

West Eugene Wetlands Mitigation Bank

Annual Report – 2004



August 2005

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

Background

The West Eugene Wetland Mitigation Bank Program operates under an agreement between the Oregon Department of State Lands, 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 Memorandum of Agreement (MOA) establishing the Bank was signed in 1995.

This is the ninth annual report required as a condition of the MOA that established the West Eugene Wetland Mitigation Bank (Bank). This annual report serves two primary purposes:

1. To fulfill the technical reporting requirements identified in the MOA.
2. To provide a broader view of the Bank's operations and accomplishments for a general audience who view the Bank as a model project in Oregon and the United States.

Organization of this report

This report is organized into two main parts with an introduction:

Chapter 1: Introduction. This chapter provides an overview of the mitigation bank program and this annual report.

Part 1: Financial and Planning Information

Chapter 2: Credit and Financial Summary. This chapter describes the financial status of the Bank. Information on credit sales, credit generation, Bank expenditures, and a financial reconciliation are included.

Chapter 3: Capital Improvement Plan. This chapter presents the Bank's proposed future projects, from 2005 through 2007.

Chapter 4: Plant Materials Program. This chapter describes the plant materials procurement activities of the Bank.

Part 2: Site reports

Chapter 5: Introduction to Site Reports. This chapter contains an overview of the information contained in the site reports. It also presents the structure for the reports.

Chapters 6 - 14: Site reports. These chapters include information on individual mitigation bank sites including: background, design goals, management actions from the previous year, and recommended actions for 2004. The monitoring reports are also included.

Appendices:

- A - Monitoring Methods.** This section is a description of the data collection methods employed to obtain data used in the monitoring reports.
- B - Species Lists for all Mitigation Bank Sites.** The species observed on each site are recorded by noting the section of the restoration or enhancement area in which they were found.
- C - Rainfall Graph.** This graph shows monthly rainfall totals for the Eugene Airport during 2003-2004 compared to the mean and standard deviation of monthly rainfall between 1940 and 2004.

A brief overview of wetland regulation and planning

Wetlands are regulated by a combination of Federal, State, and local regulations. At the Federal level, wetlands are regulated by U.S. Army Corps of Engineers under the Clean Water Act and the Rivers and Harbors Act, as well as by the U.S. Natural Resources Conservation Service under the federal Farm Bill. At the State level, wetlands are regulated by the Oregon Department of State Lands under the State Removal-Fill Law. At the local level, wetlands are also regulated by the West Eugene Wetlands Plan, Oregon's first Wetland Conservation Plan. The West Eugene Wetlands Plan (Plan) was originally adopted by the Eugene City Council and the Lane County Board of Commissioners in 1992, and then amended in 2000 and 2002. The Plan is a multiple objectives planning document that provides a vision for wetland protection while accommodating development. The Plan policies call for creation of a mitigation bank to help fund restoration and enhancement. The West Eugene Wetlands Mitigation Bank was created to meet this need.

Mitigation bank program

Why a mitigation bank? The advantage of a mitigation bank is that mitigation actions are planned within the context of the wetland system where the most suitable sites are identified, acquired, and restored in advance of wetland impact. This strategy is preferred to other alternatives that usually result in incremental and ecologically disconnected attempts at mitigation.

Why a public mitigation bank? The advantage of a public mitigation bank is that the functions and values that the wetland resource may provide are accessible to the community. Although use may be restricted, it is not prohibited. The public is able to utilize opportunities for recreation and education. The lands of the West Eugene Wetlands Program comprise the largest component of the open space system within the City's Urban Growth Boundary. Furthermore, the bank is managed by the City, which is held accountable by the community that it represents.

What is the West Eugene Wetland Mitigation Bank? The West Eugene Wetland Mitigation Bank program includes wetland restoration and enhancement on a number of suitable sites and the certification and sale of mitigation credits to applicants required to provide compensation for adverse impacts to wetland resources. Restoration sites are located within a connected system of existing wetlands that are managed by the West Eugene Wetlands Partnership. The Bank orchestrates the process of mitigation by providing compensatory mitigation in advance of approved impacts to wetlands. The Bank is a key instrument envisioned in the Plan to achieve three major objectives: (1) to

lead in the implementation of plans to restore and enhance wetland communities, (2) to provide certified compensatory mitigation credits to businesses and public agencies that seek to impact wetlands located within the Bank's service area, and (3) to provide an alternative to meet mitigation needs in a timely and economic manner

What are credits? A credit is a unit of measure representing the accrual or attainment of wetland functions at a mitigation bank. The unit of measure of function is typically indexed to the number of wetland acres that are restored, created, enhanced, or preserved. A “certified credit” results when the mitigation bank has met or exceeded the performance standards established in the Bank MOA. Once credits are certified, they are available for sale or exchange.

For more information on mitigation banks in Oregon, visit the Oregon Department of State Lands Wetlands Program web site.

Who are the players?

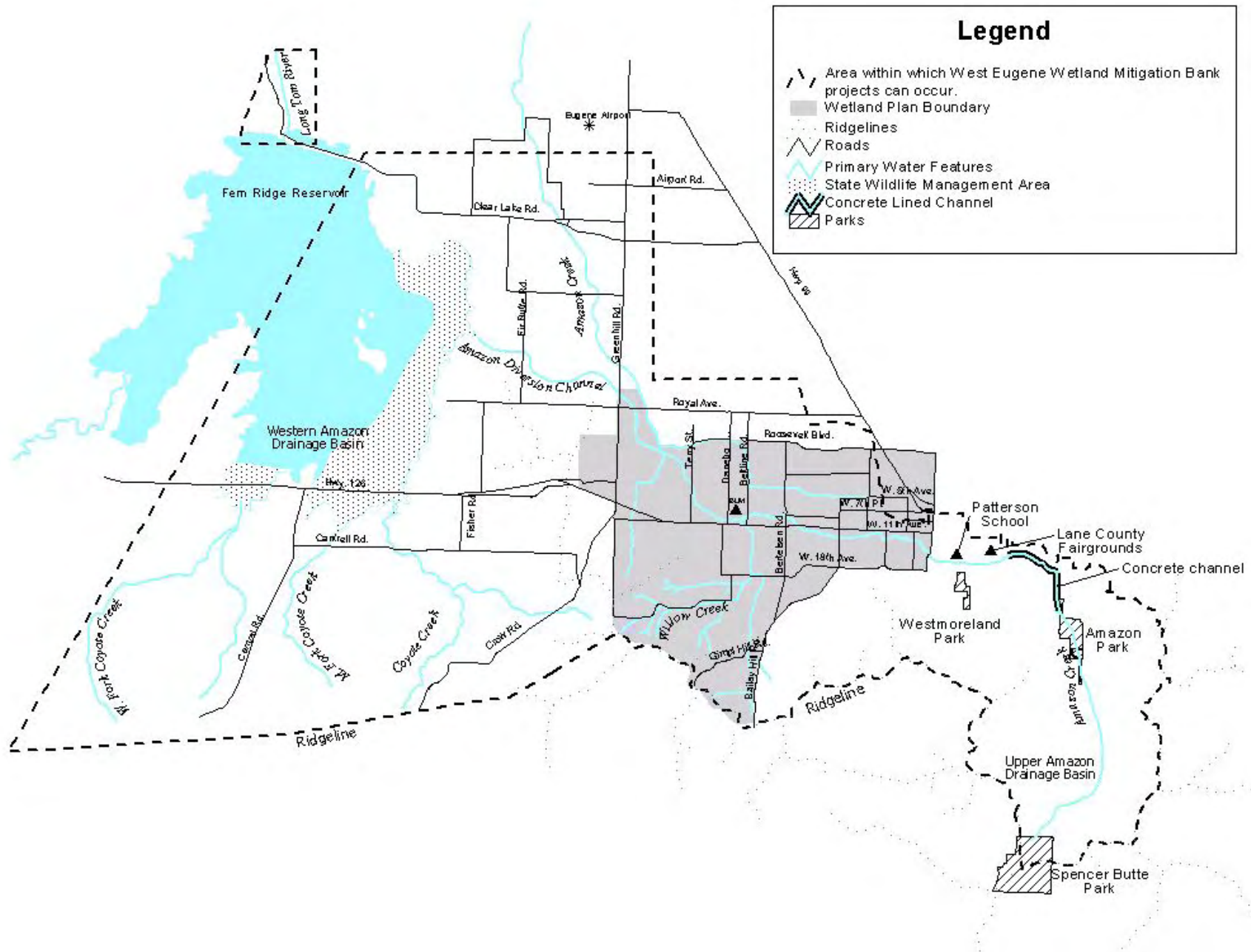
The City of Eugene is the Bank sponsor. Staff from the City of Eugene's Parks and Open Space Division, Natural Resources Section, manage Bank operations. The Bureau of Land Management (BLM) and The Nature Conservancy (TNC), as partners in the West Eugene Wetlands Program and as a cosigner to the Bank MOA (in the case of the BLM), provide technical assistance to develop monitoring protocols, to design restoration and enhancement projects, to construct Bank projects, and to contribute to the operation and management of the Bank.

State and federal agencies form a committee, the Mitigation Bank Review Team (MBRT), which oversees the Bank's operations. It is the responsibility of the MBRT to review and approve plans for wetland restoration and enhancement, to monitor Bank operations for compliance, and to provide technical assistance in Bank management when requested. The MBRT consists of representatives of three federal agencies (the U.S. Environmental Protection Agency, the Army Corps of Engineers, and the U.S. Fish & Wildlife Service) and two state agencies (the Oregon Division of State Lands and the Oregon Department of Environmental Quality).

Where can West Eugene Wetland Mitigation Bank projects occur?

Bank mitigation projects take place within the Long Tom River watershed, of which Amazon Creek is a tributary. Figure 1.1 shows the geographic area within which the mitigation bank operates. This area was originally identified on Map 2 of the West Eugene Wetlands Plan as the “Western Amazon Drainage Basin”, and in Appendix C (Map 1) of the MOA that established the Bank.

Figure 1.1. Area within which West Eugene Wetland Mitigation Bank projects can occur.



Chapter 2: Credit and Financial Summary

Financial information for the 2004 calendar year is provided in this chapter. Included is:

1. Information regarding mitigation credit sales during 2004.
2. A list of pending bank customers and the number of credits expected in the transactions.
3. A list of annual Bank credit sales from 1994 – 2004.
4. A summary of Bank revenues and expenses.

Credit sales during 2004

At the beginning of the calendar year, the Bank had a credit balance of 11.25 credits. During 2004, the bank had an additional 8.47 credits certified for sale as a result of enhancement and restoration actions undertaken in 2003, leaving a balance of 19.72 credits. The Bank sold a total of 12.19 mitigation credits during 2004 to a combination of private and public organizations, leaving an end-of-year balance of 7.53 credits. Please refer to Table 2.1 below, for a more detailed view of the credits sales.

Table 2.1. Summary of credit sales during 2004.

	Purchase Date	Credits in Transaction	Balance
Credit balance on January 1, 2004			11.25
Credits certified during 2004		8.47	19.72
Credits sold in 2004			
City of Eugene: Airport Runway Project	April 2004	(11.68)	8.04
City of Eugene: Greenhill Tributary South Project	June 2004	(0.13)	7.91
Shelley Real Estate & Builders, Inc.: Clearvue Drive, Springfield	July 2004	(0.03)	7.88
Visionary Investments II Inc.: Tax lots 104, 105, 200 & 300; Map 18-03-03	August 2004	(0.35)	7.53
Subtotal of credits sold in 2004		(12.19)	
Credit balance as of December 31, 2004			7.53
Credits requested for certification December, 2004		19.85	
Balance forward after approval of credit request (expected in January 2005)			27.38

Pending credit sales

The pending sales list is an inclusive list of Bank customers who have indicated that they intend to utilize the Bank as for achieving their mitigation within the Joint Wetland Fill Permit Application. The pending sales list is not a waiting list. Customers are added to the pending sales list upon submittal of a letter of intent to use the Bank. Wetland Fill Permit applicants are encouraged to notify the Bank of their intent to purchase credits from the Bank prior to submitting their application to the regulatory agencies. Once on the pending sales list, the Bank works with the applicant to ensure that the applicant has submitted all required information concerning the impact. In addition, this list is one of the tools

used by the Bank to gauge the demand for credits. At the end of 2004, the Bank had five pending requests for a total of 1.53 credits (see Table 2.2).

Table 2.2. Pending credit sales.

	Purchase Date	Credits in Transaction	Balance
Balance forward after approval of credit request			27.38
Pending credits sales			
Home Depot, 7 th and Seneca		(0.11)	
Archie and Company, Crescent Village		(0.12)	
City of Eugene, Candlelight Park		(0.80)	
City of Eugene, Amazon Park ballfields		(0.47)	
City of Eugene, 3 rd -4 th Street Connector		(0.03)	
Subtotal of credits pending		(1.53)	
Estimated credit balance if pending credit sales are completed			25.85

Annual Bank credit sales from 1994 - 2004

Since its first credit sale in 1994, the Mitigation Bank has sold a total of 79.82 compensatory mitigation credits. See Table 2.3 for an annual break-down of credit sales.

Table 2.3. Summary of Annual Credit Sales, 1994 – 2004

Calendar Year	Total Credits Sold
1994	7.29
1995	1.50
1996	2.71
1997	15.03
1998	9.66
1999	8.08
2000	5.13
2001	7.40
2002	7.73
2003	3.10
2004	12.19
Total	79.82

Financial summary

Table 2.4 summarizes the Bank's financial activity during 2004. The Bank started the calendar year with a cash balance of \$597,369.30. Revenue from Credit Sales and other sources of income totaled \$699,255.86. Operations and Maintenance costs totaled \$275,224.31, while Capital Costs totaled \$237,740.00. The end of year cash balance was \$783,660.85 (Table 2.4).

Table 2.4. Financial summary for 2004.

Description of Item	Transaction Amt.	Balance
Cash Balance - January 1, 2004		597,369.30
Revenue		
Credits Sold (12.19) at \$50,000 per credit.	609,500.00	
Advance payment of 0.11 credits, received in advance	5,500.00	
Other Income - Native Seed Program.	19,945.86	
BLM Assistance Agreement Grant.	47,938.00	
Lower Amazon Creek Restoration Project Native	1,750.00	
Interest Income	14,622.00	
Subtotal of Revenues	699,255.86	
		1,296,625.16
Operations and Maintenance Costs		
WMB/OM Payroll and misc. operation expenses	196,763.32	
WMB/OM Dnbo/Wllw Crk Cnflnc	4,815.82	
WMB/OM Dnbo Wst: Balboa Phs I	4,369.08	
WMB/OM Dnbo Wst Bvr Rn Phs I	1,295.84	
WMB/OM Stewart Pond Complex	3,100.75	
WMB/OM Isblle St Mngmnt Unt	306.18	
WMB/OM N. Grnhll Cnst Phs I	111.61	
WMB/OM Nolan	7,771.28	
WMB-BLM Reimbursement	34.73	
WMB/OM Beaver Run Ph II	217.28	
WMB/OM Balboa Phase 2	3,784.65	
WMB/OM N Greenhill Phase 2	1,513.10	
WMB/OM Turtle Swale	4,702.02	
WMB/OM N Greenhill Phase 3	30,218.24	
WMB/OM Willow Corner	16,220.41	
Subtotal of Operations and Maintenance Costs	275,224.31	
		1,021,400.85
Capital Costs		
WMB - Willow Corner	28,566.10	
Dragonfly Bend Enhancement	13,462.23	
WMB Dragonfly Bend	91,753.88	
WMB Steward Pond Remedial	767.10	
Wetland Mitigation Project	488.16	
WMB - Oxbow West	14,702.84	
WMB Turtle Swale	16,415.23	
WMB - Seed Procurement Program	71,584.46	
Subtotal of Capital Costs	237,740.00	
		783,660.85
Cash balance - December 31, 2004		783,660.85

Chapter 3: Capital Improvement Plan

This chapter contains a summary of the projected new mitigation bank projects for 2005 through 2007. The Capital Improvement Program for 2005 – 2007 is outlined in Table 3.1, below.

Table 3.1. Capital Improvement Program for 2005 – 2007.

Year	Project Name	Description of Actions ¹	Acres	Credits ²
2005	Dragonfly Bend, Phase 2	Implement the second phase of the Dragonfly Bend MIP, using similar techniques to Phase 1.	7.50	3.75
2005	Oxbow West	Blackberry control, remove solarization/shade cloth plots, re-seed solarization/shade cloth plots.	13.82	3.17
2005	Lower Amazon (Meadowlark Prairie), Unit 2	As a precursor to more extensive site preparation, use agricultural techniques such as disking and tilling, plus thermal weed control, to kill the existing non-native vegetation on the site. Use no-till drill to plant aggressive native grass mix, to serve as a native cover crop until additional site prep is warranted.	52.25	0.00
2006	Lower Amazon (Meadowlark Prairie), Unit 2	Foster establishment of native grass cover crop. Control spread of any aggressive, non-native species that become established.	52.25	0.00
2007	Lower Amazon (Meadowlark Prairie), Unit 2	Foster establishment of native grass cover crop. Control spread of any aggressive, non-native species that become established.	52.25	0.00

¹ For a full description of the planned actions, refer to the associated MIP

² The number of credits is estimated based on the approved MIP. The final number of certified credits is determined by as-built conditions and the subsequent approval by the DSL and the Corps. Credits are shown as 0.0 when the specific activity (e.g., doing initial site prep) shown in any one year does not actually generate credits.

Chapter 4: Plant Materials Procurement Program

The West Eugene Wetlands Partnership's plant procurement program continues to evolve and improve. The plant procurement program seeks to: (a) ensure the availability of native plant materials for restoration efforts within the West Eugene Wetlands study area, and (b) determine and implement the most ecologically and cost-effective propagation and establishment methods for each species.

Towards these ends, in spring of 2004 we began a systematic review of 10 years worth of restoration data on seeding success and combined that with a review of a list of all native species observed within the West Eugene Wetlands Partnership boundary. Each species was evaluated based on many criteria, including, but not limited to:

- whether or not it has been planted by seed before
- establishment success using seeds on past projects
- whether seed of the species was already being grown out by a commercial or private grower
- our current inventory of seed for the species
- the species' importance in high quality remnant habitats
- establishment success with planting the species using alternative methods (plugs, bulbs, or bare root plantings).

The result of this analysis was to assign a propagation strategy for each species within the four main habitats of the area (wet prairie, vernal pool wetland, emergent wetland, upland prairie). As we learn more about each species, these strategies will be updated.

The main propagation strategy for most species is still via seeds (see Table 4.1). Seeds of most of our native wetland species are not available commercially, particularly seed of local origin that will allow us to maintain genetic integrity of local wetland plant communities. Thus, seed is obtained in two main ways: (a) by purchase from a private or public grower, or (b) hand-collected from sites within 20 miles of west Eugene and processed by field staff, contract collectors, and youth crews. In the future, we intend to use private growers to a much greater extent to increase the supply of up to 45 species used in our restoration program. This will both increase the absolute amount of seed available for restoration projects, as well as substantially reduce the price/unit of seed that we procure.

We managed three seed collection crews in 2004 - two crews collected seed for restoration sites, and one crew collected seed for use in the contract growout programs we have with both private and public growers. Seed was collected through the combined efforts of BLM, The Nature Conservancy, City of Eugene, Lane Metro Youth Crews, Northwest Youth Corps, and volunteers in 2004. Over 171 pounds of seed from 107 species of native plants were collected by the combined effort, which is our biggest harvest to date. The majority of the seed collected in 2004 was used for the direct seeding of mitigation bank sites. However, one quarter of the total seed collected in 2004 was collected specifically for growout programs, to decrease collection needs in the future.

We currently have seed growout programs with five different growers, and bulb, plug, and bare-root stock growout with two additional growers. A summary of the 2004 activities with each grower are summarized below and in Table 4.1.

- **Horning Seed Orchard:** The Bureau of Land Management's Horning Seed Orchard in Colton, Oregon began growing out some of our species in 2004 for seed production. Two perennial species (*Glyceria occidentalis* and *Luzula comosa*) were successfully grown from plugs and planted out in the field in 2004. Ten annual forbs were planted in the spring of 2004. Seed was produced from five species; wetter beds and earlier planting dates are required for the other species. Eight perennial forbs were planted in the fall of 2004. Twenty more species will be planted for the 2005 growing season. Improvements have been made for replicating vernal pool and emergent habitats for greater success. By 2006, we hope to transfer production of many of these species to Heritage Seedlings (see below).
- **Heritage Seedlings:** Heritage Seedlings in Salem, Oregon, began growing out eighteen species for us under contract in 2004. We are looking forward to sending more upland prairie and wet prairie species to this established seed grower in 2005.
- **Stone Nursery:** The U.S. Forest Service's J. Herbert Stone Nursery (Stone) in Central Point, Oregon has been growing out small seed quantities for the WEW Partnership since 1996. To date, Stone has attempted to grow approximately 45 species of native plants from the West Eugene Wetlands. Most of these species are no longer grown at Stone. However, during 2004, Stone provided over fifty pounds of seed, representing five species of native plants used in the West Eugene Wetlands. Most of the seed that is produced at the nursery is seeded onto West Eugene Wetlands mitigation bank sites.
- **Pacific Northwest Natives (PNN):** PNN in Albany, Oregon has successfully grown more than nine species from the West Eugene area in larger plots, including: *Agrostis exarata*, *Beckmannia syzigachne*, *Danthonia californica*, *Deschampsia cespitosa*, *Elymus glaucus*, *Epilobium densiflorum*, *Hordeum brachyantherum*, *Lupinus rivularis*, and *Plagiobothrys figuratus*. During 2004, over 150 pounds of seed were purchased from PNN for wetland mitigations. All seed has gone through the Oregon State seed certification program, including germination and purity testing. Also, over 3,000 *Camassia quamash* bulbs were salvaged in 2004 from private land slated for development. They were sent to PNN for future seed production.
- **Plant Materials Center:** The USDA-NRCS Plant Materials Center (PMC) in Corvallis, Oregon worked with germinating, retaining vigor, and specialized harvest techniques for thirty species of West Eugene plants in 2004. Many of these species germinated successfully, including some that took two years to germinate. Seeds from problematic species were grown out under controlled conditions; the seeds produced by those efforts were returned to the West Eugene Wetlands program. Some of the new species sent to other growers in 2004 were previously grown successfully at PMC.
- **Trillium Gardens:** Trillium Gardens, a private nursery in Pleasant Hill, Oregon, grew over 100,000 seedlings (plugs and bare-root stock) in 2004. About 9,000 of these were forbs, while over 95,000 were bare-root sedges and rushes, as well as grass plugs. Plugs and bare-root seedlings were planted in the fall of 2004 on a few restoration sites by a private contractor.
- **Buggy Crazy:** A program was started in 2003 with a private bulb grower, Buggy Crazy (Lebanon, Oregon), to produce bulbs and bare-root stock of nine plant species. About 6,000 two-year-old bulbs and 500 bare root plants of eight species were planted out by a private contractor in 2004. We will have three-year-old bulbs to plant starting in 2005, and for each year thereafter.

Table 4.1. Plant Procurement Program. Description of current plant procurement strategy for the West Eugene Wetlands Partnership. An “x” in a box indicates that we used that strategy in 2004. A “2005” in a box indicates that we plan on using that strategy beginning in 2005. * em = emergent, up = upland prairie, vp = emergent, wp = wet prairie.

