie North Mitigation Bank are based on methods developed for the West Eugene Wetland Mitigation Bank that were revised and expanded upon to provide a more complete assessment of performance for Coyote Prairie North enhancements.

The Coyote Prairie North Mitigation Bank is divided into the West Phase (not started) and the East Phase (currently active phase). The East Phase is further divided into two units: the Ha-Yaba Unit (Unit 1) and the Walahan Unit (Unit 2), which have different performance criteria. The monitoring is designed to document development of the enhancements and determine if performance criteria area being met.

Photo documentation, hydrologic monitoring, and vegetation monitoring are conducted in both of the east units, although because the performance standards for the units vary, the type of monitoring conducted at each Unit is not identical.

Photopoints

Purpose: Photo document surface hydrology and vegetation structure. Photos are taken pre- and post- treatment to show landscape level changes. Photos are also used to document specific actions and site conditions.

Method:

1. Permanent photo stations are established with metal stakes or GPSed in the field in sufficient number to provide photo coverage of the enhanced area.
2. Photographs are taken pre- and post-project and documented by photopoint number and compass bearing (and landmarks).
3. A complete set of photos are stored with the City of Eugene, Parks and Open Space Division and are available upon request.

Hydrology

Purpose: Assess whether wetland hydrology is established within the enhancement site. The extent of soil saturation during the growing season (March 3 – November 21; NRCS data for Lane County) is an important factor in determining jurisdictional wetlands.

Method:

1. Site visits during the winter and spring include a brief description of the location, extent, and depth of standing water at each site.
2. The timing of the spring visit should extend at least 2 weeks into the beginning of the growing season.
3. Water depth is recorded in November, December, or January and again in April or May from the staff gauges installed in vernal pool and emergent areas in a given phase. Depths and duration of inundation in other pools is collected based on specific needs.
4. A modified wetland delineation (see DSL's Delineation "Lite" for Mitigation Monitoring in: Oregon Dept State Lands. 2009. Removal-Fill Guidelines, Compensatory Mitigation for

Non-Tidal Wetlands and Tidal Waters and Compensatory Non-wetland Mitigation. Interim Review draft, October 14). is conducted in year 3, 4, or 5, when precipitation is near normal.

Vegetation Monitoring

The standard protocol for quantitative vegetative monitoring at West Eugene Wetlands Mitigation Bank sites was developed in 1994 and further expanded and revised in 1997 and 1998. It relies on the point-intercept method to assess plant cover by species, combined with full site surveys to identify species occurring in the mitigation site, but not encountered during point-intercept monitoring. The vegetation monitoring method for Coyote Prairie North builds on past monitoring experience and continues the use of point-intercept sampling and site-wide plant surveys to provide an objective method of measuring plant cover and assessing plant species richness.

Overall Goal

Monitor the establishment and development of hydrophytic vegetation within enhancement sites.

Species Lists

Purpose: Annually assess the status of each site in meeting the City of Eugene's intent to enhance and restore wetland prairies with a high diversity of native wetland prairie plant species that encompass many spatial, temporal, and functional groups (e.g. species that are early-germinating, late-flowering, or nitrogen-fixing).

Method:

1. The species list should be collected annually; once early in the growing season (late May to mid-June), and once late in the growing season (early to mid-August).
2. Compile the list by thoroughly walking through a site while filling out the species checklist.
3. Cross check and add to the list from other monitoring efforts including the Point-Intercept Sampling and Planting Establishment Assessments to ensure all species observed are represented.

Planting Establishment Assessments

Purpose: To provide an early qualitative assessment of plant establishment that will help guide future seeding and planting plans.

Method:

1. The assessment usually takes place in the first growing season, when the maximum number of species are identifiable and flowering (June to mid-July).
2. Each native species encountered during meandering surveys through the site is noted and its presence across the enhancement site is assigned to one of 4 broad cover classes. Although the classes may be defined based on comparison with one another, they typically equate to the following cover classes in the first growing season: Dominant = 40+% cover, Common = 10 – 39% cover, Occasional = 2 -9% cover, Trace = present, but less than 2% cover).