Species	Habitat*	Hand Collected	Purchased Seed					Plugs, Bare Root, and Bulbs	
			Heritage	PMC	Horning	PNN	Stone	Buggy Crazy	Trillium
<i>Achillea millefolium</i>	up		x						x
<i>Agoseris grandiflora</i>	up	x							
<i>Agrostis exarata</i>	wp/vp					x			
<i>Alisma triviale</i>	em	x							
<i>Allium amplexans</i>	wp/up	x						x	
<i>Apocynum cannabinum var. glaberrimum</i>	wp/up	x							
<i>Asclepias fascicularis</i>	wp	x							
<i>Asclepias speciosa</i>	wp/up	x	2005						x
<i>Aster hallii</i>	wp/up		2005				x		x
<i>Balsamorhiza deltoidea</i>	up			x					
<i>Beckmannia syzigachne</i>	em					x			
<i>Bidens cernua</i>	em	x							
<i>Bidens frondosa</i>	em	x							
<i>Brodiaea coronaria</i>	wp/up	x		x				x	
<i>Brodiaea elegans</i>	wp/up	x						x	
<i>Bromus carinatus (prairie)</i>	up	x	2005	x					
<i>Bromus sitchensis</i>	up	x				x			
<i>Calochortus tolmei</i>	up	x						x	
<i>Calochortus uniflorus</i>	wp	x		x					
<i>Calystegia atriplicifolia ssp. atriplicifolia</i>	up	x							
<i>Camassia leichtlinii ssp. suksdorfii</i>	up	x						x	
<i>Camassia quamash var. maxima</i>	wp	x						x	
<i>Cardamine penduliflora</i>	vp/wp	x		x					
<i>Carex aurea</i>	wp	x		x					
<i>Carex densa</i>	em						x		
<i>Carex feta</i>	vp/wp	x		x					
<i>Carex lanuginosa</i>	vp	x		x					
<i>Carex obnupta</i>	em	x		x					
<i>Carex stipata</i>	em	x			x				
<i>Carex tumulicola</i>	up		x						
<i>Carex unilateralis</i>	vp/wp				x		x		x
<i>Carex vesicaria</i>	vp/wp	x		x					
<i>Castilleja tenuis</i>	wp/up	x	2005	x					
<i>Cicendia quadrangularis</i>	vp	x		x					
<i>Clarkia amoena</i>	up		x	x					
<i>Clarkia purpurea</i>	up		x						
<i>Collomia grandiflora</i>	wp/up		x						
<i>Danthonia californica</i>	wp/up					x			
<i>Delphinium menziesii</i>	up			x					
<i>Deschampsia cespitosa</i>	wp					x			
<i>Deschampsia danthonioides</i>	vp/wp	x	2005	x					
<i>Deschampsia elongata</i>	wp	x		x					
<i>Dicanthelium acuminatum</i>	wp	x			x				
<i>Dichelostemma congestum</i>	wp	x						x	
<i>Downingia spp. (elegans and yina)</i>	vp/wp	x				x			
<i>Eleocharis acicularis</i>	em			x					

Species	Habitat*	Hand Collected	Purchased Seed					Plugs, Bare Root, and Bulbs	
			Heritage	PMC	Horning	PNN	Stone	Buggy Crazy	Trillium
<i>Eleocharis obtusa</i>	em	x			x				
<i>Eleocharis palustris</i>	em	x							
<i>Elymus glaucus</i>	up					x			
<i>Elymus trachycaulus</i>	up	x	2005						
<i>Epilobium densiflorum</i>	wp					x			
<i>Epilobium pygmaeum</i>	vp/em	x							
<i>Eriophyllum lanatum</i>	wp/up		x				x		
<i>Eryngium petiolatum</i>	vp	x							
<i>Festuca californica</i>	up	x	x						
<i>Festuca roemerii</i>	up	x	2005	x					
<i>Fragaria virginiana</i>	wp/up	x						x	
<i>Galium trifidum</i>	wp	x		x					
<i>Gentiana sceptrum</i>	wp	x		x					
<i>Geranium oreganum</i>	up	x		x					
<i>Geum macrophyllum var. macrophyllum</i>	wp	x							x
<i>Gilia capitata</i>	wp/up	x		x					
<i>Glyceria occidentalis</i>	vp/em	x			x				
<i>Gnaphalium palustre</i>	vp/em	x							
<i>Gratiola ebracteata</i>	vp	x							
<i>Grindelia integrifolia</i>	vp/wp	x	2005		x				
<i>Hordeum brachyantherum</i>	vp					x			
<i>Iris tenax</i>	up							x	
<i>Juncus acuminatus</i>	vp/em	x							x
<i>Juncus bolanderi</i>	vp/em	x					x		x
<i>Juncus effusus var. pacificus</i>	vp/em	x							x
<i>Juncus ensifolius</i>	vp	x							x
<i>Juncus nevadensis</i>	vp/wp	x		x					x
<i>Juncus oxymeres</i>	vp/em	x							x
<i>Juncus patens</i>	vp/em	x							x
<i>Juncus tenuis</i>	wp/up	x	2005						x
<i>Koeleria macrantha</i>	up	x	2005						
<i>Lasthenia glaberrima</i>	vp			x					
<i>Leersia oryzoides</i>	em	x							
<i>Linanthus bicolor</i>	wp			x					
<i>Lomatium nudicaule</i>	wp/up	x	2005	x	x				
<i>Lomatium utriculatum</i>	up	x							
<i>Lotus formosissimus</i>	wp	x		x					
<i>Lotus unifoliatus var. unifoliatus</i>	wp/up		x						
<i>Ludwigia palustris</i>	vp/em	x		x					
<i>Lupinus affinis</i>	up			x					
<i>Lupinus bicolor</i>	wp	x		x					
<i>Lupinus polyphyllus</i>	wp	x	2005						
<i>Lupinus rivularis</i>	wp/up	x				x			
<i>Luzula comosa</i>	wp/up		2005	x	x				
<i>Madia elegans</i>	wp		x						
<i>Madia glomerata</i>	wp				x				
<i>Madia sativa</i>	wp/up		x						
<i>Microseris laciniata</i>	wp/up	x	2005				x		
<i>Mimulus guttatus</i>	vp/wp	x							
<i>Montia linearis</i>	vp			x					
<i>Myosotis laxa</i>	vp	x		x					
<i>Myosurus minimus</i>	vp	x		x					

Species	Habitat*	Hand Collected	Purchased Seed					Plugs, Bare Root, and Bulbs	
			Heritage	PMC	Horning	PNN	Stone	Buggy Crazy	Trillium
<i>Navarretia intertexta</i>	vp	x		x					
<i>Nemophila menziesii</i>	up			x					
<i>Orthocarpus bracteosus</i>	wp		x						
<i>Perideridia</i> spp. (<i>gairdneri</i> and <i>oregana</i>)	wp/up	x	2005	x					
<i>Phlox gracilis</i>	vp			x					
<i>Plagiobothrys figuratus</i>	vp/wp					x			
<i>Plectritis congesta</i>	wp/up		2005						
<i>Poa scabrella</i>	up	x							
<i>Potentilla gracilis</i>	wp/up		x						x
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	wp/up		x						x
<i>Psilocarpus elatior</i>	em	x							
<i>Pyracoma racemosa</i>	wp			x					
<i>Ranunculus occidentalis</i>	wp		x						x
<i>Ranunculus alismafolia</i>	vp	x							
<i>Ranunculus orthorhynchus</i>	wp	x	x		x				
<i>Rorippa curvisiliqua</i>	em/vp			x	x				
<i>Rumex salicifolius</i>	up	x			x				
<i>Saxifraga oregana</i>	wp			x				x	
<i>Sidalcea cusickii</i>	wp	x				x			x
<i>Sidalcea virgata</i>	up		x	x					
<i>Sisyrinchium idahoense</i>	wp/up	x						x	
<i>Thalictrum fendleri</i> var. <i>polycarpum</i>	up	x		x					
<i>Triteleia hyacinthina</i>	wp	x						x	
<i>Veronica peregrina</i> var. <i>xalapensis</i>	vp	x			x				
<i>Veronica scutellata</i>	em/vp								
<i>Viola praemorsa</i>	up			x					
<i>Wyethia angustifolia</i>	wp/up	x	2005				x		x
<i>Zigadenus venenosus</i>	wp/up	x						x	

Chapter 5: Introduction to Site Reports

Monitoring reports have been prepared for all active West Eugene Wetlands Mitigation Bank sites. The reports are found in the following section (Part 2: Chapters 6-16). There are currently ten mitigation sites within the monitoring program. Bank sites are monitored for a period of 5 or 7 years. The duration of monitoring is dependent upon which authorizing agreement mandated Bank operations at the time the MIP was approved. During the monitoring period, a variety of assessments are made of each site throughout the year.

The monitoring reports are utilized when assessing the mitigation's success in achieving the performance criteria and the overall performance of the mitigation. Qualitative assessments are made on a quarterly basis and seek to document site hydrology, non-native vegetative cover, and wildlife use. Quantitative vegetation assessments occur in years 2, 5, and 7 (if applicable). Analysis of collected data is considered against the performance criteria outlined in the site's MIP. The progress of the site towards meeting mitigation bank standards is assessed at this time. Both qualitative and quantitative data guide the maintenance activities prescribed for each site. The methods used in the collection of all data are discussed in detail in Appendix A.

The outline of each site report is given below. The reports begin with a description of the site, its history, and management goals. This section also includes a site map. A summary of the site's progress toward meeting mitigation bank performance criteria follows. The current year's management and maintenance actions, along with recommendations for future management actions, are also included. The final section summarizes the data collection and analysis that took place in the current year.

I. Site Name

A. Site Description

1. *Size*
2. *Ownership*
3. *Site Timeline*
4. *Location*
5. *Site History*
6. *Focus of Prescriptions*
7. *Site-Specific Management Goals*
8. *Site Map*

B. 2003 Monitoring Summary

1. *2003 Management Actions*
2. *Management Actions for 2004*

C. Monitoring Results

1. *Hydrology*
 - a) *Methods*
 - b) *Results*
2. *Vegetation*
 - a) *Methods*
 - b) *Results*
3. *Wildlife Utilization*

Chapter 6: Balboa Unit

A. Site Description

1. *Size:* 74.1 acres
2. *Ownership:* BLM, City of Eugene
3. *Site Timeline:* **Table 6.1**

	Section	Year of Construction	Acreage	Monitoring Period
Phase 1	Northern Portion (Atlantic/Pacific)	1998	1 acre	1999-2004
	Southern Portion	1998	7 acres	1999-2003
Phase 2		1999	1.57 acres	2000-2004
Enhancement		1999	10 acres	2000-2005

* For the final report on the southern portion of Phase 1, see the 2003 Annual Report.

4. Location

West side of Danebo Road, adjacent to the north bank of Amazon Creek. TRS, Tax lot #:17-04-33-20 tax lots: 603 and 700

5. Site History

Over the course of the last 60 years this site has been modified to serve as an airfield and a drag racing strip. Prior mitigation prescriptions were executed for the development of Ross Industrial properties located to the north and east along Danebo Ave. These prescriptions removed segments of the former airstrip runway.

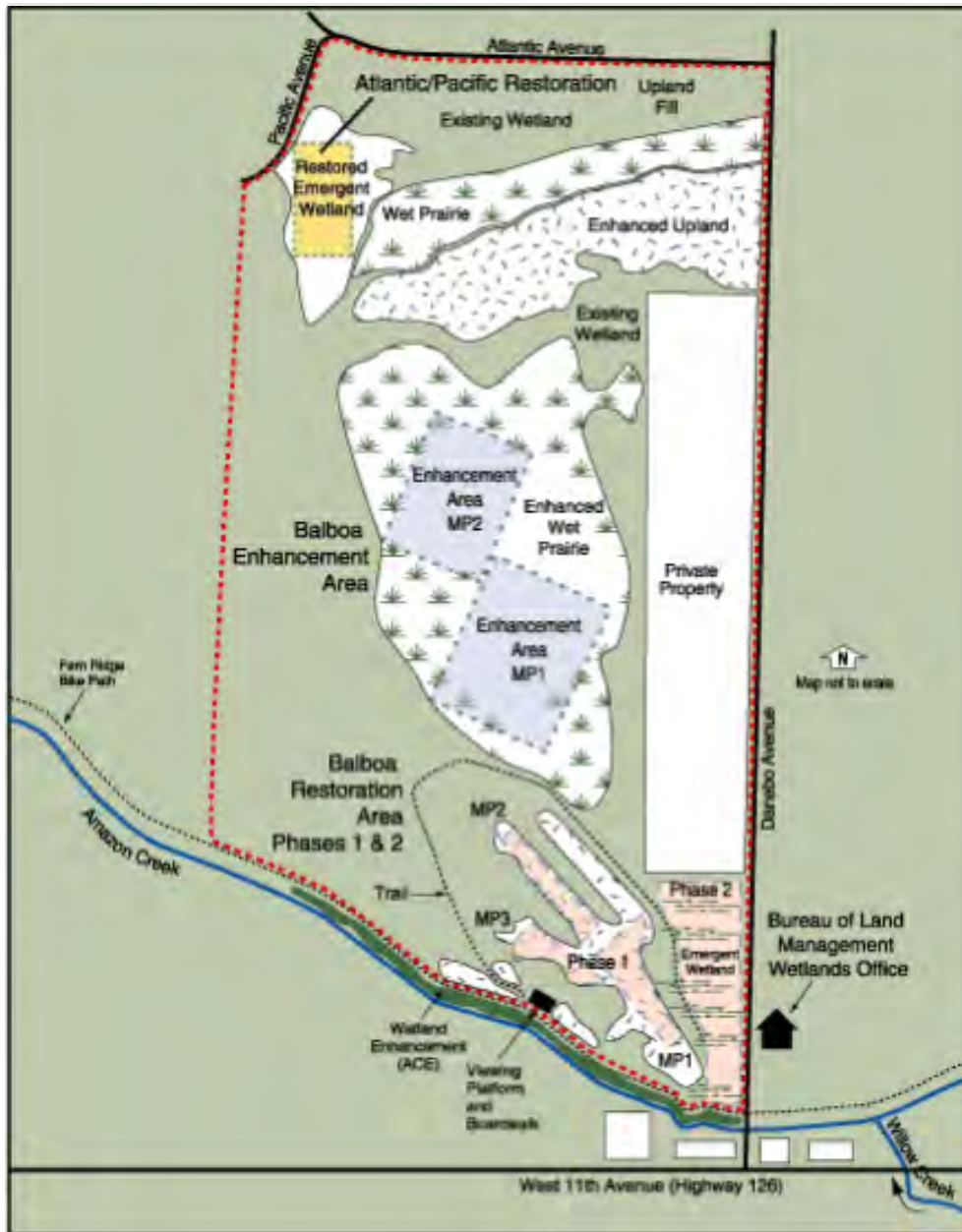
6. Focus of Prescriptions

Restoration and enhancement of a large, continuous wetland tract adjacent to Amazon Creek that connects adjacent grasslands and enhances the wildlife corridor. Frontage along Amazon Creek exposes the public to a variety of wetland community types occurring within the west Eugene system. Prescriptions include removal of the remaining runway, removal of fill material, removal of noxious and invasive species, and seeding/planting of native grasses and forbs. In addition, an upland area will be enhanced to serve as a buffer from adjacent industrial land use and a trail system will be developed through the unit

7. Site-Specific Management Goals

1. Restore wet prairie and emergent wetland vegetation to areas proposed for fill removal.
2. Enhance existing wet prairie vegetation by removing invasive woody vegetation and maintaining as prairie through periodic burning and/or mowing on a portion of the wetland area that has moved from wet prairie to scrub-shrub wetland.
3. Restore native wet prairie and emergent wetland conditions by removing fill material to the original hydric soil surface.
4. Enhance habitat conditions for native wildlife species associated with wet prairie and emergent wetland habitats.
5. Maintain upland areas in native vegetation.

Balboa North and South



- Atlantic/Pacific Restoration Macroplot
- Balboa Enhancement Macroplot
- Balboa Restoration Macroplot

Figure 6.1. Balboa Site Map. The Enhancement area, Phases 1 and 2 restorations, and the Atlantic/Pacific restoration are labeled with their associated macroplots. Although not labeled as such, the area within the red project line that is shaded green is existing wetland.

B. 2004 Monitoring Summary

Phase 1 North (Atlantic/Pacific):

Hydrology and vegetation monitoring show that Phase 1 North meets all mitigation bank criteria. It continues to exhibit wetland soils, hydrology and native hydrophytic vegetation. Of the total plant cover, 76% is from native species and 86% of those species occurring at a 50% frequency rate or greater are from the Native Plant list.

Phase 2 Restoration:

Hydrology and vegetation monitoring show that Phase 2 meets all mitigation bank criteria. It continues to exhibit wetland soils, hydrology and native hydrophytic vegetation. Of the total plant cover, 91% is from native species. Additionally, 54 native species were observed in the restoration, with 13 having a percent cover of >1%.

Enhancement Area:

The rare plant populations in the Balboa Enhancement appear stable. *Erigeron decumbens* ssp. *decumbens* decreased after the initial treatment, but appears to have stabilized. *Horkelia congesta* var. *congesta* and *Aster curtus* populations were within their historic range of variability in 2004.

The Great Copper butterfly (*Lycaena xanthoides*) was also rediscovered in the West Eugene Wetlands using restored areas of the Balboa Unit. The Great Copper, last recorded in the area 30 years ago, nectars almost exclusively on *Grindelia integrifolia* and uses *Rumex salicifolius* as its host plant—both species are abundant in the area because of the mitigation bank restoration.

1. 2004 Management Actions

Phase 2 Restoration:

1. Maintenance crews spent 2 days removing woody vegetation.
2. The bike path edge was mowed to prevent the spread of exotic plant seed and to keep vegetation out of the bike path.

Enhancement specific actions:

1. The whole enhancement area, except the largest concentration of *Erigeron decumbens* ssp. *decumbens*, was mowed to reduce shrubs cover.
2. All reed canarygrass populations were mowed prior to seed development.

2. Management Actions for 2005

Entire Site:

1. Control reed canary-grass (*Phalaris arundinacea*) across the site to prevent its spread into the restoration and enhancement areas.
 - i. Weed out small patches of reed canary-grass located along the viewing deck and along the walking trail.
 - ii. Mow reed canary-grass patches to prevent seeds from spreading.
 - iii. Use shade cloth on the reed canary-grass patches that are spreading into the enhancement area from the west.
2. Cut blackberries in upland prairie area as resources allow.
3. Continue to mow bike path edge (3 times a season)

Phase 1 and 2 Restorations:

Further management will be the responsibility of the Bureau of Land Management

Enhancement specific actions:

1. Mow/ treat areas of reed canarygrass with methods appropriate to the size of each patch (i.e., hand pull, solarize, etc.)
2. Grind tree stumps to prevent resprouting.
3. Mow the enhancement area.

Table 6.2. Progress of the Balboa Unit restorations towards meeting the MOA vegetation standards. The most recent data for each phase is compared to its relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site’s success in meeting the associated standard. ‘PI’ refers to point-intercept cover data collection.

Site Characteristics and MOA Vegetation Standards	Phase 2	Goal Met?	Phase 1: Northern Portion	Goal Met?
Site status in the monitoring period	Year 5 of 5	N/A	Year 6 of 5	N/A
Most recent quantitative data collected in year:	2004	N/A	2004	N/A
50% native cover after 2 years	49%	Yes	51%	Yes
70% native cover after 5 years	91%	Yes	76%	Yes
75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list	100%	Yes	86%	Yes
70% of the planted species shall be alive and present at the end of the five year monitoring period	77%	Yes	74%	Yes
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	10	Yes	12	Yes
Emergent/Vernal Pool: min 5 native species occurring at 10% frequency rate or greater	12	Yes	11	Yes

Table 6.3. Progress of the Balboa Unit enhancement towards meeting the MIP vegetation standards. The most recent data for the enhancement is compared to its relevant vegetation standards from the MIP. A date in the cell indicates the year in which the data will be collected to evaluate the site’s success in meeting the associated standard.

Site Characteristics and MIP Vegetation Standards	Enhancement Area	Goal Met?
Site status in the monitoring period	Year 5 of 6	N/A
Most recent quantitative data collected in:	1999 (baseline data)	N/A
60% reduction of total shrub cover after 5 years	2005	TBD
70% reduction of tree density after 5 years	2005	TBD

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil were estimated and mapped during a site visit in the 2nd quarter (March-May). Each phase receives an estimate for the percentage of the mitigation covered by standing water and saturated soils.

b) Results

Despite the below average rainfall from January through May, observations during 2004 indicate that the hydrology of Phase 1 North (Atlantic/Pacific) and Phase 2 Restorations, along with the Enhancement Area continues to be sufficient to support hydric soil development. Saturated soils persisted over the site into the growing season at depths appropriate for native wetland vegetation establishment (Figures 6.2 – 6.5).

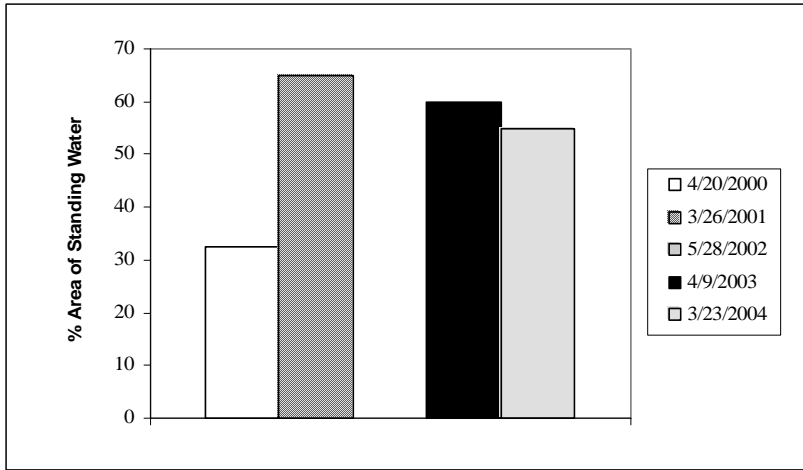


Figure 6.2. Spring standing water in Phase 2 of the Balboa Unit. Percentage of Phase 2 with standing water in the late spring over the history of the restoration.

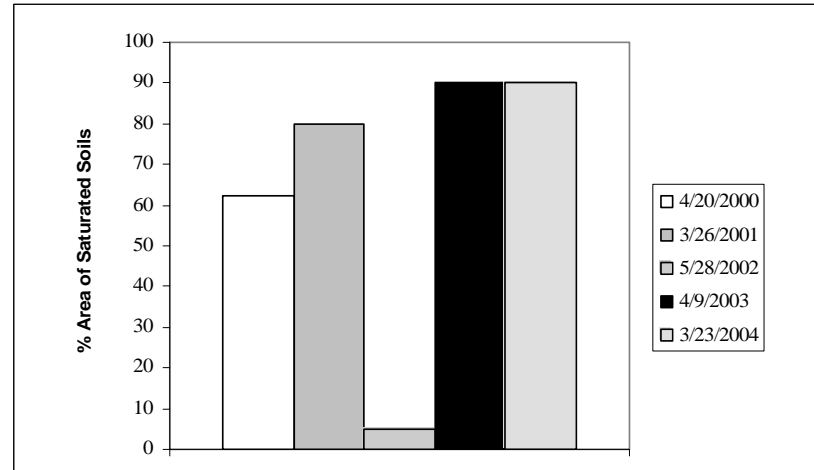


Figure 6.3. Spring saturated soils in Phase 2 of the Balboa Unit. Percentage of the Phase 2 with saturated soils in the late spring over the history of the restoration.

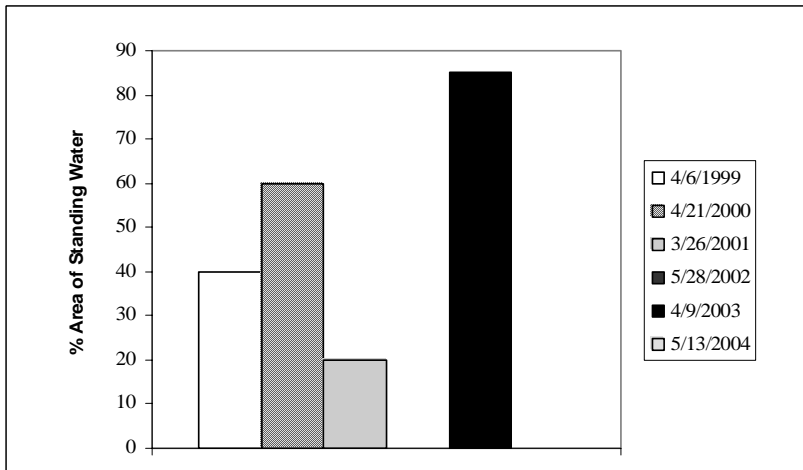


Figure 6.4. Spring standing water in the Atlantic/Pacific portion of the Balboa Unit. Percentage of Atlantic/Pacific with standing water in the early spring over the history of the restoration.

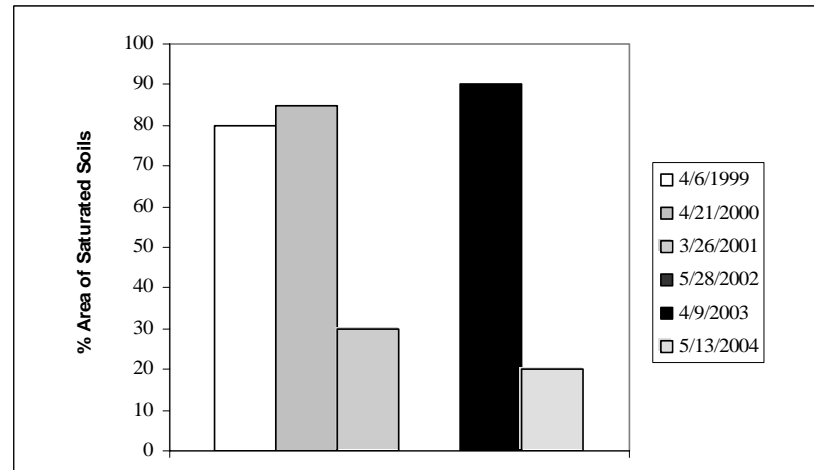


Figure 6.5. Spring saturated soils in the Atlantic/Pacific of the Balboa Unit. Percentage of the Atlantic/Pacific with saturated soils in the early spring over the history of the restoration.

2. Vegetation

a) Enhancement Methods

Rare species monitoring on the Balboa Unit enhancement area is required by the MIP to occur annually. Monitoring was conducted on June 24th through July 2nd. Three rare plant species were monitored. Data collection included:

- Frequency of *Aster curtus* in 2464 1m² quadrats
- Complete census, number of reproductive plants, and number of inflorescences per reproductive plant for *Erigeron decumbens* ssp. *decumbens*
- Complete census, numbers of seedling, vegetative, and reproductive plants, and number of inflorescences per reproductive plant for *Horkelia congesta* var. *congesta*

Qualitative monitoring for the site included an update to the plant species lists for the entire Balboa Unit. These lists can be viewed in Appendix B.

b) Results

All plant populations increased from 2003 to 2004 (Figure 6.6). *Horkelia congesta* var. *congesta* is up 5 plants from 2003, the frequency of *Aster curtus* is up 15, and the number of *Erigeron decumbens* ssp. *decumbens* crowns is up 9.

The data collected in 1999 was before the initial woody vegetation removal, and can therefore be used to begin to investigate the effects of woody vegetation removal on these populations. It appears that the removal of trees and shrubs has not adversely impacted the populations *Horkelia congesta* var. *congesta* or *Aster curtus* and has likely helped to promote the population expansion of *Aster curtus*. Despite the continued decline of *Erigeron decumbens* ssp. *decumbens*, the removal of woody vegetation may have had some influence on the number of flowers produced per crowns of *Erigeron decumbens* ssp. *decumbens*. The flowering of *Erigeron decumbens* ssp. *decumbens* has increased by 31%.

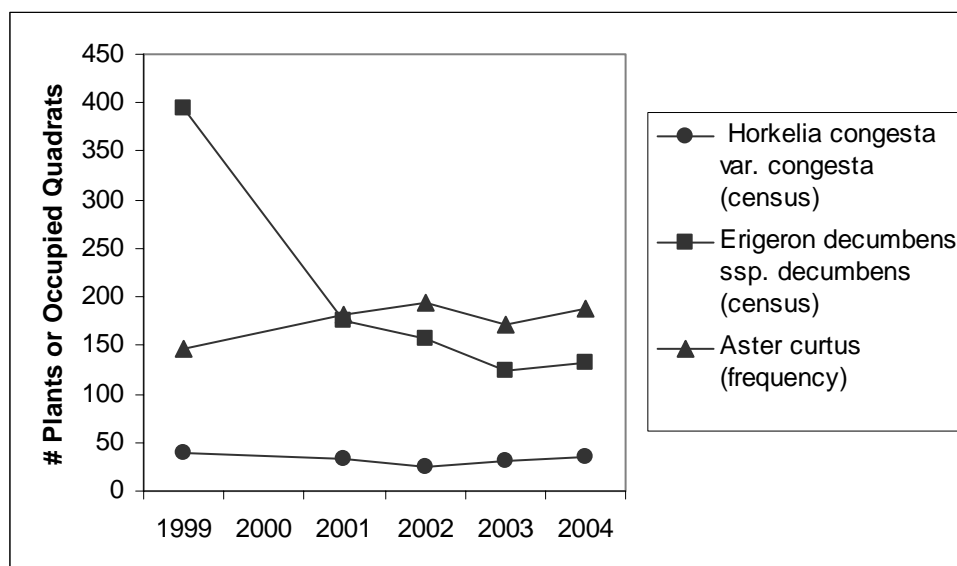


Figure 6.6. Rare plant population trends on the Balboa enhancement. Census data for *Horkelia congesta* var. *congesta* and *Erigeron decumbens* ssp. *decumbens* and frequency data for *Aster curtus* are plotted from 1999-2004, excluding 2000.

Erigeron decumbens ssp. *decumbens*

The number of *Erigeron decumbens* ssp. *decumbens* plants observed from increased 2003 to 2004 by 9 individuals; however, the total number of flowers continues to decline.

Table 6.4. *Erigeron decumbens* ssp. *decumbens* population trends from 1999 and 2001-2004.

Attributes for the *Erigeron decumbens* ssp. *decumbens* population on the Balboa Unit enhancement are given for 1999 and 2001-2004.

<i>Erigeron decumbens</i> ssp. <i>decumbens</i>	1999	2000	2001	2002	2003	2004
Total # of plants	394	No data	175	156	124	133
% of plants reproductive	71.1%	No data	48.6%	96.7%	94.3%	87.2%
Avg. # of flowers per reproductive plant	4.8	No data	11.2	14.4	11.0	11.1
Total # flowers	1349	No data	1736	2175	1292	1282

Horkelia congesta var. *congesta*

The *Horkelia congesta* var. *congesta* population increased by 5 individuals from 2003 to 2004. The total number of flowering stems increased from 2003 by 27.

Table 6.5. *Horkelia congesta* var. *congesta* population trends from 1999 and 2001-2004. Attributes for the *Horkelia congesta* var. *congesta* population on the Balboa Unit enhancement are given for 1999 and 2001-2004.

<i>Horkelia congesta</i> var. <i>congesta</i>	1999	2000	2001	2002	2003	2004
Total # of plants	39	No data	33	25	30	35
% of plants reproductive	51.3%	No data	48.5%	96.0%	63.3%	No data
Avg. # of flowering stems per reproductive plant	1.55	No data	1.87	1.87	1.63	No data
Total # flowering stems	31	No data	30	45	31	58

Aster curtus

The frequency *Aster curtus* within the macroplot increased from 2003 to 2004, but remains within the historic range of variability.

Table 6.6. *Aster curtus* frequency on the Balboa Unit enhancement from 1999 to 2004.

<i>Aster curtus</i>	1999	2000	2001	2002	2003	2004
Total # of plots occupied	147	No data	182	195	172	187

c) Phase 1 Northern Portion (Atlantic/Pacific) Methods

Both point-intercept (214 points) and nested frequency (104 frames) data were collected in the northern portion of Phase 1 July 26th through 28th of 2004.

d) Phase 1 Northern Portion (Atlantic/Pacific) Results

Phase 1 North was sampled in 2000 and 2004 for percent cover of native vegetation, non-native vegetation, bare ground litter and moss (Figure 6.7). Vegetative cover increased significantly, 62.4% ($56.9\% < \mu < 67.7\%$) to 82.3% ($77.5\% < \mu < 86.5\%$), between 2001 and 2004. The increase in native cover was not significant, 52.7% ($47.2\% < \mu < 58.2\%$) to 62.3% ($56.5\% < \mu < 67.8\%$); however, the increase in non-native vegetation was significant 16.0% ($12.2\% < \mu < 20.5\%$) to 36.3% ($30.8\% < \mu < 42.0\%$). The percent cover of bare ground decreased significantly from 37.5% ($32.3\% < \mu < 43.0\%$) to 14.0% ($10.2\% < \mu < 18.4\%$). This project meets the mitigation bank standard of 70% native vegetation of with 76% of the total cover being native. Changes in the cover of individual species with greater than five percent cover can be viewed in Figure 6.8. There were significant increases in grasses (*Agrostis exarata* and *Deschampsia cespitosa*) and vernal pool forbs such as *Grindelia integrifolia* and *Eryngium petiolatum*.

A total of 98 species were detected during nested frequency data collections. Of those 98 species, 51 were from the native plant list of West Eugene, 46 were not native, and 2 we could not be identified to the species level. Table 6.7 lists the species observed with a frequency of greater than 10%. Habitat information is also provided for the native species. Of the native species occurring in Phase 1 North with a frequency of greater than 10%, 7 were wet prairie species, 5 were wet prairie/vernal pool, and 11 were vernal pool or emergent species. Thus, the mitigation bank goal of 10 wet prairie species and 5 vernal pool species with greater than 10% frequency was met.

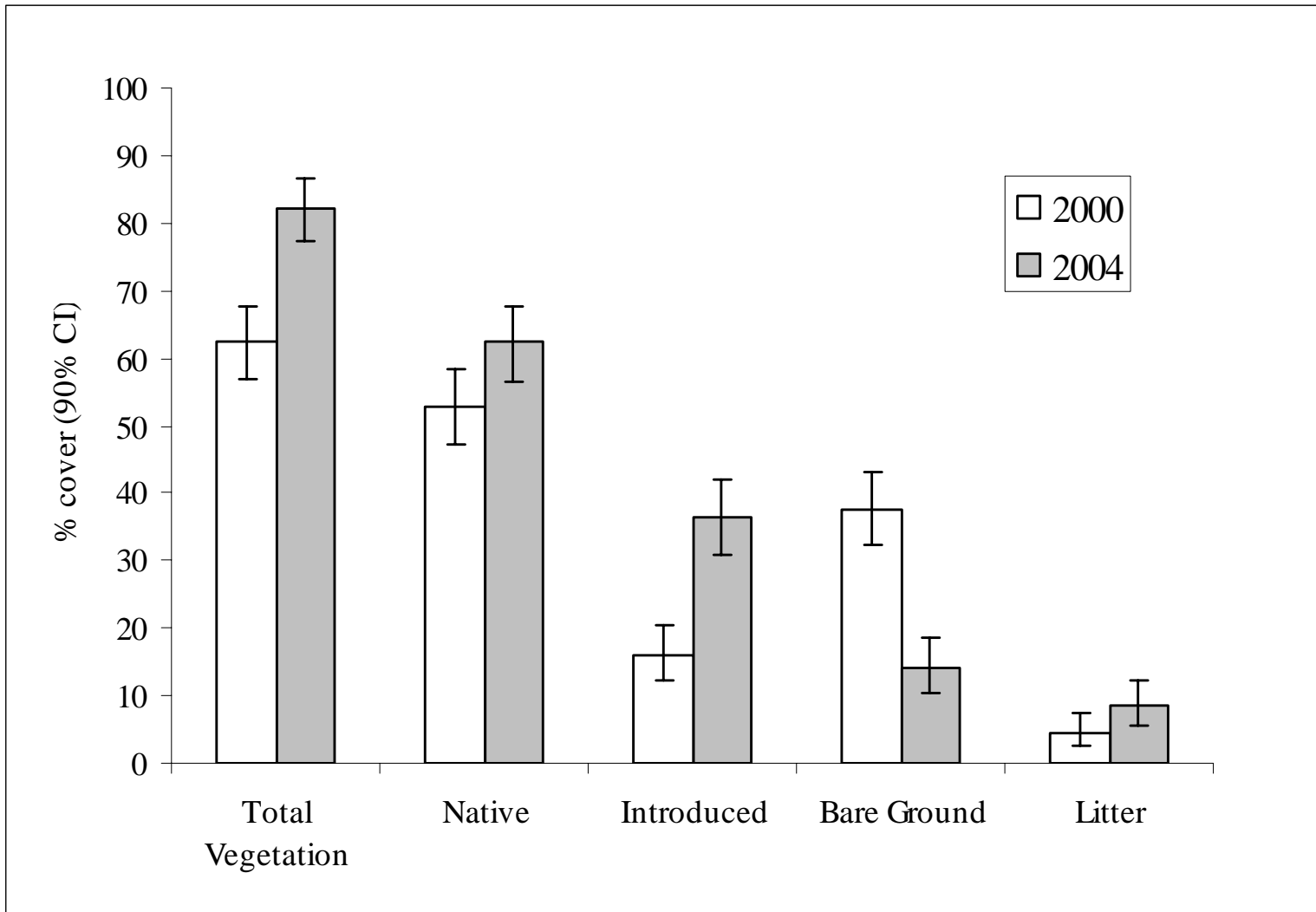


Figure 6.7. Percent cover of ground cover guilds at the Balboa Unit Phase 1 Northern Portion (Atlantic/Pacific). Total percent cover, native percent cover and introduced percent covers are graphed for the 2nd and 6th years of the monitoring period for the Phase 1 northern section of the Balboa Unit.

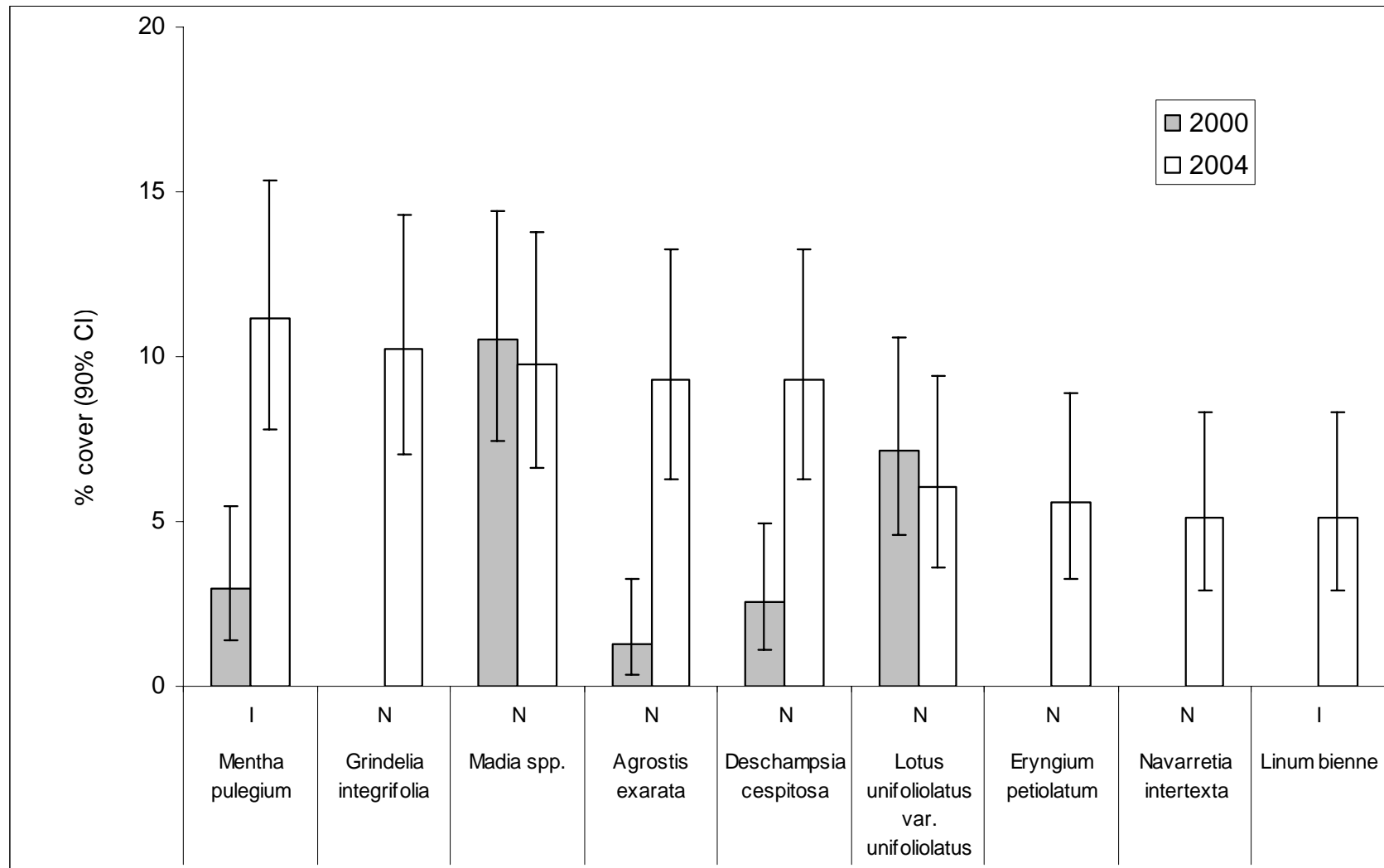


Figure 6.8. Native species on the Phase 1 northern section of the Balboa Unit with > 5% cover. All native species in 2004 with greater than 5 percent cover are graphed for 2000 and 2004.

Table 6.7. Species Present with Greater than 10% Frequency in the Northern portion of Balboa Phase 1 (Atlantic/Pacific). All species present with > 10% frequency in Balboa Phase 1 North are listed with their origin and 90% confidence limits. Habitat information is also listed for native species where ‘WP/VP’ refers to species present in both wet prairie and vernal pool habitats, ‘VP/E’ represents vernal pool and emergent habitats, ‘E’ represents emergent habitats, and ‘WP’ corresponds to wet prairie habitat.

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Mentha pulegium</i>	I	79.81	72.24	86.05	
<i>Deschampsia cespitosa</i>	N	65.38	56.97	73.13	WP
<i>Madia species</i>	N	65.38	56.97	73.13	WP/VP
<i>Lotus unifoliolatus var. unifoliolatus</i>	N	63.46	55.00	71.34	WP
<i>Grindelia integrifolia</i>	N	62.50	54.01	70.44	WP/VP
<i>Navarretia intertexta</i>	N	59.62	51.09	67.72	VP
<i>Agrostis exarata</i>	N	50.96	42.48	59.40	WP/VP
<i>Epilobium densiflorum</i>	N	48.08	39.66	56.58	WP
<i>Vicia tetrasperma</i>	I	42.31	34.11	50.85	
<i>Plagiobothrys figuratus</i>	N	41.35	33.19	49.88	VP
<i>Downingia sp</i>	N	40.38	32.28	48.91	VP
<i>Madia glomerata</i>	N	40.38	32.28	48.91	VP
<i>Eryngium petiolatum</i>	N	35.58	27.76	44.02	VP
<i>Leontodon taraxacoides</i>	I	34.62	26.87	43.03	
<i>Centarium erythraeae</i>	I	30.77	23.34	39.05	
<i>Daucus carota</i>	I	28.85	21.59	37.03	
<i>Lasthenia glaberrima</i>	N	26.92	19.86	35.00	VP
<i>Aira caryophyllea</i>	I	26.92	19.86	35.00	
<i>Hypochaeris radicata</i>	I	25.00	18.15	32.96	
<i>Veronica peregrina var. xalapensis</i>	N	22.12	15.61	29.85	
<i>Juncus tenuis</i>	N	20.19	13.95	27.76	WP
<i>Leucanthemum vulgare</i>	I	20.19	13.95	27.76	
<i>Gratiola ebracteata</i>	N	19.23	13.12	26.70	VP
<i>Parentucellia viscosa</i>	I	17.31	11.50	24.58	
<i>Linum bienne</i>	I	17.31	11.50	24.58	
<i>Moenchia erecta</i>	I	16.35	10.69	23.50	
<i>Prunella vulgaris var. lanceolata</i>	N	15.38	9.89	22.42	WP
<i>Trifolium dubium</i>	I	15.38	9.89	22.42	
<i>Briza minor</i>	I	15.38	9.89	22.42	
<i>Epilobium brachycarpum</i>	N	14.42	9.11	21.34	WP
<i>Alopecurus geniculatus</i>	UNK	14.42	9.11	21.34	
<i>Danthonia californica</i>	N	14.42	9.11	21.34	WP
<i>Vulpia bromoides</i>	I	13.46	8.33	20.24	
<i>Agrostis stolonifera/capillaris</i>	I	12.50	7.55	19.14	

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Galium parisiense</i>	I	12.50	7.55	19.14	
<i>Epilobium pygmaeum</i>	N	11.54	6.79	18.02	VP
<i>Alopecurus pratensis</i>	I	11.54	6.79	18.02	
<i>Kickxia elatine</i>	I	11.54	6.79	18.02	
<i>Beckmannia syzigachne</i>	N	10.58	6.05	16.90	E
<i>Carex densa</i>	N	10.58	6.05	16.90	VP/E

e) Phase 2 Methods

Both point-intercept (215 points) and nested frequency (121 frames) data were collected in the northern portion of Phase 1 July 7th, 10th, 11th, 14^h of 2004.

f) Phase 2 Results

Phase 2 was sampled in 2001 and 2004 for percent cover of native vegetation, non-native vegetation, bare ground litter and moss (Figure 6.9). Vegetative cover did not change significantly between 2001 and 2004. The percent cover of bare ground decreased significantly from 35.4% ($30.7\% < \mu < 40.3\%$) to 15.3% ($11.5\% < \mu < 20.0\%$). The percent cover of litter increased significantly from 9.3% ($6.7\% < \mu < 12.7\%$) to 24.7% ($19.9\% < \mu < 30.0\%$). This project meets the mitigation bank standard of 70% native vegetation of with 91% of the total cover being native. There have been significant changes in the proportion of grasses to forbs (Figure 6.10). In 2001, the site was dominated by the grasses *Deschampsia cespitosa* and *Agrostis exarata*, while in 2004, there is a much broader array of forb species that contribute to the total cover.

A total of 122 species were detected during nested frequency data collections. Of those 122 species, 70 were from the native plant list of West Eugene, 48 were not native, and 4 we could not be identified to the species level. Table 6.8 lists the species observed with a frequency of greater than 10%. Habitat information is also provided for the native species. Of the native species occurring in Phase 1 with a frequency of greater than 10%, 10 were wet prairie species and 12 were vernal pool or emergent species. Thus, the mitigation bank goal of 10 wet prairie species and 5 vernal pool species with greater than 10% frequency was met.