Point-intercept Sampling

Purpose: To assess whether the enhancement or restoration site is meeting performance criteria addressing native and non-native plant cover, bare ground, and diversity, identified in the Coyote Prairie North Mitigation Bank Instrument.

Methods:

1. The entire restoration or enhancement site is sampled annually in years 2, 3, 4, and 5. This is a variation of methods used in the West Eugene Wetlands Mitigation Bank where representative, randomly chosen macroplots are sampled, rather than the entire enhancement area.
2. The sampling method is a systematic sampling with a random start, with each point being one sampling unit.
3. Sample points are dispersed systematically throughout the sampled area. Locations of sample points are determined by pacing and use of an on-site grid system that covers the entire site, rather than use of measuring tape.
4. The number of samples collected should be at least 200 in the first monitoring year of an enhancement phase, unless prior monitoring in an enhancement phase has identified that smaller sample sizes would still meet monitoring objectives identified in the Mitigation Bank Instrument and in the Oregon Department of State Lands Routine Performance Standards.
5. In 2011, at Coyote Prairie North, East Phase, a large number of sample points (679) were collected, so that the effects of future changes in sample size could be evaluated. Location of sample points were identified in the following way:
 - a. The sampling method uses the grid system that the City installed in the East Phase and which divides the 84-acre site into equally sized 1-acre squares. The corner of each grid square is marked with a wooden pole about 6 ft tall. Therefore, poles occur about every 70 meters throughout the site.
 - b. For monitoring purposes, the x-axis of the site is east-west, parallel to Cantrell Road, and the y-axis is north-south (Fig. A-1). The start location for the first transect on the x-axis is identified to be a random number between 1 and 10 (assigned via random number table). Based on the 2011 randomly chosen start point of 9 meters and the desire for at least 600 sampled points, the 2011 sampling locations were as follows: 4 points were sampled in the north half of the each grid square at 9 m, 27 m, 45 m, and 63 m east of each grid line (Fig. A-1). This was repeated, using the same x-coordinates along a second transect in the south half of each grid. .
 - c. The start point for the two east-west transects, described above, were established for each grid using two random numbers (one in the north and one in the south half of the square) chosen along the north-south axis (y-axis). On the y-axis, two transects were run within each 1-acre grid square at points 17 m and 47 m south of the north grid lines. Thus, within each of the 84 one-acre squares, sampling occurred at the following x-y coordinates: 9-17, 27-17, 45-17, 63-17, 9-47, 27-47, 45-47, and 63-47, except within partial squares. (Fig. A-1).

- d. All distances were paced by the monitoring crew after equating their paces to actual distances measured with a measuring tape.
 - e. The site is slightly larger than 84 acres and partial grid squares exist at the site's boundaries, so with 8 sample points collected in each of the 1-acre grid squares, 679 total samples were collected.
 - f. To reduce bias in arriving at the exact sample location, the monitoring crew uses a meter stick and measures off the tip of their boot to locate it, once they have paced to within 1-meter of their sample location.
6. Each sample (or point) is obtained by lowering a vertical cylindrical metal rod with a sharp pin at the tip and noting each vascular plant species the tip intersects on its route to the ground at that location. The pole is held vertical during lowering by assessment and adjustment of a level on a specially modified camera tripod.

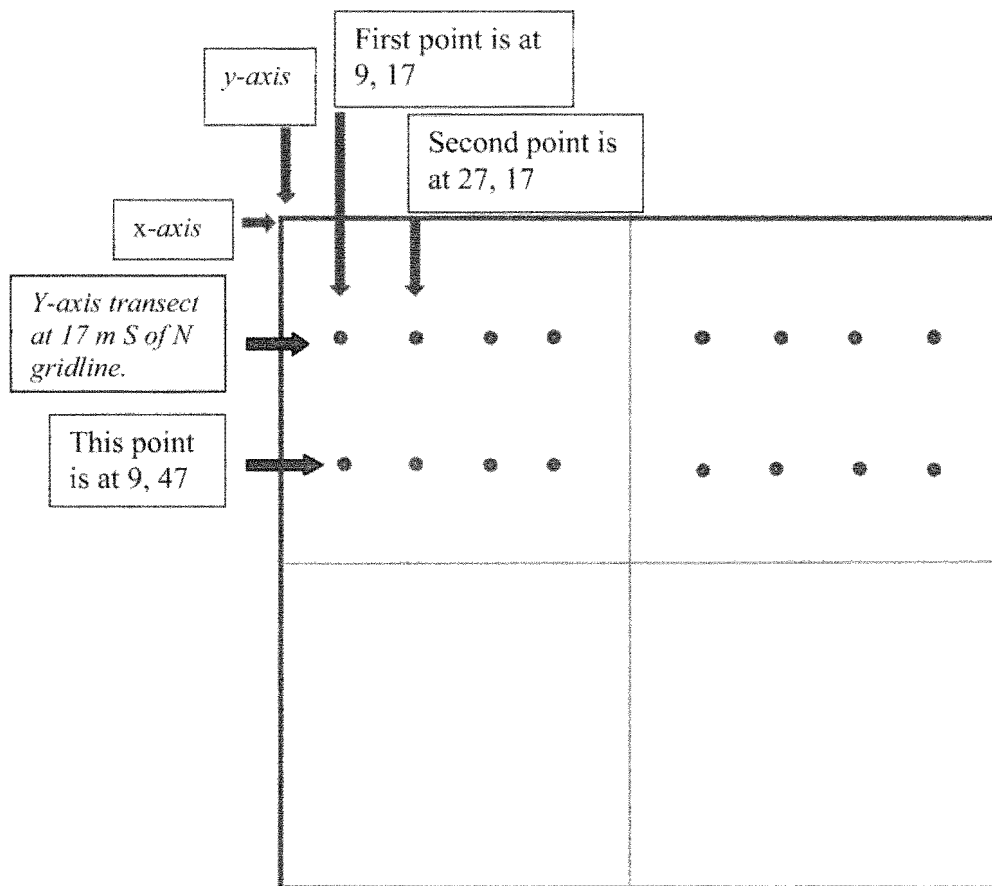


Figure A-1. Coyote Prairie, East Phase grid-based monitoring strategy. Four example one-acre grid squares are shown (points shown only in two). Dots represent sampled points, based on 2011 sample size needs and random start number. In each grid square 8 sample points were collected (4 on each of two transects).

7. Ground cover is identified at each sample point as either bare, moss, or litter. Although this data is collected at each point, only samples that record no plant cover are included in the calculation of percent bare ground. The data collected on litter may be used in future years in determining how rapidly thatch build-up occurs in newly enhanced wetland prairies.
8. The habitat type of each point is also noted (emergent, vernal pool, wet prairie).
9. The percentage of ground covered by each species is calculated by dividing the total number of observations of each plant by the total number of sample points. Cover estimates are given with 80% binomial confidence intervals, unless otherwise indicated.
10. The data is summarized and reported using the following definitions:

<p>Native Cover: <i>the sum of all individual native vascular plant species cover values (individual cover values are the sum of all 'hits' for a species divided by the total pin drops); an absolute value that can exceed 100%</i></p>
<p>Nonnative Cover: <i>the sum of all individual nonnative vascular plant species cover values; an absolute value that can exceed 100%</i></p>
<p>Invasive Nonnative Cover: <i>computed the same as Nonnative Cover, but with only those species identified as invasive according to the definition accepted by the Oregon Department of State Lands and included in the Mitigation Bank Instrument.</i></p>
<p>Total Plant Cover: <i>the sum of all vascular plants species cover values; an absolute value that can exceed 100%;</i></p>
<p>Total Native and Nonnative Plant Cover (a relative cover value): <i>the number of pin drops out of the total pin drops that hit a vascular plant in one of those guilds (native, nonnative). For example, the hit is recorded as 'native' if at least one native species is hit with that pin drop and does not change if the pin drop hits more than 1 native species. Total native and nonnative cover could each equal 100%.</i></p>
<p>Bare ground: <i>the sum of all pin drops that do not hit a plant, divided by the total pin drops; combines scores for bare ground, litter, and moss.</i></p>