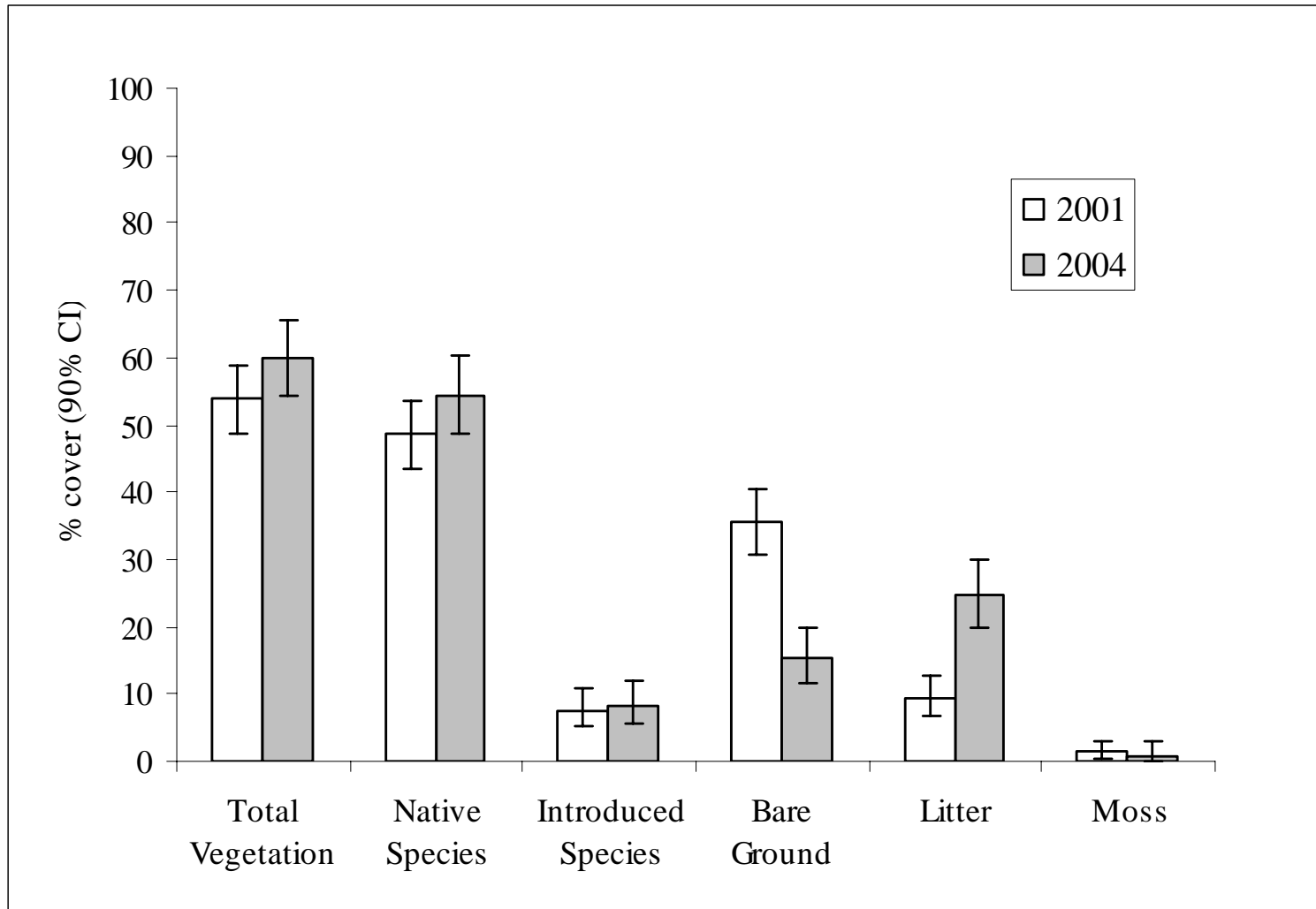


Figure 6.9. Percent cover of ground cover guilds at the Balboa Unit Phase 2. Total percent cover, native percent cover and introduced percent covers are graphed for the 2nd and 5th years of the monitoring period for the Phase 2 section of the Balboa Unit.

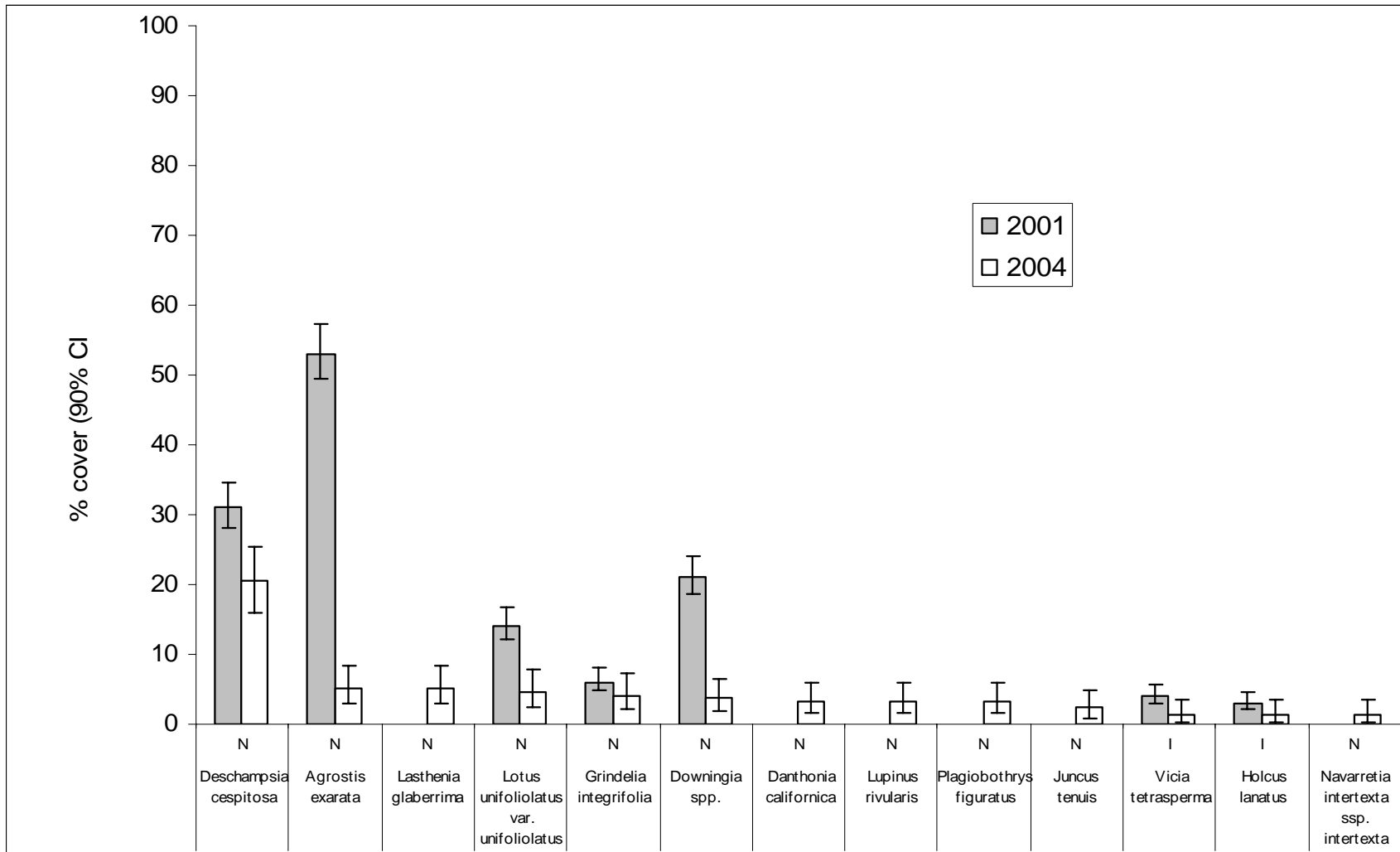


Figure 6.10. Native species on the Phase 2 section of the Balboa Unit with > 1% cover. All native species in 2004 with greater than 1 percent cover are graphed for 2001 and 2004.

Table 6.8. Species Present with Greater than 10% Frequency in Balboa Phase 2. All species present with > 10% frequency in Balboa Phase 2 are listed with their origin and 90% confidence limits. Habitat information is also listed for native species where ‘VP/E’ represents vernal pool and emergent habitats and ‘WP’ corresponds to wet prairie habitat.

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Deschampsia cespitosa</i>	N	71.07	5.84	5.09	wp
<i>Plagiobothrys figuratus</i>	N	66.94	5.78	5.51	vp
<i>Grindelia integrifolia</i>	N	64.46	5.83	5.65	vp
<i>Lotus unifoliolatus</i>	N	59.50	5.89	5.88	wp
<i>Navarretia intertexta</i> ssp. <i>intertexta</i>	N	57.02	5.89	5.97	vp
<i>Downingia elegans</i>	N	56.20	6.05	5.84	vp
<i>Agrostis exarata</i>	N	56.20	6.05	5.84	wp/vp
<i>Gratiola ebracteata</i>	N	47.93	6.11	5.86	vp
<i>Juncus tenuis</i>	N	39.67	5.53	6.22	wp
<i>Madia glomerata</i>	N	35.54	5.65	5.83	vp
<i>Hypochaeris radicata</i>	I	34.71	5.76	5.65	
<i>Lasthenia glaberrima</i>	N	34.71	5.76	5.65	vp
<i>Phlox gracilis</i>	N	33.88	5.41	5.97	vp
<i>Epilobium ciliatum</i>	N	31.40	5.26	5.91	wp
<i>Microseris laciniata</i>	N	30.58	5.36	5.72	wp
<i>Downingia</i> spp.	N	28.93	5.09	5.84	vp
<i>Danthonia californica</i>	N	26.45	4.91	5.74	wp
<i>Parentucellia viscosa</i>	I	26.45	4.91	5.74	
<i>Eriophyllum lanatum</i>	N	26.45	4.91	5.74	wp
<i>Bidens frondosa</i>	N	25.62	5.00	5.53	vp/em
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	N	24.79	5.08	5.32	wp
<i>Holcus lanatus</i>	I	24.79	5.08	5.32	
<i>Hordeum brachyantherum</i>	N	23.97	4.71	5.62	vp
<i>Beckmannia syzigachne</i>	N	23.14	4.79	5.41	vp/em
<i>Eryngium petiolatum</i>	I	19.01	4.23	5.33	vp
<i>Rumex acetosella</i>	I	19.01	4.23	5.33	
<i>Leontodon taraxacoides</i>	I	18.18	4.29	5.09	
<i>Mentha pulegium</i>	I	17.36	4.34	4.85	
<i>Vicia tetrasperma</i>	I	16.53	3.95	5.14	
<i>Agrostis</i> spp.	I	16.53	3.95	5.14	
<i>Carex unilateralis</i>	N	15.70	4.00	4.89	vp/em
<i>Epilobium densiflora</i>	N	14.88	4.03	4.63	wp
<i>Juncus bufonius</i>	N	13.22	3.67	4.65	vp
<i>Ranunculus orthorhynchus</i>	N	12.40	3.69	4.38	wp
<i>Panicum capillare</i> ssp. <i>capillare</i>	N	11.57	3.70	4.10	wp
<i>Aira caryophylla</i>	I	11.57	3.70	4.10	

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Lupinus rivularis</i>	N	11.57	3.70	4.10	wp
<i>Carex</i> spp.	N	11.57	3.70	4.10	
<i>Gnaphalium palustre</i>	N	11.57	3.70	4.10	vp
<i>Veronica peregrina</i>	N	10.74	3.29	4.37	vp/em

3. Wildlife Utilization

The Balboa Unit remained a popular site for wildlife and the species sighted were similar to those of previous years. Canadian geese, mallards, blue heron, deer and killdeer were the most commonly sighted birds. In addition, common garter snakes and Pacific treefrogs were also observed on the site. A great egret was also seen again in the northwest emergent area.

Chapter 7: Beaver Run Unit

A. Site Description

1. *Size:* 23.3 acres
2. *Ownership:* BLM
3. *Site Timeline:* **Table 7.1**

Section	Year of Construction	Monitoring Period
Enhancement	1998	1999-2004
Phase 1	1998	2000-2004
Phase 2	1999	2000-2004

4. Location

The Beaver Run Unit of the Danebo West Management Area is located to the south of Amazon Creek, north of W. 11th Street, and west of Danebo Avenue, Eugene, Or.

5. Site History

Woody vegetation was invading the existing wet prairie within which there are documented populations of rare herbaceous species. Soil, concrete and rubble have been historically dumped in a 2-acre area on site. Currently three outfall pipes drain the site directly into Amazon Creek. Prior to channelization, Amazon Creek flowed through the site. Remnants of the historic Amazon channel remain on site. These fragmented reaches exhibit oxbow-like characteristics. The resident beaver population was constructing dams and actively altering site hydrology resulting in a transition of community types including a net loss of wet prairie. An atypical hydrologic condition existed as surface water was conveyed across the unit during summer months introduced through irrigation of lands upstream. Coupled with beaver activity, site hydrology was being adversely impacted in the context of the goals established for protection of this unit within the WEWP.

6. Focus of Prescriptions

Restoration and enhancement focus on the emergent and wet prairie communities. Site hydrology is still in transition because of external influences, but fill materials were removed. Vegetative treatments include removal of invasive herbaceous and woody species across the unit and seeding of native grasses and forbs. The overall goal for the project is to stabilize site hydrology so hydrologic conditions favor perpetuation of a diverse wet prairie community. Additional goals for the Unit include: enhancement of the woodland adjacent to the levee, enhancement of the emergent pools, and enhancement of habitat for resident wildlife (common western garter snake, beaver, great blue heron, red wing blackbird, western pond turtle).

7. Site-Specific Management Goals:

1. Restore wet prairie vegetation to areas of proposed fill removal.
2. Establish hydrophytic vegetation within the restoration and enhancement areas by planting, seeding and/or natural colonization.

3. Enhance wet prairie vegetation by removing woody vegetation and maintaining as prairie through periodic mowing on a portion of the wetland area that has transitioned from wet prairie to scrub-shrub wetland.
4. Establish wetland hydrology within the restoration area.
5. Improve overall hydrology across the Unit by reestablishing east to west cross-site flow.
6. Stabilize hydrology across the Unit.
7. Enhance habitat conditions for native wildlife species associated with wet prairie and emergent wetland habitats.
8. In Phase 2, explore the usefulness of biosolid application in the establishment of native wetland plants.

Beaver Run

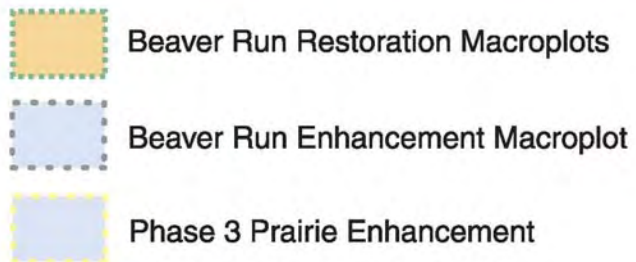
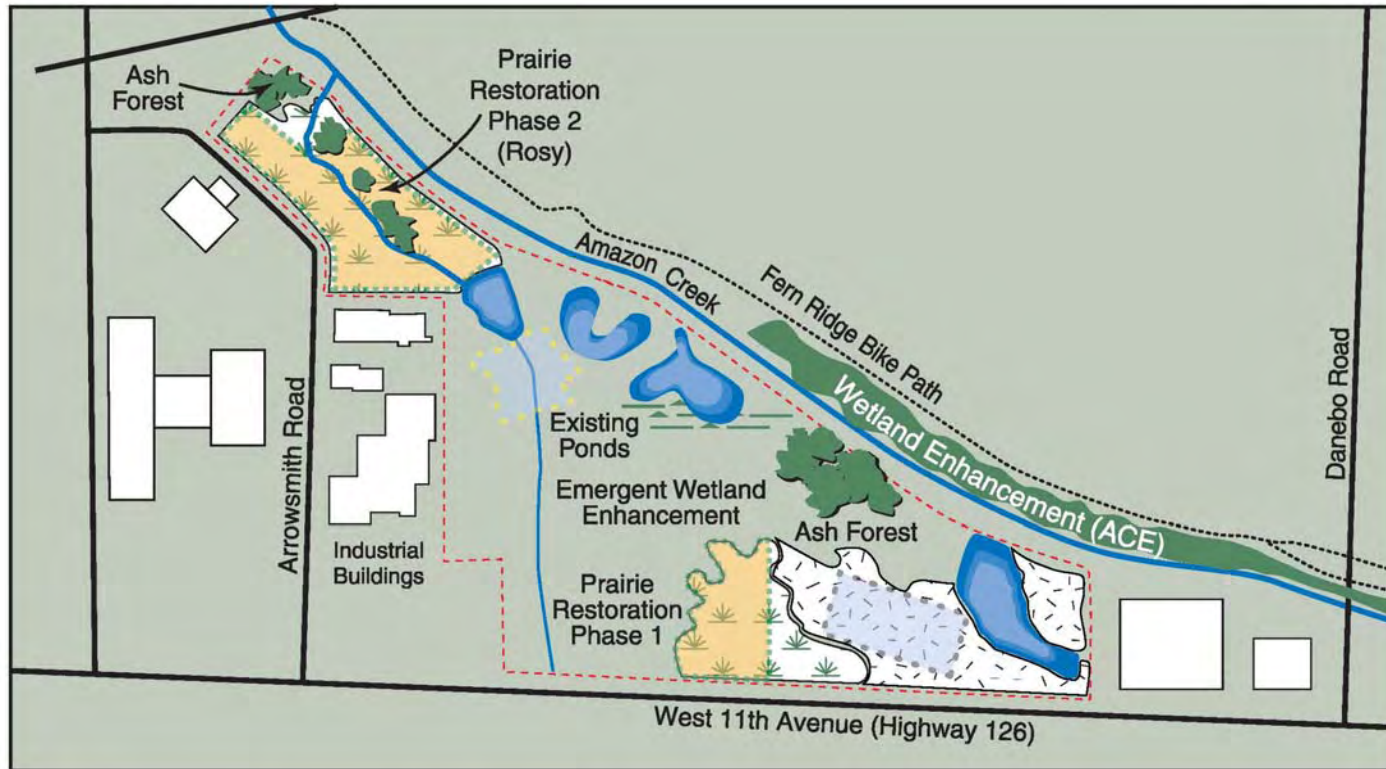


Figure 7.1. Beaver Run Site Map. The Enhancement area and the Phases 1 and 2 restorations are labeled with their associated macroplots. The area under the enhancement area and both phases are wet prairie habitat.

B. 2004 Monitoring Summary

Despite the dry spring, all phases of Beaver Run support hydric soils and hydrophytic vegetation. Final quantitative vegetation data collected in the enhancement, and Phase 2 show that they are meeting all mitigation bank standards (Tables 7.2 and 7.3). Phase 1 met three of the five criteria (Table 7.2). It met the criteria for species diversity and planting survival, but fell short with the dominance criterion and nearly met the goal for total percent native cover.

1. 2004 Management Actions

1. Maintenance crews mowed the perimeter of Phases 1 and 2.
2. Crew spent a day hand weeding Harding grass (*Phalaris aquatica*) and teasel (*Dipsacus sylvestris*).

2. Management Actions for 2005

Future management will be the responsibility of the Bureau of Land Management.

Activities will include, but are not limited to:

1. Mowing the reed canarygrass on the perimeter of the mitigation bank projects.
2. Mowing the enhancement area to prevent the spread of woody vegetation.

Table 7.2. Progress of the Beaver Run Unit restorations towards meeting the MOA vegetation standards. The most recent data for each phase is compared to its relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard. 'PI' refers to point-intercept cover data collection.

Site Characteristics and MOA Vegetation Standards	Phase 1	Goal Met?	Phase 2 (Rosy)	Goal Met?
Site status in the monitoring period	Year 6 of 6	N/A	Year 5 of 5	N/A
Most recent quantitative data collected in year:	2004	N/A	2004	N/A
50% native cover after 2 years	61%	Yes	59%	Yes
70% native cover after 5 years	67% (62% > μ > 71%)	No	90%	Yes
75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list	40	No	100%	Yes
70% of the planted species shall be alive and present at the end of the five year monitoring period	76%	Yes	81%	Yes
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	15	Yes	13	Yes
Emergent: min 5 native species occurring at 10% frequency rate or greater	16	Yes	13	Yes

Table 7.3. Progress of the Beaver Run Unit enhancement towards meeting the MIP vegetation standards. The most recent data for the enhancement is compared to its relevant vegetation standards from the MIP. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Site Characteristics and MIP Vegetation Standards	Enhancement Area	Goal Met?
Site status in the monitoring period	Year 5 of 5	N/A
Most recent quantitative data collected in:	2004	N/A
50% reduction of total shrub cover after 2 years	50%	Yes
50% reduction of tree density after 2 years	86%	Yes
60% reduction of total shrub cover after 5 years	68%	Yes
70% reduction of tree density after 5 years	97%	Yes

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil were estimated and mapped during site visits in the 2nd quarter (April-June). These estimates were made separately for the main Phase 1 restoration area and the Phase 2 restoration area. Water depths were measured monthly at 1 staff gauge in Phase 2.

b) Results

Water levels were significantly lower this year because of the reduction in rainfall; however, in years with normal rainfall, the extent and duration of water at Phase 1, Phase 2, and the Enhancement Area of the Beaver Run Unit have been more than sufficient for the development of hydric soils and wetland vegetation (Figures 7.2 – 7.6). The areas of saturation and inundation remain relatively constant from year to year. Phase 1 and the Enhancement contain mostly wet prairie and vernal pool habitats, while Phase 2 has some wet prairie, but is largely vernal pool and emergent habitats.

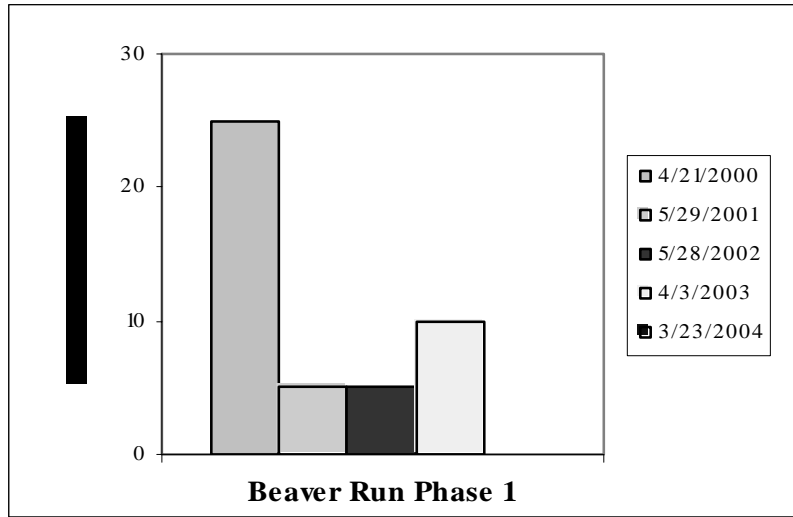


Figure 7.2. Spring standing water in Phase 1 of the Beaver Run Unit. Percentage of Phase 1 with standing water in the early spring over the history of the restoration.

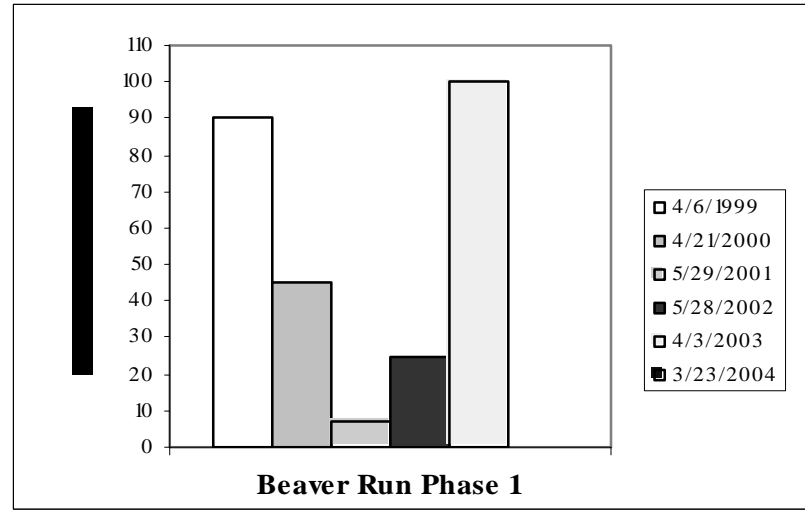


Figure 7.3. Spring saturated soils in Phase 1 of the Beaver Run Unit. Percentage of the Phase 1 with saturated soils in the early spring over the history of the restoration.

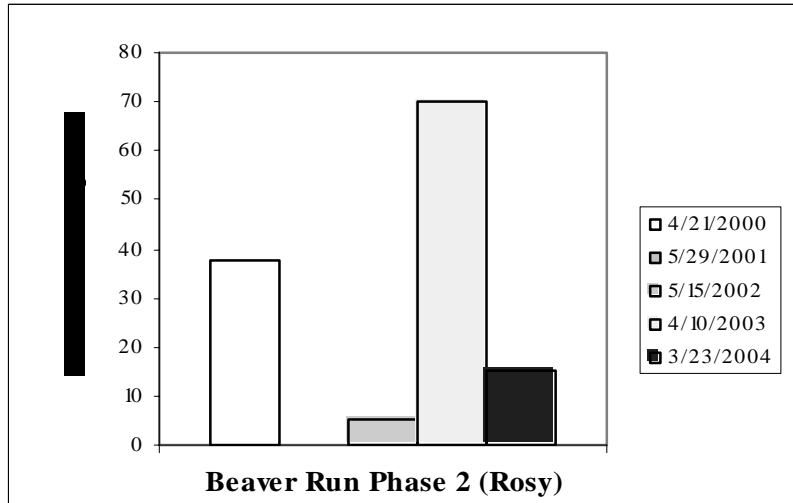


Figure 7.4. Spring standing water in Phase 2 of the Beaver Run Unit. Percentage of Phase 1 with standing water in the early spring over the history of the restoration.

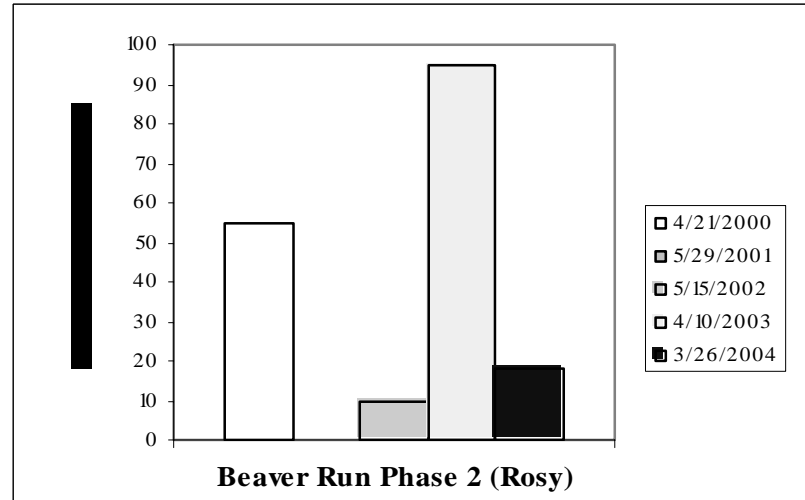


Figure 7.5. Spring saturated soils in Phase 2 of the Beaver Run Unit. Percentage of the Phase 1 with saturated soils in the early spring over the history of the restoration.

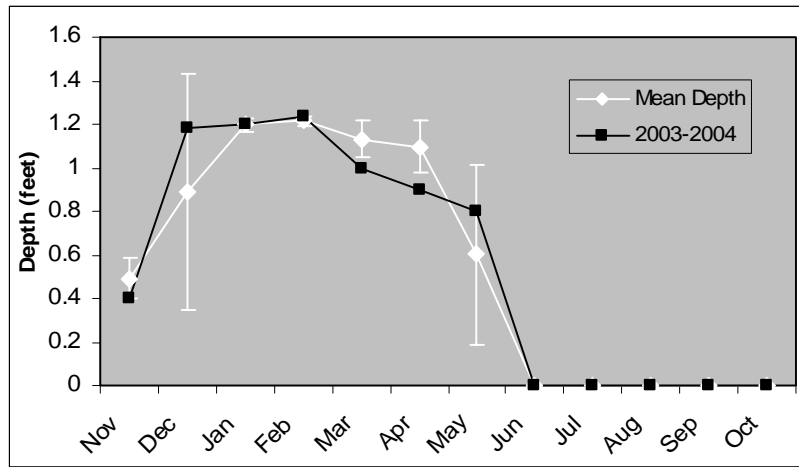


Figure 7.6. Beaver Run Unit—Phase 2 inundation levels in the western section during 2003-2004 compared to the mean depth between 1999 and 2004. Depth of inundation throughout the year in the western vernal pool in 2003-2004. The mean calculated from depths observed between 1998 and 2004 are also graphed for comparison. Error bars represent one standard deviation from the mean.

2. *Vegetation*

a) *Methods*

All mitigation bank sections of Beaver Run received quantitative monitoring in 2004. The enhancement was sampled using the point-intercept method on July 9th to obtain 187 samples. Additionally, both a census of the trees on the site and line-intercept data were collected in the enhancement area on August 12th. Both Phases 1 and 2 received point-intercept and nested frequency monitoring. Point-intercept on Phase 1 took place on July 20th, 22nd, and 23rd. A total of 276 points were sampled. A total of 144 nested frequency plots were sampled in Phase 1 on July 20th, 22nd, and 23rd. Phase 2 (Rosy) underwent point-intercept (217 samples) and nested frequency (114 samples) monitoring on July 6th through 8th.

Species lists were updated for each section and the results can be viewed in Appendix B.

b) *Enhancement Results*

Results of Line-intercept Sampling:

The Beaver Run Enhancement met the requirement that the total shrub cover be reduced by 60% 5 years after the initial treatment of woody vegetation removal. The total shrub cover was decreased by 68% (Figure 7.7).

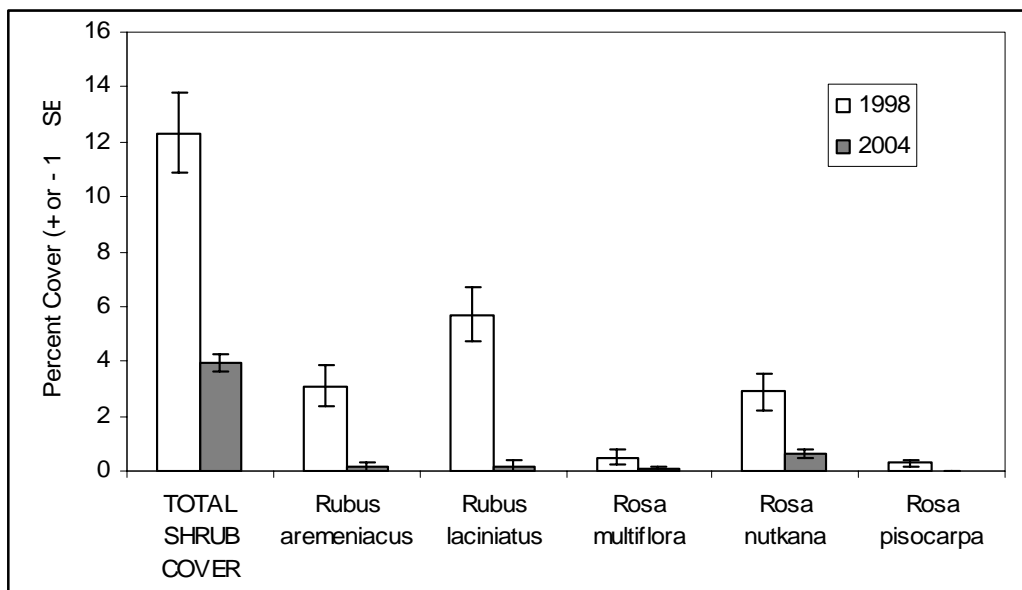


Figure 7.7. Percent Cover of Shrubs in the Beaver Run Enhancement in 1998 and 2004. The table includes all shrub species found in the Beaver Run Enhancement in 1998 (prior to woody vegetation removal) and 2004 (6 years post treatment). The percent cover of all species and each individual species in each year (± 1 SE) are graphed.

Results of Tree Census:

The mitigation bank standard for tree reduction is that 70% of trees that are greater than 1 m tall should be removed. The results of the tree census show a 97% reduction of the trees greater than 1 m tall (Table 7.4).

Table 7.4. Tree Census Results from the Beaver Run Enhancement in 1998 and 2004. The table includes all tree species found in the Beaver Run Enhancement in 1998 (prior to woody vegetation removal), 2004, whether the trees are native or non-native in origin, totals by height class and species, and the percent reduction in trees.

N /I	Species	Number of trees by height class								Species total	
		1-2 m		2-3 m		3-4 m		>4 m		1998	2004
		1998	2004	1998	2004	1998	2004	1998	2004	1998	2004
I	<i>Crataegus monogyna</i>	182	0	31	0	19	0	7	0	269	0
N	<i>Crataegus suksdorfii</i>	175	0	159	6	58	4	31	6	423	16
N	<i>Fraxinus latifolia</i>	1	1	0	1	2	0	6	2	9	4
I	<i>Prunus avium</i>	0	0	0	0	0	0	1	0	1	0
N	<i>Malus fusca</i>	25	0	6	0	5	0	4	0	40	0
I	<i>Malus x domestica</i>	14	0	17	0	3	0	2	0	36	0
N	<i>Rhamnus purshiana</i>	1	0	0	0	0	0	0	0	1	0
Totals by height class		398	1	243	7	87	4	51	8	779	20

Difference between 1998 and 2004 in the total number of tree between = 759

Percent reduction = 97%

c) Phase 1 Results

There were several significant changes in guild plant cover (Figure 7.8) in Phase 1. Between 2000 and 2004, there was a decrease in total live plant cover—from 90.3% (86.3% < μ < 93.5%) to 78.6% (74.2% < μ < 82.6%). This corresponded with an increase in bare ground from 0.97% (0.2% < μ < 3.0%) to 8.0% (5.5% < μ < 11.2%) and an increase in litter from 7.7% (4.9% < μ < 11.5%) to 14.1% (10.8% < μ < 18.0%). Additionally, the total cover on native species decreased significantly from 72.0% (66.4% < μ < 77.1%) to 52.5% (47.4% < μ < 57.6%), while the total cover of non-native species did not change significantly from 2000 to 2004, with the 2004 level being 42.0% (37.0% < μ < 47.14%).

There were many changes in the percent cover of specific native and non-native species between 2000 and 2004 (Figure 7.9). The most prominent change included a significant decrease in the two dominant wet prairie grasses, *Deschampsia cespitosa* and *Danthonia californica*. Conversely, many native and non-native species increase significantly. Non-native species that increased significantly included *Hypochaeris radicata*, *Leontodon taraxacoides*, *Agrostis stolonifera/capillaris*, *Phalaris arundinacea*, and *Holcus lanatus*. Native species that increased significantly included *Panicum acuminatum*, *Lotus unifoliolatus*, *Grindelia integrifolia*, *Lasthenia glaberrima*, *Downingia* spp., *Prunella vulgaris*, *Aster hallii*, and *Juncus tenuis*.

Frequency data collection detected 122 species. Of those 122 species, 68 were from the native plant list

of West Eugene, 53 were not native. Table 7.5 lists the species observed with a frequency of greater than 10%. Habitat information is also provided for the native species. Of the native species occurring in Phase 1 North with a frequency of greater than 10%, 12 were wet prairie species, 3 were wet prairie/vernal pool species, and 11 were vernal pool or emergent species. Thus, the mitigation bank goal of 10 wet prairie species and 5 vernal pool species with greater than 10% frequency was met.

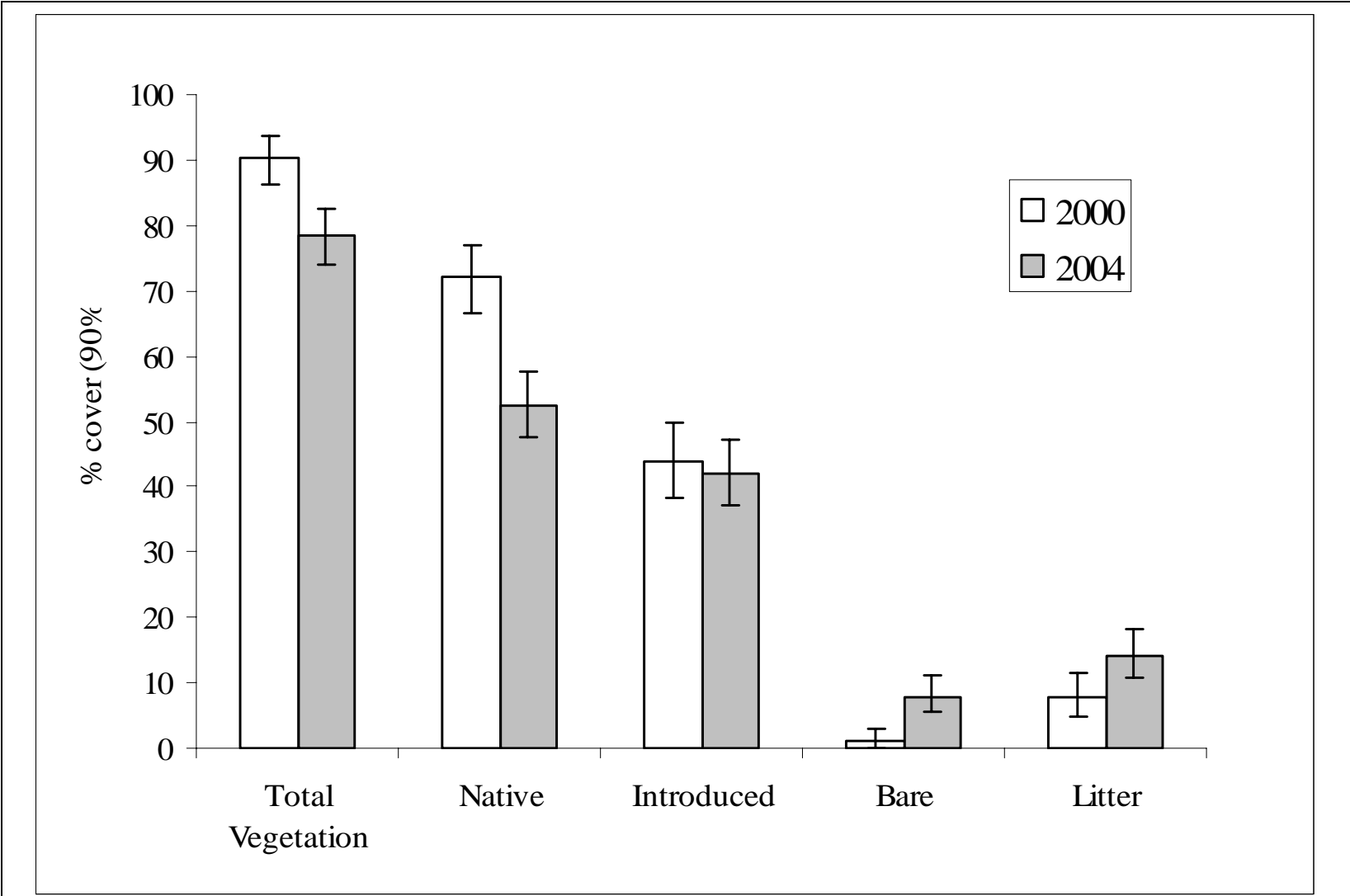


Figure 7.8. Percent cover of ground cover guilds at Beaver Run Unit - Phase 1. Total percent cover, native percent cover and introduced percent covers are graphed for the 2nd and 5th years of the monitoring period for the Phase 1 section of the Beaver Run.

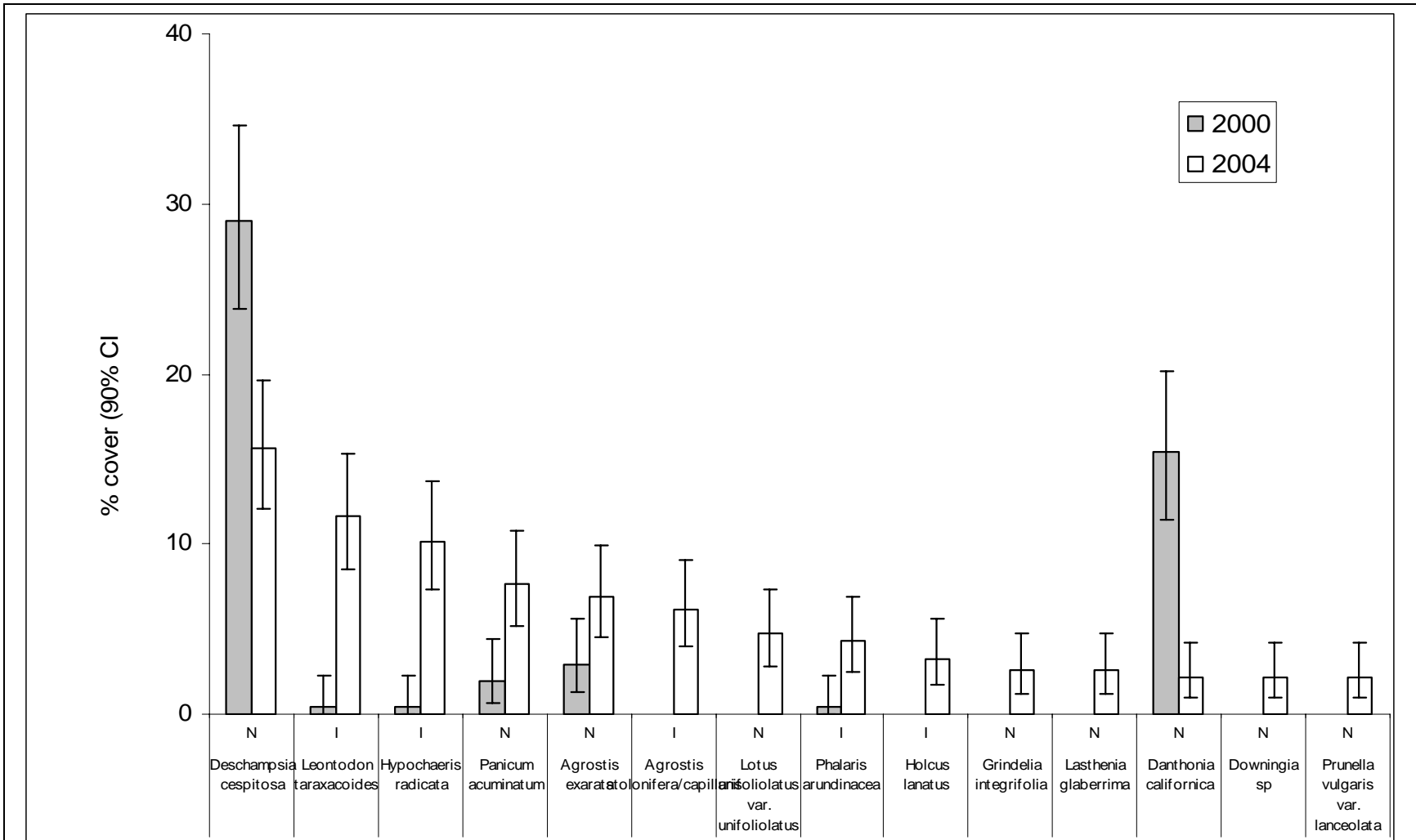


Figure 7.9. Native species on the Phase 1 section of the Beaver Run Unit with > 2% cover. All native species in 2004 with greater than 2 percent cover are graphed for 2000 and 2004.

Table 7.5. Species Present with Greater than 10% Frequency in Beaver Run Phase 1. All species present with > 10% frequency in Beaver Run Phase 1 are listed with their origin and 90% confidence limits. Habitat information is also listed for native species where ‘WP/VP’ refers to species present in both wet prairie and vernal pool habitats, ‘VP/E’ represents vernal pool and emergent habitats, ‘E’ represents emergent habitats, and ‘WP’ corresponds to wet prairie habitat.

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Deschampsia cespitosa</i>	N	81.3	75.08	86.42	WP
<i>Leontodon taraxacoides</i>	I	72.9	66.16	78.96	
<i>Hypochaeris radicata</i>	I	72.2	65.42	78.32	
<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	N	64.6	57.50	71.21	WP
<i>Parentucellia viscosa</i>	I	63.2	56.08	69.90	
<i>Anthoxanthum odoratum</i>	I	56.9	49.75	63.92	
<i>Juncus tenuis</i>	N	54.9	47.67	61.90	WP
<i>Agrostis stolonifera/capillaris</i>	I	52.8	45.59	59.88	
<i>Panicum acuminatum</i> ssp.	N	52.1	44.90	59.20	WP
<i>Holcus lanatus</i>	I	50.7	43.53	57.83	
<i>Agrostis exarata</i>	N	45.1	38.10	52.33	WP/VP
<i>Madia</i> sp	N	45.1	38.10	52.33	WP
<i>Mentha pulegium</i>	I	41.0	34.07	48.15	
<i>Aira caryophyllea</i>	I	36.1	29.44	43.21	
<i>Vicia tetrasperma</i>	I	32.6	26.18	39.64	
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	N	31.9	25.53	38.92	WP
<i>Juncus acuminatus</i>	N	31.3	24.89	38.20	VP/EM
<i>Centarium erythraeae</i>	I	30.6	24.24	37.48	
<i>Grindelia integrifolia</i>	N	29.2	22.96	36.03	WP/VP
<i>Phalaris arundinacea</i>	I	27.1	21.04	33.84	
<i>Aster hallii</i>	N	22.2	16.65	28.68	WP
<i>Rumex acetosella</i>	I	22.2	16.65	28.68	
<i>Leucanthemum vulgare</i>	I	22.2	16.65	28.68	
<i>Bidens frondosa</i>	N	21.5	16.03	27.93	VP/EM
<i>Hypericum perforatum</i>	I	19.4	14.19	25.67	
<i>Briza minor</i>	I	19.4	14.19	25.67	
<i>Cicendia quadrangularis</i>	N	19.4	14.19	25.67	VP
<i>Downingia</i> sp	N	18.8	13.58	24.92	VP
<i>Rubus armeniacus</i>	I	18.1	12.97	24.16	
<i>Danthonia californica</i>	N	18.1	12.97	24.16	WP
<i>Daucus carota</i>	I	18.1	12.97	24.16	
<i>Navarretia intertexta</i>	N	17.4	12.37	23.40	VP
<i>Eryngium petiolatum</i>	N	17.4	12.37	23.40	VP
<i>Lythrum portula</i>	I	17.4	12.37	23.40	
<i>Epilobium brachycarpum</i>	N	16.7	11.77	22.63	WP

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Lasthenia glaberrima</i>	N	16.0	11.17	21.86	VP
<i>Hordeum brachyantherum</i>	N	15.3	10.58	21.09	WP/VP
<i>Gratiola ebracteata</i>	N	14.6	9.98	20.32	VP
<i>Gnaphalium purpureum</i>	N	13.9	9.40	19.54	VP
<i>Plagiobothrys figuratus</i>	N	13.2	8.82	18.76	VP
<i>Eleocharis palustris</i>	N	13.2	8.82	18.76	VP/EM
<i>Centaurea erythraea</i>	I	12.5	8.24	17.97	
<i>Lotus corniculatus</i>	I	12.5	8.24	17.97	
<i>Juncus bufonius</i>	N	11.8	7.66	17.18	
<i>Orthocarpus bracteosus</i>	N	11.1	7.09	16.39	WP
<i>Epilobium densiflorum</i>	N	10.4	6.53	15.59	WP
<i>Microseris laciniata</i>	N	10.4	6.53	15.59	WP

d) Phase 2 Results

Phase 2 was sampled in 2001 and 2004 for percent cover of native vegetation, non-native vegetation, bare ground litter and moss (Figure 7.10). Vegetative cover did not change significantly between 2001 and 2004. The percent cover of bare ground decreased significantly from 27.1% ($22.1\% < \mu < 32.6\%$) to 12.9% ($9.3\% < \mu < 17.3\%$). The percent cover of non-native species increased significantly from 6.1% ($3.6\% < \mu < 9.5\%$) to 17.5% ($13.4\% < \mu < 22.3\%$). This project meets the mitigation bank standard of 70% native vegetation of with 89% of the total cover being native.

Changes in the composition of species with greater than 2% cover are shown in Figure 7.11. Of the two grasses that were dominant in 2001, *Deschampsia cespitosa* increased significantly from 12.6% ($9.1\% < \mu < 17.0\%$) to 32.7% ($27.5\% < \mu < 38.3\%$), while *Agrostis exarata* decreased significantly from 20.1% ($15.7\% < \mu < 25.1\%$) to 6.9% ($4.3\% < \mu < 10.4\%$). Native forb species that increased significantly included *Lotus unifoliolatus*, *Gratiola ebracteata*, *Lasthenia glaberrima*, *Navarretia intertexta*, *Downingia elegans*.

A total of 128 species were detected during nested frequency data collections. Of those 128 species, 78 were from the native plant list of West Eugene, 45 were not native, and 4 could not be identified to the species level. Table 7.6 lists the species observed with a frequency of greater than 10%. Habitat information is also provided for the native species. Of the native species occurring in Phase 2 with a frequency of greater than 10%, 8 were wet prairie species, 5 survive in both wet prairie and vernal pool hydrologic regimes, and 9 were vernal pool or emergent species. Thus, the mitigation bank goal of 10 wet prairie species and 5 vernal pool species with greater than 10% frequency was met.

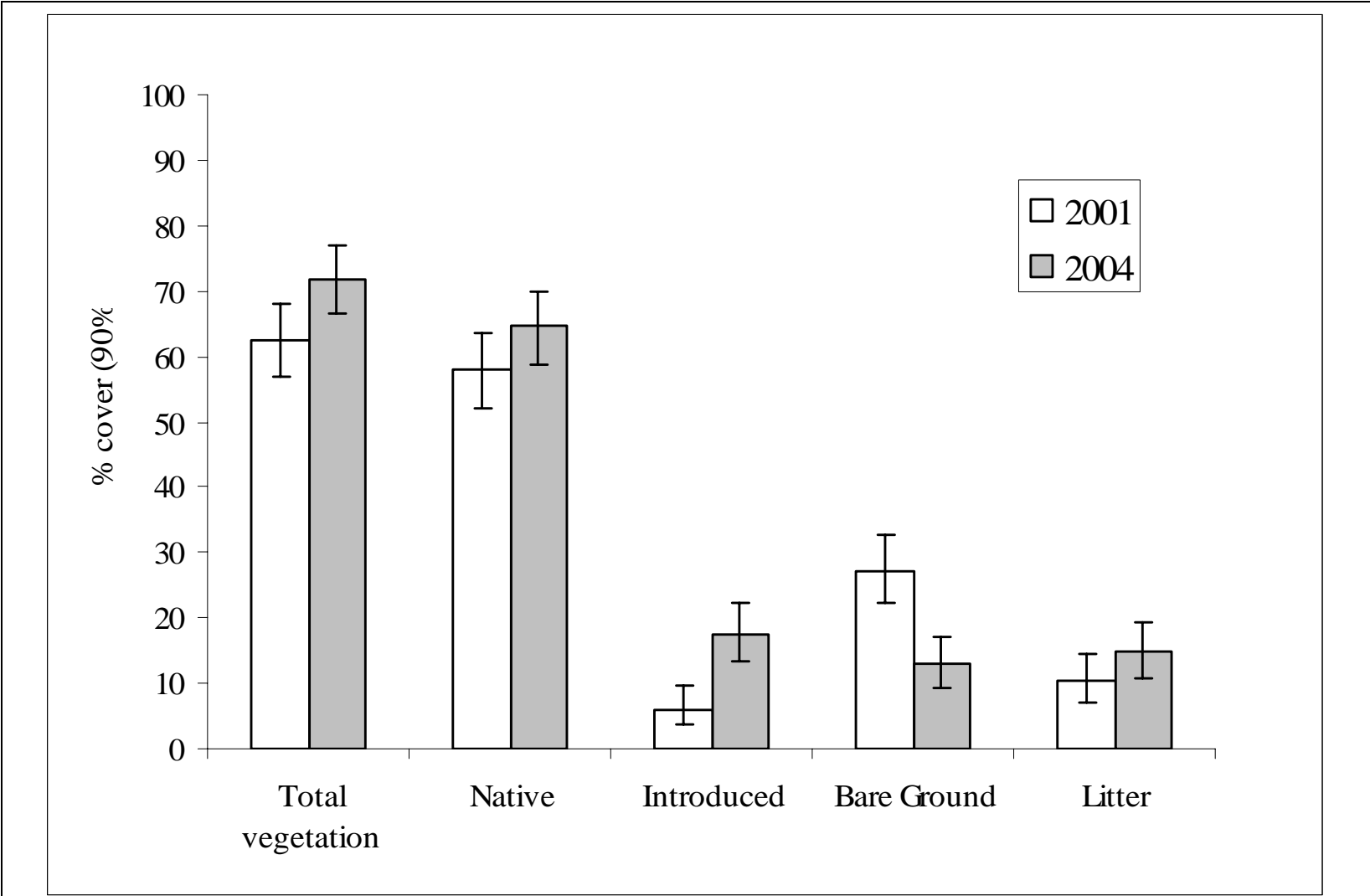


Figure 7.10. Percent cover of ground cover guilds at Beaver Run Phase 2. Total percent cover, native percent cover and introduced percent covers are graphed for the 2nd and 5th years of the monitoring period for the Phase 2 section of the Beaver Run Unit.

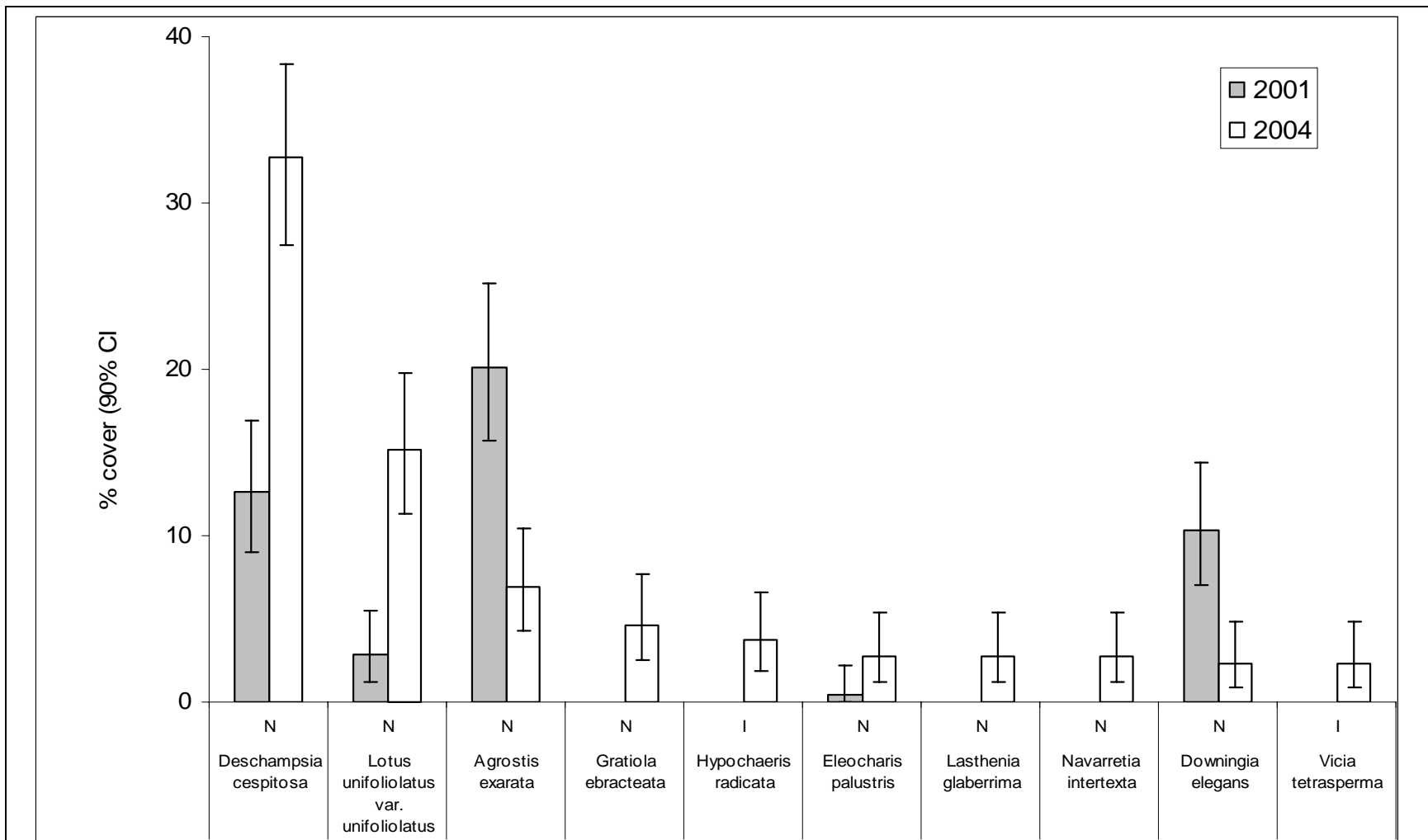


Figure 7.11. Native species on the Phase 2 section of the Beaver Run Unit with > 2% cover. All native species in 2004 with greater than 2 percent cover are graphed for 2001 and 2004.

Table 7.6. Species Present with Greater than 10% Frequency in Beaver Run Phase 2. All species present with > 10% frequency in Beaver Run Phase 2 are listed with their origin and 90% confidence limits. Habitat information is also listed for native species where 'VP' represents vernal pool, 'EM' are present in emergent habitats, and 'WP' corresponds to wet prairie habitat.

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Deschampsia cespitosa</i>	N	73.68	66.04	80.38	wp
<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	N	64.04	55.99	71.52	wp
<i>Grindelia integrifolia</i>	N	44.74	36.81	52.87	wp/vp
<i>Downingia elegans</i>	N	42.98	35.13	51.12	vp
<i>Hypochaeris radicata</i>	I	42.11	34.29	50.24	
<i>Agrostis exarata</i>	N	36.84	29.30	44.91	wp/vp
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	N	36.84	29.30	44.91	wp
<i>Vicia tetrasperma</i>	I	34.21	26.84	42.21	
<i>Juncus tenuis</i>	N	33.33	26.03	41.30	wp
<i>Parentucellia viscosa</i>	I	32.46	25.22	40.40	
<i>Madia</i> sp.		31.58	24.41	39.49	
<i>Microseris laciniata</i>	N	30.70	23.60	38.57	wp
<i>Epilobium densiflorum</i>	N	29.82	22.80	37.66	wp
<i>Lythrum portula</i>	I	28.95	22.00	36.74	
<i>Eriophyllum lanatum</i> var. <i>lanatum</i>	N	25.44	18.84	33.03	wp
<i>Plagiobothrys figuratus</i>	N	25.44	18.84	33.03	vp
<i>Orthocarpus bracteosus</i>	N	25.44	18.84	33.03	wp
<i>Navarretia intertexta</i>	N	24.56	18.05	32.09	vp
<i>Galium parisiense</i>	I	23.68	17.27	31.15	
<i>Gratiola ebracteata</i>	N	23.68	17.27	31.15	vp
<i>Phalaris aquatica</i>	I	21.05	14.96	28.31	
<i>Aira caryophyllea</i>	I	19.30	13.44	26.40	
<i>Hypericum perforatum</i>	I	18.42	12.69	25.43	
<i>Leontodon taraxacoides</i>	I	18.42	12.69	25.43	
<i>Juncus acuminatus</i>	N	17.54	11.94	24.46	vp
<i>Lasthenia glaberrima</i>	N	17.54	11.94	24.46	
<i>Phlox gracilis</i>	N	16.67	11.20	23.49	vp
<i>Agrostis stolonifera/capillaris</i>	I	15.79	10.46	22.51	
<i>Centarium erythraeae</i>	I	14.91	9.73	21.52	
<i>Beckmannia syzigachne</i>	N	14.91	9.73	21.52	vp/em
<i>Madia glomerata</i>	N	14.91	9.73	21.52	
<i>Epilobium ciliatum</i>	N	13.16	8.29	19.54	wp
<i>Madia sativa</i>	N	12.28	7.58	18.53	
<i>Eleocharis palustris</i>	N	12.28	7.58	18.53	vp/em
<i>Holcus lanatus</i>	I	11.40	6.88	17.52	
<i>Danthonia californica</i>	N	10.53	6.19	16.50	wp

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Hordeum brachyantherum</i>	N	10.53	6.19	16.50	wp/vp
<i>Eleocharis obtusa</i>	N	10.53	6.19	16.50	vp

3. *Wildlife Utilization*

Historically, many species of wildlife has been observed utilizing this site (see previous Annual Reports). Past sightings included great blue herons, Canadian geese, mallards, orange-crowned warblers, beaver, western pond turtles, and red-winged blackbirds.

Chapter 8: Dragonfly Bend Unit

A. Site Description

1. *Size:* 76.8 acres
2. *Ownership:* City of Eugene
3. *Site Timeline:* **Table 8.1. Dragonfly Bend Unit site timeline.**

Section	Treatment and Construction Years	Acreage	Monitoring Period
Phase 1 Enhancement	2004-2005	39.7	2006-2010
Phase 2 Enhancement	2004-2006	8.0	2007-2011

4. Location

The Dragonfly Bend Unit is located at the northeastern corner of Royal Avenue and Greenhill Road, but begins northeast of the Amazon Diversion Channel. It is bordered to the west by North Greenhill Road, the southwest by the Amazon Diversion Channel, the south by Royal Avenue, and the east and north by Amazon Creek.

5. Baseline Conditions

Historically, the site was likely dominated by wet prairie with some vernal pool and emergent vegetation. However, over the past fifty year, it has been in agricultural use. Immediately prior to enhancement, the field was in annual rye grass production.

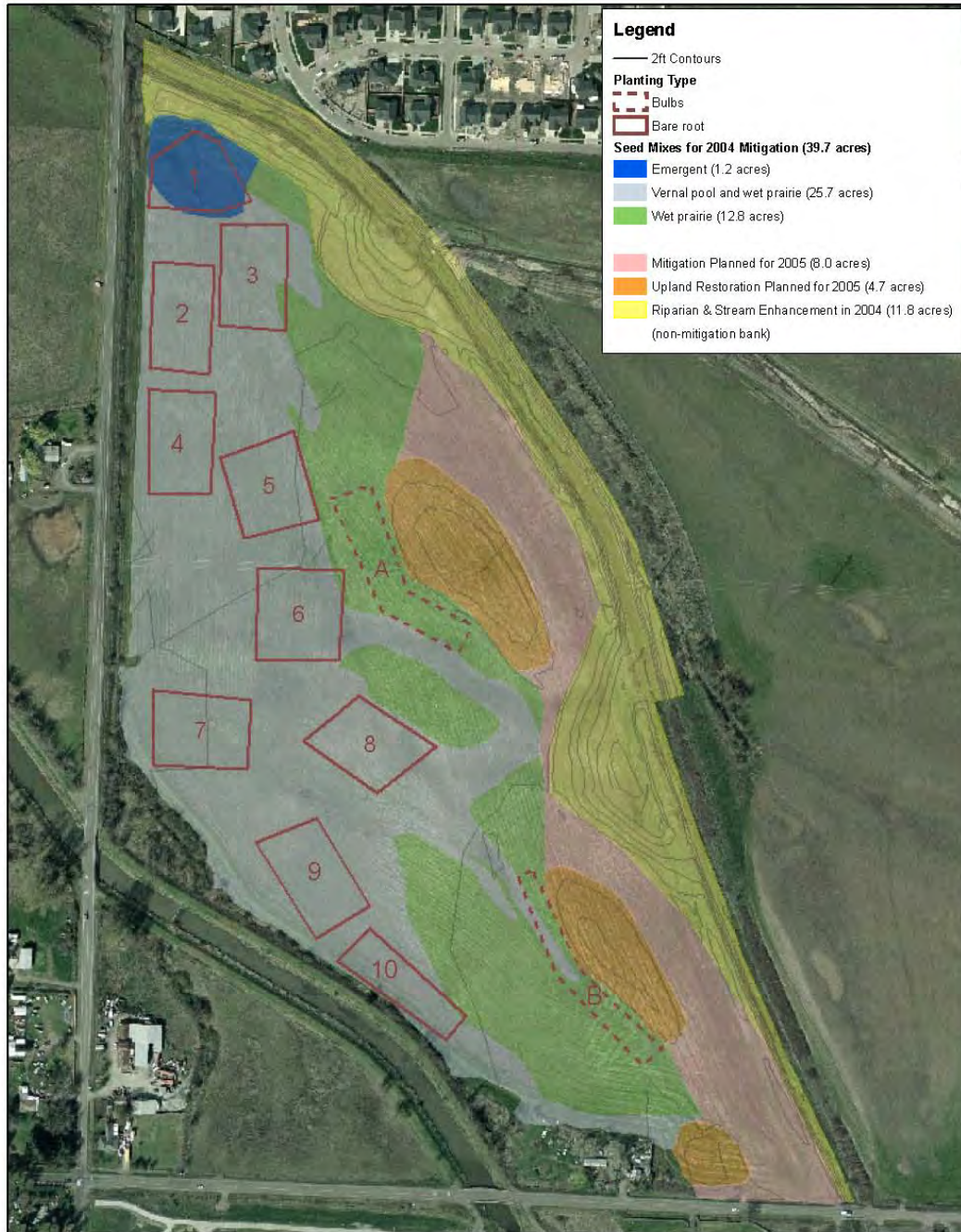
6. Focus of Prescriptions

Phase 1 was sprayed with a broad-spectrum herbicide and then planted with a seed mix containing only broadleaf plants, sedges, and rushes. Bare root sedges, bare root rushes, and lily bulbs were also planted in designated locations. A grass-specific herbicide will be used in 2005 until annual rye grass has been sufficiently removed from the seed bank. Native grasses will then be planted on the site in the fall of 2005. An identical prescription will be used on Phase2 beginning in 2005.

Two other non-mitigation bank projects were also completed on this site. A stream channel enhancement designed to create habitat for the Western pond turtle and several upland prairie mounds were built up with soil from the stream channel enhancement to provide habitat for Kincaid's lupine, Fender's blue butterfly, and nesting habitat for the Western pond turtle.

7. Site-Specific Management Goals

1. Restore the mosaic of native wetland and upland vegetation.
2. Provide suitable habitat for the Fender's blue butterfly and Kincaid's lupine.
3. Provide suitable Western pond turtle habitat areas along and adjacent to Amazon Creek.



Data collected by Jean Jancaitis and Paul Gordon
 Map produced by Jean Jancaitis
 12/07/04
 Spring 2004 aerial photo
 P:\Natural_Resources\WetlandProgram\Jancaitis\GIS\Dragonfly_Bend\ArcGIS\IDB_A-s-construct_04.pdf



0 50 100 200 Meters

Figure 8.1. Dragonfly Bend Unit – 2004 Project Map and Planting Plan. The map shows the mitigation areas with Phase 1 in blue and green and Phase 2 in pink. The seed mixes used in Phase 1 are listed in Tables 8.3-8.5. Lily bulb and bare root sedge and rush planting areas are also shown on the map in solid red or dashed boxes, respectively. The contents of each planting area are listed in Table 8.6 by the number or letter of the planting area. Areas in orange and yellow are upland and stream enhancement projects, respectively.

B. 2004 Monitoring Summary

Phase 1 was sprayed three times with a broad-spectrum herbicide to exhaust the annual rye grass seed bank. The area was then seeded with habitat-appropriate seed mixes and planted with bare root sedges and rushes and lily bulbs. A staff gauge was installed in the northwestern portion of the site to monitoring site hydrology.

1. 2004 Management Actions

1. Agricultural drainage ditches were removed through plowing. This will prevent rapid drainage of the site that had been occurring through decades of agricultural practices.
2. A berm was constructed along the western portion of the site (i.e., along the Greenhill Road side of the site). This berm will facilitate water retention on the site.
3. A water control structure was installed in the northwest corner of the site, to allow for some human-controlled modification of water depth.
4. A glyphosate-based herbicide was applied on three different occasions to kill the existing non-native vegetation (grasses and forbs), which consisted primarily of annual ryegrass.
5. Blackberries and other non-native shrubs were removed by hand along the south and western edges of the site.
6. Three different native seed mixes were applied to various portions of the site, appropriate to the expected site hydrology (wet prairie, vernal pool, and emergent).
7. Approximately 45,000 bare root plants (*Carex* spp., *Juncus* spp., and *Eleocharis palustris*) were planted in 10 different planting zones. These bare-root plants should establish and produce seed within 1-2 years.
8. Approximately 7,500 bulbs of various lily species were planted in two different planting zones (see Attachment B). Planting these bulbs is expected to result in flowering individuals much sooner than by relying on seed alone.

2. Management Actions for 2005

Phase 1:

1. Spray phase with grass-specific herbicide to remove any residual annual rye grass.
2. Spot herbicide common invasive forbs.
3. Seed native grasses in the fall.

Phase 2:

1. Spray phase with broad-spectrum herbicide to remove annual rye grass and other non-native species.
2. Seed with habitat-specific native mixes that do not contain grasses in the fall of 2006.

Table 8.2. Progress of the Dragonfly Unit Enhancements towards meeting the MOA vegetation standards. The most recent data for each section are compared to their relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Vegetation Standard in MOA	Phase 1	Goal Met?	Phase 2	Goal Met?
Site status in the monitoring period	2006-2010	N/A	2007-2011	N/A
50% native cover after 5 years	2010	TBD	2011	TBD
The combined cover of <i>Phalaris arundinacea</i> , <i>Dipsacus fullonum</i> , and <i>Rubus armeniacus</i> shall not exceed 10% of the total cover in the enhancements.	2010	TBD	2011	TBD

C. Monitoring Results

1. Hydrology

Hydrology monitoring will begin in 2005 for Phase 1 and 2006 for Phase 2.

2. Vegetation

Vegetation monitoring will begin in 2005 for Phase 1 and 2006 for Phase 2.

Plant materials placed on the site included habitat-specific seed mixes, bare root rushes and sedges, and lily bulbs. Phase 1 was broadcast seeded with wet prairie, emergent, and vernal pool seed mixes (Tables 8.3-8.5). Bare root plugs and bulbs were planted on the site in late fall (Table 8.6). Assessments of the seeding and plugging success will take place in 2005 (to assess the forb planting) and 2006 (to assess the grass planting).

Table 8.3. Dragonfly Bend Phase 1 Wet Prairie Mix. 39 acres were seeded with a wet prairie mix. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied. This area includes the light blue and green areas on Figure 8.1.

Species	Weight (grams)	grams/acre	% of Mix
<i>Allium amplexans</i>	299.5	7.7	0.4%
<i>Aster hallii</i>	7800.0	200.0	9.3%
<i>Camassia leichtlinii</i>	780.0	20.0	0.9%
<i>Camassia quamash</i>	4680.0	120.0	5.6%
<i>Carex densa</i>	975.0	25.0	1.2%
<i>Carex unilateralis</i>	977.0	25.1	1.2%
<i>Castilleja tenuis</i>	507.0	13.0	0.6%
<i>Downingia elegans</i>	7340.0	188.2	8.7%
<i>Downingia elegans and yina</i>	10.0	0.3	0.0%
<i>Downingia yina</i>	295.5	7.6	0.4%
<i>Epilobium densiflorum</i>	7800.0	200.0	9.3%
<i>Eriophyllum lanatum</i>	585.0	15.0	0.7%
<i>Gentiana sceptrum</i>	117.0	3.0	0.1%
<i>Grindelia integrifolia</i>	7800.0	200.0	9.3%
<i>Juncus tenuis</i>	3900.0	100.0	4.6%
<i>Lomatium nudicaule</i>	780.0	20.0	0.9%
<i>Lotus formosissimus</i>	39.0	1.0	0.0%
<i>Lotus unifoliolatus</i>	1170.0	30.0	1.4%
<i>Lupinus rivularis</i>	3900.0	100.0	4.6%
<i>Luzula comosa</i>	25.0	0.6	0.0%
<i>Madia sativa</i>	1755.0	45.0	2.1%
<i>Microseris laciniata</i>	7800.0	200.0	9.3%
<i>Orthocarpus bracteosus</i>	39.0	1.0	0.0%
<i>Perideridia oregana</i>	1872.0	48.0	2.2%
<i>Plagiobothrys figuratus</i>	7645.0	196.0	9.1%
<i>Potentilla gracilis</i>	2925.0	75.0	3.5%
<i>Prunella vulgaris</i>	1560.0	40.0	1.9%
<i>Ranunculus orthorhynchus</i>	981.0	25.2	1.2%
<i>Rumex salicifolius</i>	936.0	24.0	1.1%
<i>Saxifraga oregana</i>	273.0	7.0	0.3%
<i>Sisyrinchium idahoense</i>	78.0	2.0	0.1%

Table 8.3. Dragonfly Bend Phase 1 Wet Prairie Mix. 39 acres were seeded with a wet prairie mix. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied. This area includes the light blue and green areas on Figure 8.1.

Species	Weight (grams)	grams/acre	% of Mix
<i>Thalictrum polycarpum</i>	390.0	10.0	0.5%
<i>Wyethia angustifolia</i>	7450.0	191.0	8.9%
<i>Zigadenous venenosus</i>	409.5	10.5	0.5%

Table 8.4. Dragonfly Bend Phase 1 Vernal Pool Mix. 16 acres were seeded with a wet prairie mix. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied. This area includes the light blue areas on Figure 8.1.

Species	Weight (grams)	grams/acre	% of Mix
<i>Carex densa</i>	1600.0	100.0	11.1%
<i>Carex unilateralis</i>	1600.0	100.0	11.1%
<i>Downingia yina</i>	1200.0	75.0	8.3%
<i>Epilobium densiflorum</i>	1185.0	74.1	8.2%
<i>Eryngium petiolatum</i>	500.0	31.3	3.5%
<i>Gratiola ebracteata</i>	226.5	14.2	1.6%
<i>Grindelia integrifolia</i>	1600.0	100.0	11.1%
<i>Juncus acuminatus</i>	800.0	50.0	5.6%
<i>Juncus bolanderi</i>	240.0	15.0	1.7%
<i>Lasthenia glaberrima</i>	310.0	19.4	2.2%
<i>Madia glomerata</i>	800.0	50.0	5.6%
<i>Navarretia intertexta</i>	400.0	25.0	2.8%
<i>Plagiobothrys figuratus</i>	1520.0	95.0	10.6%
<i>Ranunculus alismafolius</i>	800.0	50.0	5.6%
<i>Rorripa curvisiliqua</i>	800.0	50.0	5.6%
<i>Rumex salicifolius</i>	320.0	20.0	2.2%
<i>Veronica peregrina</i>	480.0	30.0	3.3%

Table 8.5. Dragonfly Bend Phase 1 Emergent Mix. 2 acres were seeded with a wet prairie mix. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied. This area includes the dark blue areas on Figure 8.1.

Species	Weight (grams)	grams/acre	% of Mix
<i>Alisma triviale</i>	200.0	100.0	2.5%
<i>Beckmannia syzigachne</i>	4800.0	2400.0	59.1%
<i>Carex densa</i>	200.0	100.0	2.5%
<i>Carex obnupta</i>	170.0	85.0	2.1%
<i>Carex unilateralis</i>	200.0	100.0	2.5%
<i>Downingia elegans and yina</i>	40.0	20.0	0.5%
<i>Downingia yina</i>	150.0	75.0	1.8%
<i>Eleocharis obtusa</i>	50.0	25.0	0.6%
<i>Eleocharis palustris</i>	100.0	50.0	1.2%
<i>Eryngium petiolatum</i>	50.0	25.0	0.6%
<i>Glyceria occidentalis</i>	200.0	100.0	2.5%
<i>Hordeum brachyantherum</i>	800.0	400.0	9.8%
<i>Juncus acuminatus</i>	100.0	50.0	1.2%
<i>Juncus bolanderi</i>	30.0	15.0	0.4%

Table 8.5. Dragonfly Bend Phase 1 Emergent Mix. 2 acres were seeded with a wet prairie mix. The table includes the species seeded, the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied. This area includes the dark blue areas on Figure 8.1.

Species	Weight (grams)	grams/acre	% of Mix
<i>Juncus effusus</i> var. <i>pacificus</i>	100.0	50.0	1.2%
<i>Juncus ensifolius</i>	80.0	40.0	1.0%
<i>Juncus oxymeris</i>	60.0	30.0	0.7%
<i>Juncus patens</i>	60.0	30.0	0.7%
<i>Ludwigia palustris</i>	100.0	50.0	1.2%
<i>Myosotis laxa</i>	40.0	20.0	0.5%
<i>Polygonum hydropiperoides</i>	100.0	50.0	1.2%
<i>Rorripa curvisiliqua</i>	100.0	50.0	1.2%
<i>Rumex salicifolius</i>	40.0	20.0	0.5%
<i>Scirpus tabernaemontani</i>	200.0	100.0	2.5%
<i>Sparganium emersum</i>	4.0	2.0	0.0%
<i>Veronica scutellata</i>	150.0	75.0	1.8%

Table 8.6. Bare root and Bulbs Planted at Dragonfly Bend in Phase 1 the fall of 2004. The plugs and bulbs planted at Dragonfly Bend in the fall of 2004 are listed with their plant material type and the quantity planted. These species were planted in areas designated in Figure 8.1.

Species	Plant Material Type	Quantity
<i>Allium amplexans</i>	Flats of bulbs	12
<i>Brodiaea coronaria</i>	Flats of bulbs	10
<i>Camassia leichtlinii</i> var. <i>suksdorfii</i>	Flats of bulbs	10
<i>Camassia quamash</i> var. <i>maxima</i>	Flats of bulbs	12
<i>Carex densa</i>	Bare root	10,000
<i>Carex unilateralis</i>	Bare root	4,500
<i>Eleocharis palustris</i>	Bare root	8,000
<i>Juncus acuminatus</i>	Bare root	5,000
<i>Juncus bolanderi</i>	Bare root	3,000
<i>Juncus effusus</i> var. <i>pacificus</i>	Bare root	500
<i>Juncus ensifolius</i>	Bare root	3,250
<i>Juncus nevadensis</i>	Bare root	10,000
<i>Juncus oxymeris</i>	Bare root	500
<i>Juncus patens</i>	Bare root	500
<i>Triteleia hyacinthina</i>	Flats of bulbs	10
<i>Zigadenus venenosus</i> var. <i>venenosus</i>	Flats of bulbs	10

Chapter 9: Nolan Unit

A. Site Description

1. *Size:* 16.32 acres
2. *Ownership:* City of Eugene
3. *Site Timeline:* **Table 9.1**

Section	Construction Year	Monitoring Period
East	1997	1998-2006*
West	1997	1998-2006*

*Monitoring period has been extended to allow for remedial action.

4. *Location*

Former site of the partially developed Nolan Industrial Park, the Unit is situated along the north bank of Amazon Creek, east of Beltline Road, and south of 7th Street.

5. *Site History*

The site was farmed through the late 1970's. In 1980, urban infrastructure was extended to the site. The site was to be developed as an industrial park.

6. *Focus of Prescriptions*

Restoration and enhancement of wetland prairie and emergent wetland communities. Restoration and enhancement of the wetland was realized through the excavation and removal of fill material, grading and scarifying hydric soils and the installation of water control structures to regulate site hydrology. The site was seeded with native plant species.

7. *Site-Specific Management Goals*

1. Preserve, enhance, and restore wetlands adjacent to Amazon Creek.
2. Remove fill (previously placed in wetlands) down to the original hydric soil surface, and restore with native emergent wetland vegetation.
3. Enhance existing wetlands by eliminating reed canarygrass from the site.

Nolan

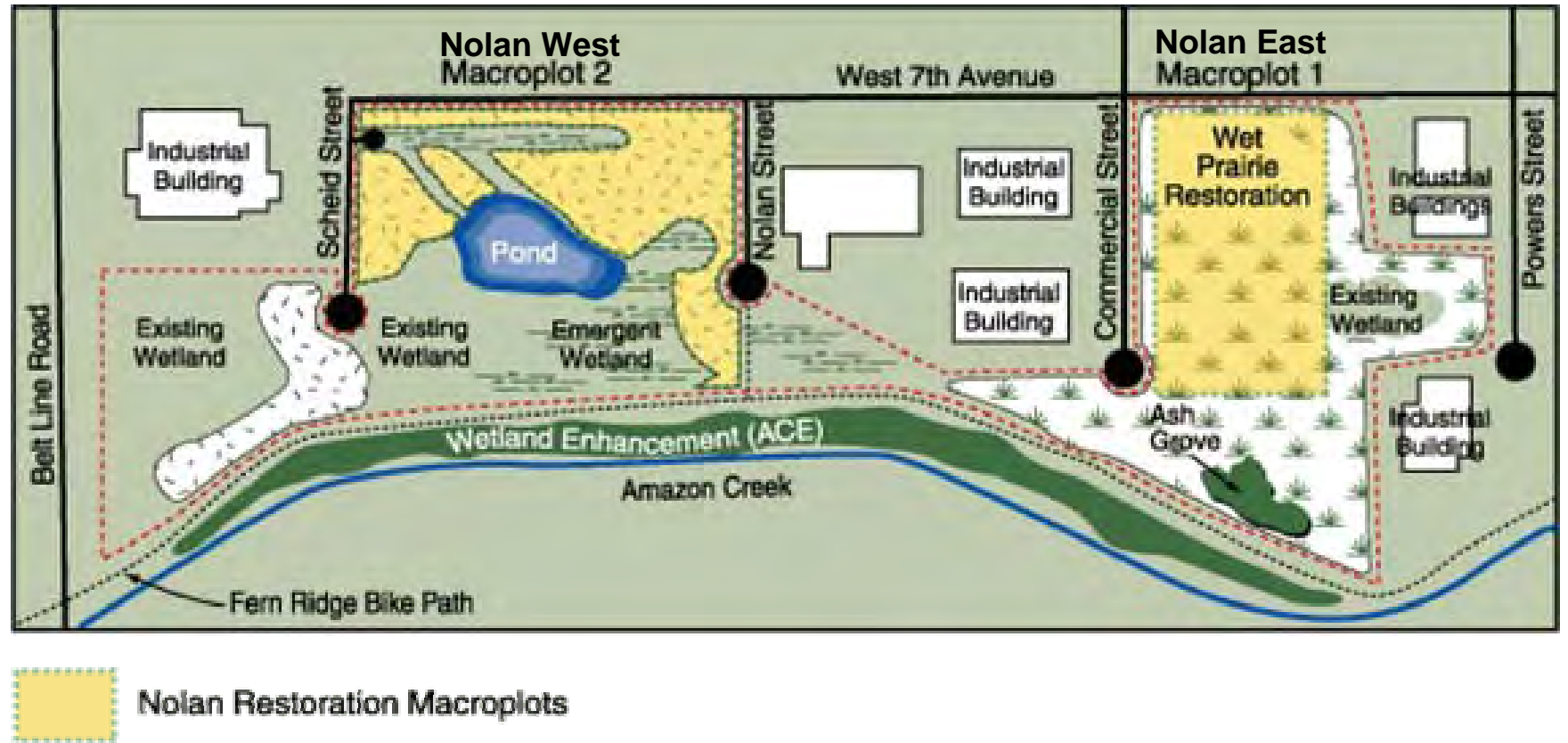


Figure 9.1. Nolan Unit Site Map. Nolan East and Nolan West restorations are labeled with their associated macroplots.

B. 2004 Monitoring Summary

This year was the 7th of the 8-year monitoring period for the Nolan Unit. Both the eastern and western sections continue to demonstrate wetland hydrology sufficient to support the development of wetland soils and vegetation. Pennyroyal continues to persist on the mitigation over large areas, despite many attempts to remove it. Nolan East was sprayed and then reseeded in 2004. Remedial actions planned for the site include planting willow, cotton wood, spirea and rose.

1. 2004 Management Actions

1. Patches of reed canarygrass (*Phalaris arundinacea*) and Harding grass (*Phalaris aquatica*) were mowed or the seed heads were cut over the whole site.
2. Maintenance crews also spent one day hand weeding the site.
3. The perimeter was mowed.
4. The site was sprayed to reduce the cover of pennyroyal (*Mentha pulegium*).
5. The site was seeded with vernal pool and emergent mixes.

2. Management Actions for 2005

1. Continue early fall perimeter mow around entire site.
2. Remove teasel (*Dipsacus fullonum*) along bike path edge.
3. Focus on controlling reed canary-grass (*Phalaris arundinacea*) and Harding grass (*Phalaris aquatica*) to prevent its spread.
4. Continue to remove ash and hawthorn as they spread into prairie.
5. Plant Douglas spiraea, Nootka rose, and willows in the vernal pool areas.

Table 9.2. Progress of the Nolan Unit restorations towards meeting the MOA vegetation standards. The most recent data for each phase is compared to its relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard. 'PI' refers to point-intercept cover data collection.

Site Characteristics and MOA Vegetation Standards	Nolan East	Goal Met?	Nolan West	Goal Met?
Site status in the monitoring period	Year 7 of 8	N/A	Year 7 of 8	N/A
Most recent quantitative data collected in:	PI - 2002	N/A	PI - 2002	N/A
70% native cover after 5 years	63.4%	No	78.7%	Yes
75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list	2006	TBD	2006	TBD
70% of the planted species shall be alive and present at the end of the seven year monitoring period	2006	TBD	2006	2004
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	2006	TBD	2006	2004
Emergent: minimum of 5 native species occurring at 10% frequency rate or greater	2006	TBD	2006	2004

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil were estimated and mapped during 2 site visits, the first in early spring and the second in late fall. Water depths were measured monthly at 1 staff gauge.

b) Results

Both Nolan East and Nolan West have hydrology sufficient for the development of hydric soils (Figures 10.2-10.4). Neither section of Nolan showed any changes in hydrology.

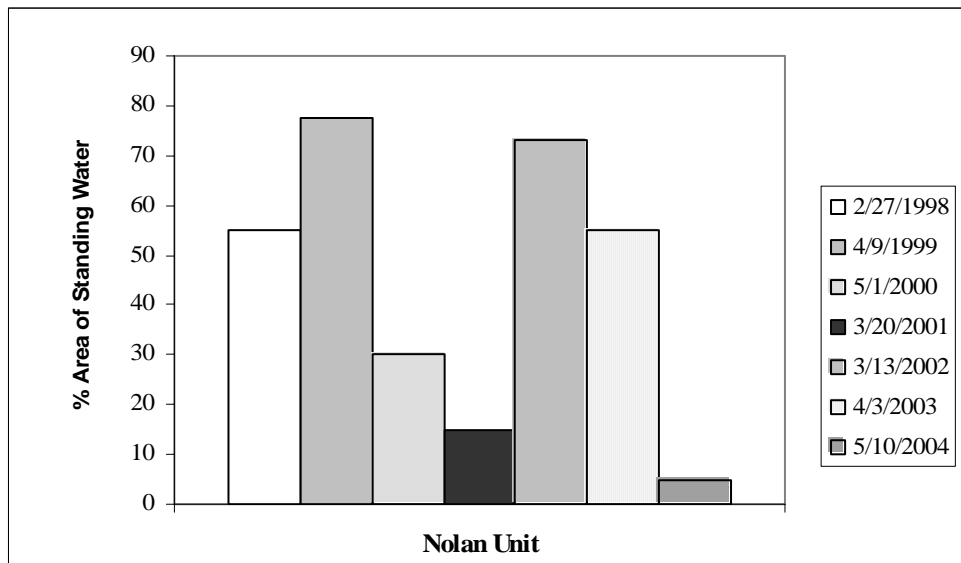


Figure 9.2. Spring standing water in the Nolan Unit. Percentage of the Nolan Unit with standing water in the early spring over the history of the restoration.

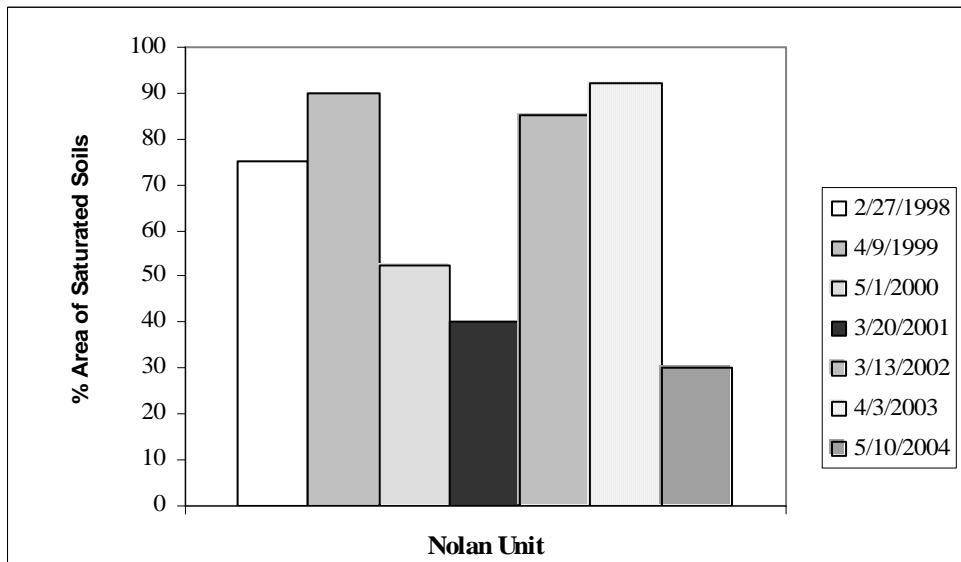


Figure 9.3. Spring saturated soils in the Nolan Unit. Percentage of the Nolan Unit with saturated soils in the early spring over the history of the restoration.

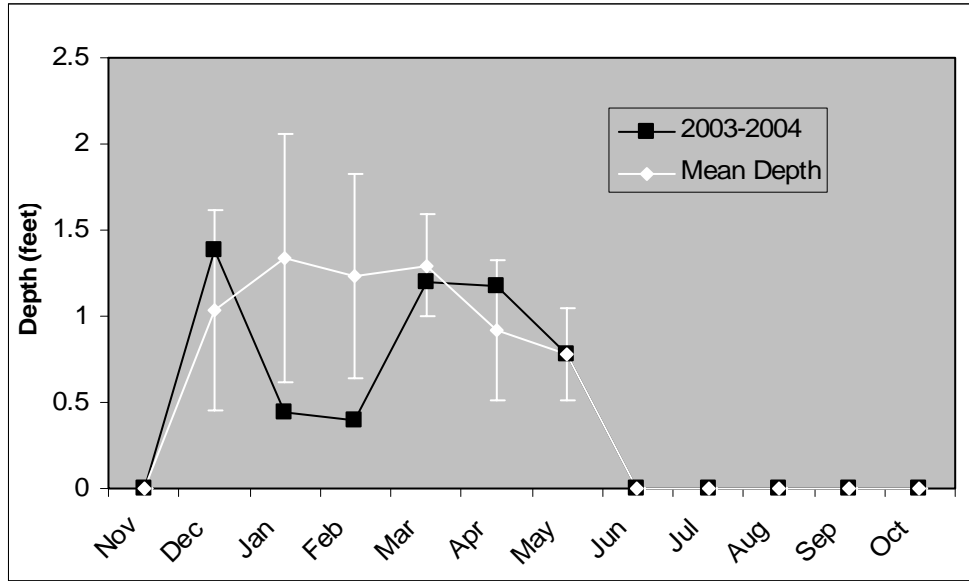


Figure 9.4. Nolan Unit inundation levels in the western section during 2003-2004 compared to the mean and standard deviation of depths between 1998 and 2004. Depth of inundation throughout the year in the eastern in 2003-2004. The mean and standard deviation calculated from depths observed between 1998 and 2004 are also graphed for comparison.

2. *Vegetation*

a) *Methods*

No quantitative monitoring was scheduled this year on any section of the Nolan Unit. Routine qualitative monitoring, such as photopoints, were completed. Point-intercept and nested frequency for the entire site are scheduled for the summer of 2006. Species lists were updated for each section and the results can be viewed in Appendix B.

3. *Wildlife Utilization*

Waterfowl are attracted by the seasonal pond and remain the most frequent visitors to the site. Specific sightings for this year include Canada geese, mallards, and ring-necked pheasants.

Chapter 10: North Greenhill Prairie

A. Site Description

1. *Size:* 71 acres
2. *Ownership:* BLM
3. *Site Timeline:* **Table 10.1**

Section	Construction Year/s	Acreage	Monitoring Period
Phase 1 Sod-Removal	1998	12.5 acres	1999-2003
Phase 1 Solarization	1998	1.0 acres	1999-2003
Phase 2 Sod-Removal	2000-2001	7.5 acres	2000-2006
Phase 2 Solarization	2000	0.9 acres	2001-2004
Phase 3 Sod-Removal	2002	19.04 acres	2003-2007

4. Location

The site is located on the west side of Greenhill Road, approximately one half mile south of Royal Avenue and approximately three quarters of a mile north of the Southern Pacific Railroad tracks in Township 17 S., Range 4 W., Section 30, tax lot 2100.

5. Site History

Of the 71 acres, 50.6 acres were delineated as farmed wetland. Sampling indicated that approximately 90% of the vegetation was non-native grasses. From conditions observed in February and March of 1997, it was determined that there were three primary sources of water on the site: precipitation directly on the site, flow from the South Greenhill site, and flow from seeps likely fed by run-off from the east side of Oak Hill. The site was farmed for hay production prior to BLM ownership.

6. Focus of Prescriptions

Restore/enhance native wet prairie and vernal pool communities in the former agricultural lands on the site.

7. Site-Specific Management Goals

1. Restore natural hydrology by dispersing water flows currently confined to ditches into broader surface flows.
2. Restore/enhance native wet prairie and vernal pool communities in the agricultural lands on the site.
3. Restore upland prairie vegetation to the tops of mounds situated within the wetland mitigation area.
4. Enhance habitat conditions for native wildlife species associated with wet prairie and ash savanna habitats.
5. Ensure compatibility of wetlands between this mitigation site and the ODOT mitigation site immediately to the south.
6. Take advantage of the large size of the site to establish large areas of contiguous wetland communities on the site and in conjunction with future wetland restoration on adjacent sites to the east and south.

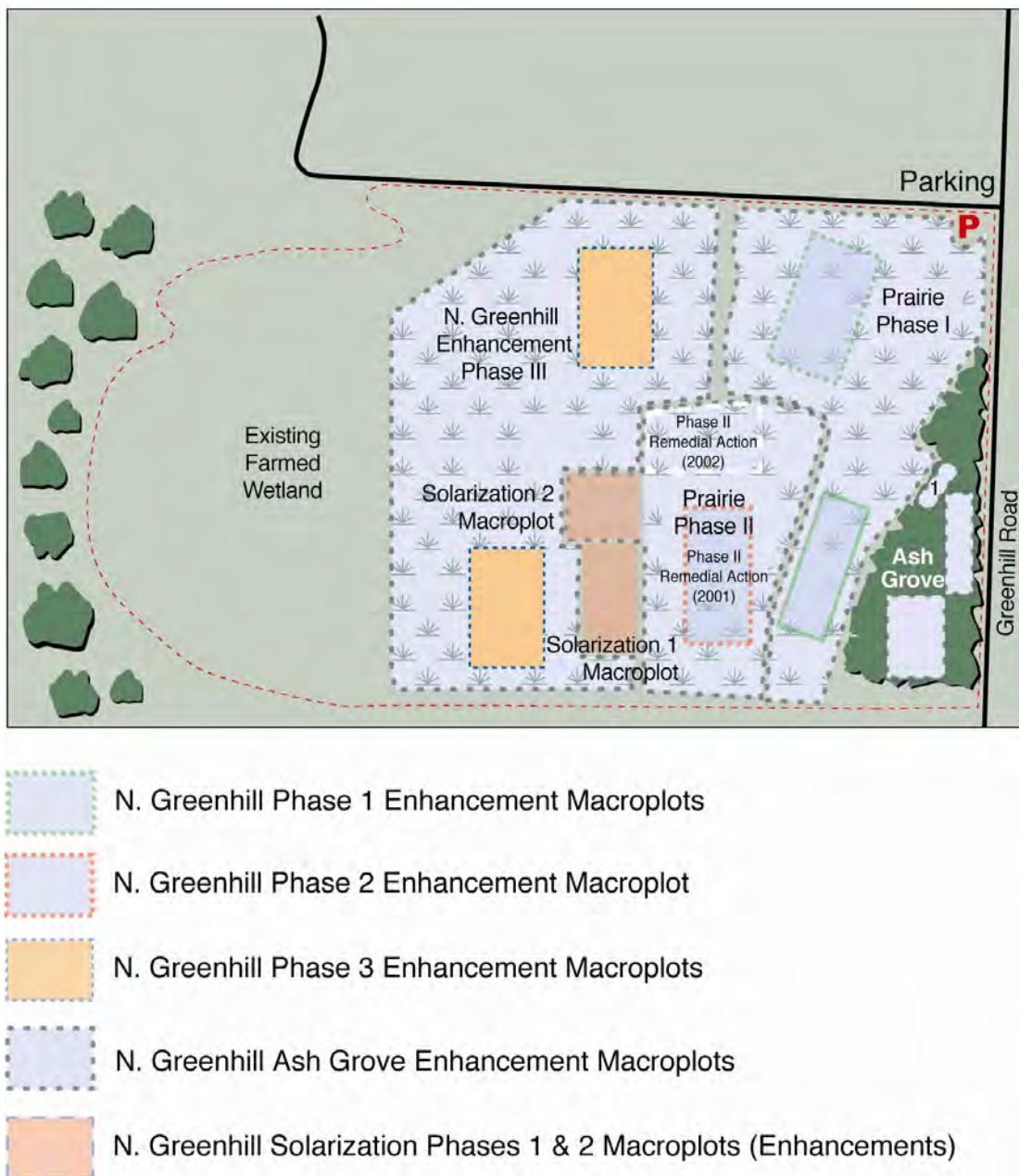


Figure 10.1. North Greenhill Prairie Site Map. The Enhancement Ash Grove area, Phases 1, 2, and 3 sod-removal enhancements as well as Phases 1 and 2 solarization enhancements are labeled with their associated macroplots.

B. 2004 Monitoring Summary

Both the Phase 1 Solarization and Phase 1 Sod-removal are complete projects. The final monitoring report is included in the 2003 Annual Report.

There were no significant changes in Phase 2 Solarization or Sod-removal. Minor weed issues were addressed in Phase 2 Sod-removal. No quantitative vegetation monitoring occurred in either area. The Phase 2 Sod-removal appears to be on track to meet all mitigation bank standards, while Phase 2 Solarization may need additional work to meet diversity standards.

This was the second growing season for Phase 3. The spring season was too dry to accurately assess site hydrology, so this will take place in subsequent years. Point-intercept cover sampling data were collected and the site met the mitigation bank criterion of 50% native vegetation in year 2, with over 94% native cover in both macroplots. The project also appears to be on track in meeting year 5 diversity standards as well.

2004 Management Actions

Phase 1:

This project has completed its monitoring period. It is currently under BLM management.

Phase 2:

1. A maintenance crew spent two days removing non-native species from the area.
2. The site perimeter was mowed to reduce weed invasion.

Phase 3:

1. A maintenance crew spent seven days removing non-native species from the area.
2. The site perimeter was mowed to reduce weed invasion.
3. The entire site was mowed to reduce the cover of grasses and promote forb diversity and cover.

1. Management Actions for 2005

Phase 1:

This project has completed its monitoring period. It is currently under BLM management.

Phase 2:

Continue hand weeding as was done in 2004. Based on last year's weeding, special attention should be given to St. John's wort (*Hypericum perforatum*), hairy cat's ear (*Hypochaeris radicata*), Centaury (*Centaurea erythraeae*), and Parentucellia (*Parentucellia viscosa*).

Phase 3:

1. Hand-weed the restoration area.
2. Continue to mow the perimeter to reduce weed invasion.

Table 10.2. Progress of the North Greenhill Unit Phase 2 and 3 Enhancements towards meeting the MIP vegetation standards. The most recent data for each phase is compared to its relevant vegetation standards from the site’s MIP. A date in the cell indicates the year in which the data will be collected to evaluate the site’s success in meeting the associated standard.

Site Characteristics and MOA Vegetation Standards	Phase 2				Phase 3	
	Sod-Removal	Goal Met?	Solarization	Goal Met?	Sod-Removal	Goal Met?
Site status in the monitoring period	Year 4 of 6	N/A	Year 4 of 5	N/A	Year 2 of 5	N/A
Most recent point-intercept cover data collected in:	2003	N/A	2002	N/A	2004	N/A
50% native cover after 2 years	81%	Yes	82%	Yes	MP 1 = 94% MP 2 = 97%	Yes
70% native cover after 5 years	2006	TBD	2005	TBD	2007	TBD
70% of the species occurring at 20% cover or greater are native	2006	TBD	2005	TBD	2007	TBD
Minimum of 10 native species occurring at 2% cover or greater	2006	TBD	2005	TBD	2007	TBD

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil were estimated and mapped during site visits in early spring for all active project phases. Soil pits were also dug in Phase 3.

b) Results

Phase 2

Hydrology monitoring in 2003 consisted of both hydrography mapping. Approximately 10% of the site was inundated and 60% was saturated to the soil surface. Depths to the water table ranged from 1.5 inches to 3 inches. Hydrology on the site is sufficient for the development and maintenance hydric soils.

Phase 3

Hydrology monitoring in 2004 consisted of both hydrography mapping and soil pits to measure the depth to the water table from the soil surface.

The site was approximately 5% inundated and 50% saturated on April 1st of 2004. Four soil pits were dug in a transect upslope. Due to the unusually dry spring, none had water within 12 inches of the soil surface. While the water table was insufficient for wetland hydrology this year, oxidized root channels present in all holes indicate that it has likely been achieved. The soil pits will be retested in a year will more normal spring rainfall.

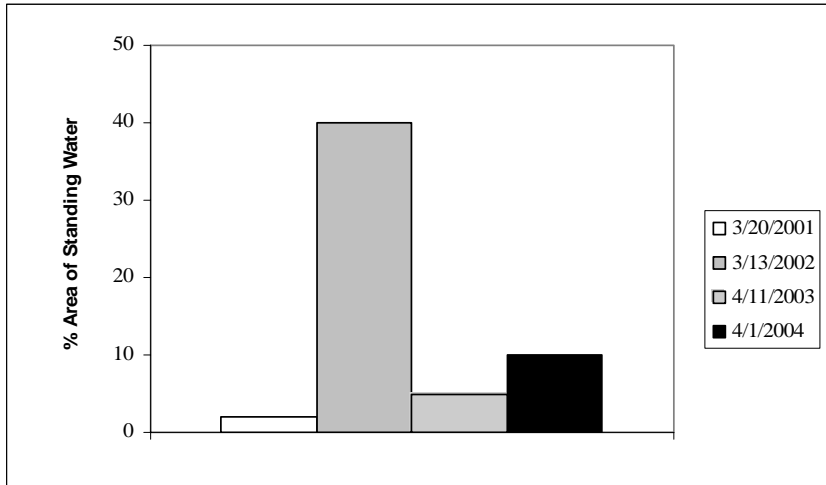


Figure 10.2. Spring standing water in Phase 2 of the N. Greenhill Prairie Unit. Percentage of Phase 2 with standing water in the early spring over the history of the restoration.

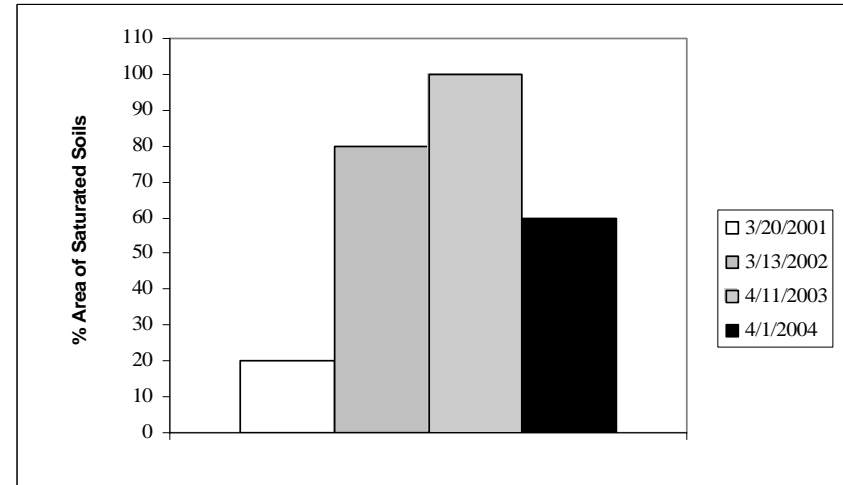


Figure 10.3. Spring saturated soils in Phase 2 of the N. Greenhill Prairie Unit. Percentage of the Phase 2 with saturated soils in the early spring over the history of the restoration.

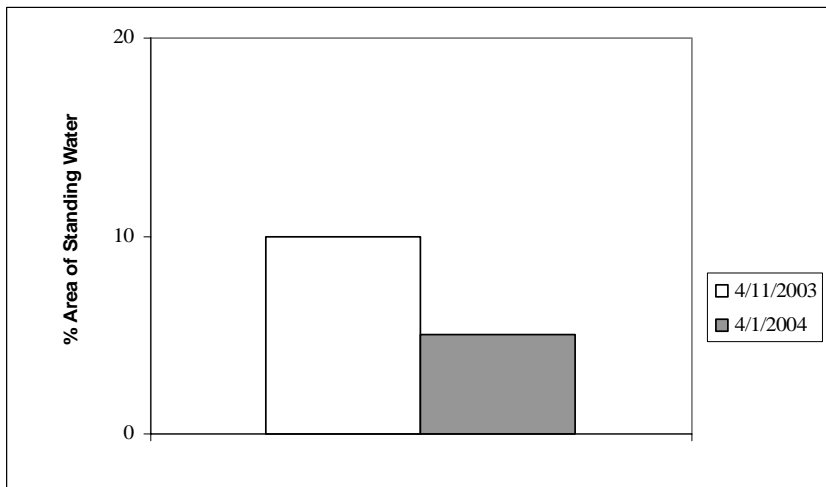


Figure 10.4. Spring standing water in Phase 3 of the N. Greenhill Prairie Unit. Percentage of Phase 3 with standing water in the early spring over the history of the restoration.

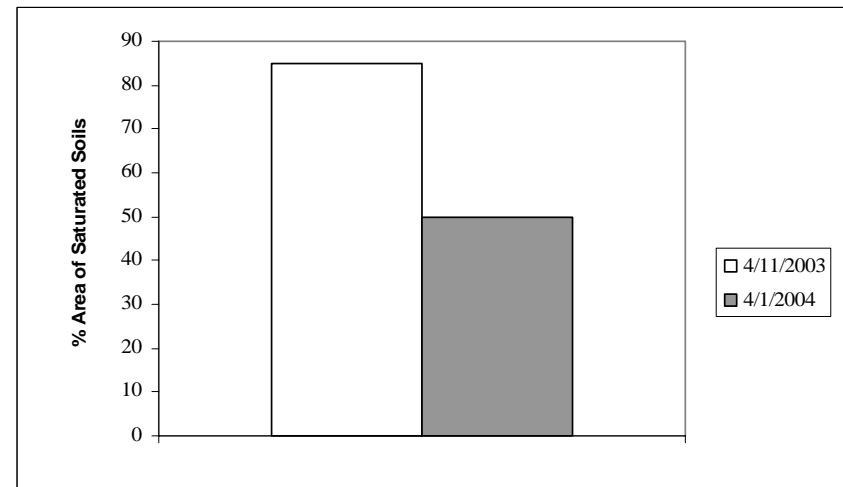


Figure 10.5. Spring saturated soils in Phase 3 of the N. Greenhill Prairie Unit. Percentage of the Phase 3 with saturated soils in the early spring over the history of the restoration.

2. Vegetation

a) Methods

Point-intercept data were collected in 2 macroplots within the Phase 3 (sod-removal) in 2004.

Macroplot 1 was sampled July 12th and 13th for a total of 203 points and macroplot 2 was sampled July 13th for a total of 202 points.

A species list for each active phase was also compiled and/or updated and can be viewed in Appendix B.

b) Results

Phase 3 Sod-Removal Enhancement: Point-intercept Results

Both macroplots exceeded the 2nd year vegetation standard of 50% relative native vegetation cover. Of the total plant cover, 95% was native cover in Macroplot 1 and Macroplot 2 was 97% native cover.

Dominant species in both macroplot included *Deschampsia cespitosa* and *Agrostis exarata*, each ranging from 19% to 30% cover. Dominant forbs included *Eriophyllum lanatum* var *lanatum*, *Madia* spp., and *Prunella vulgaris* var. *lanceolata*. These species range from 1.5% to 8% cover.

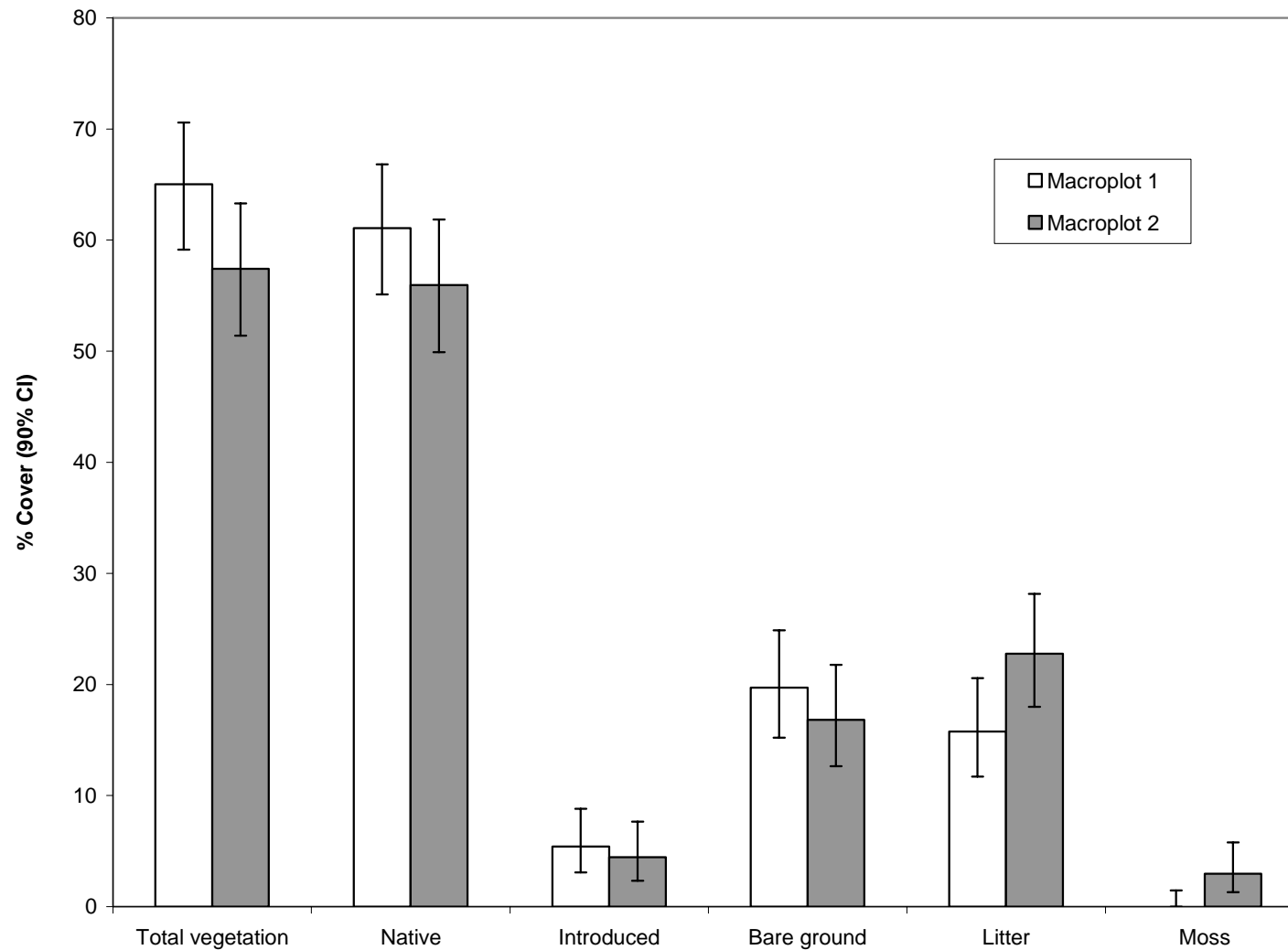


Figure 10.6. Percent cover of ground cover guilds in Macroplots 1 and 2 of the North Greenhill Phase 3 Sod-Removal Enhancement. The total percent cover of all vegetation, native species, introduced species, bare ground, litter, and moss are graphed for macroplots 1 and 2 of the North Greenhill Phase 3 Sod-Removal Enhancement. Data were collected for each macroplot the 2nd year after planting.

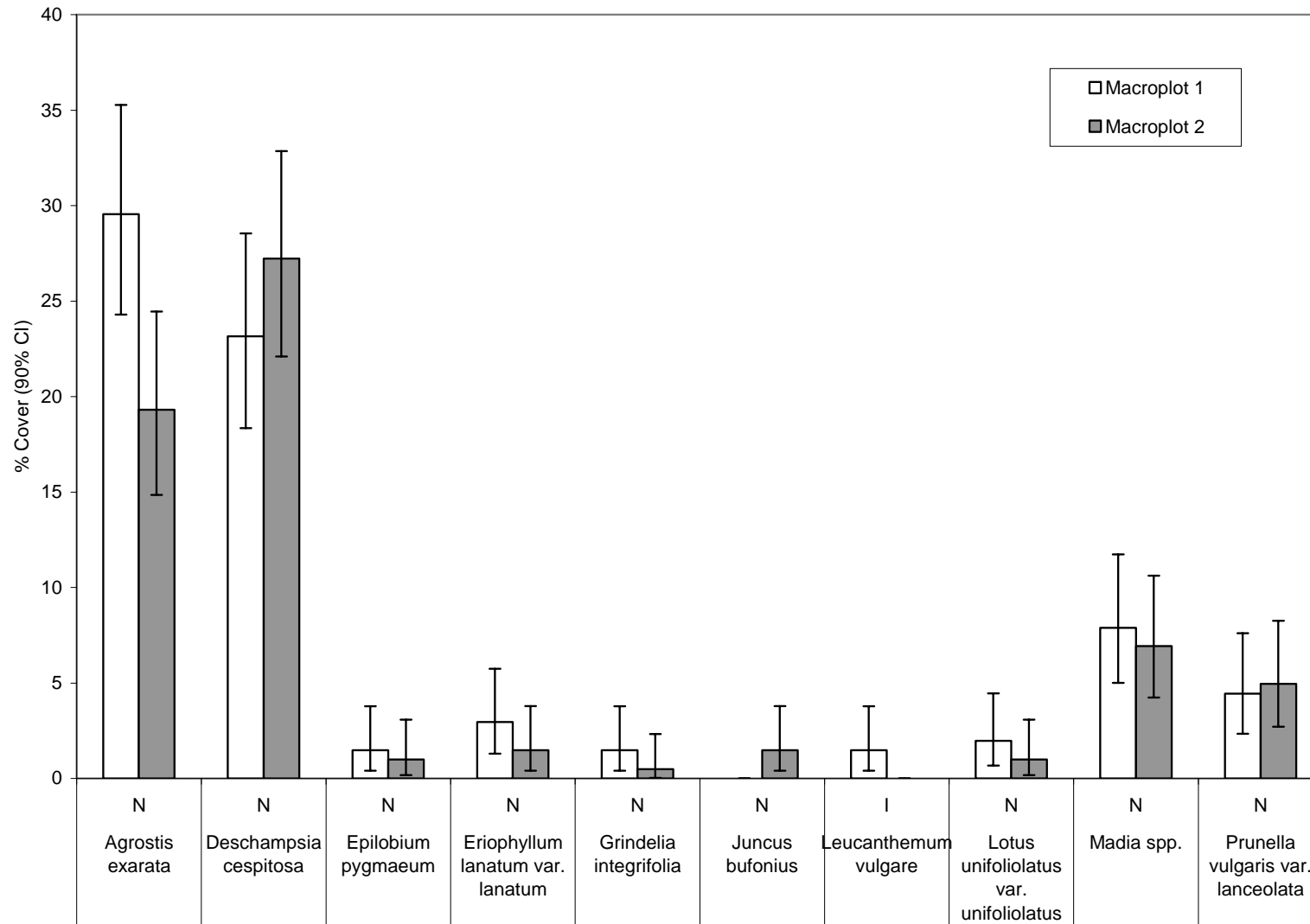


Figure 10.7. Species in the North Greenhill Phase 2 Sod-Removal, Macroplot 1 and 2, with > 1% cover. All species in 2004 with greater than one percent cover are graphed for North Greenhill Phase 3 Sod-Removal, Macroplots 1 and 2. Data were collected the 2nd year after seeding.

3. Wildlife Utilization

Wildlife sightings for 2003 were similar to those of previous years. Mallard, Canadian goose, northern harrier, common snipe, and northern flicker were all bird species commonly observed on the site. Evidence of raccoons and deer were again found in the unit.

Chapter 11: Oxbow West Unit

A. Site Description

1. *Size:* 57 acres
2. *Ownership:* BLM
3. *Site Timeline:* **Table 11.1 Oxbow West Unit site timeline.**

Section	Treatment and Construction Years	Acreage	Monitoring Period
Forest Enhancement	2003	1.12	2003-2008
Western Wet Prairie Enhancement	2003	4.31	2003-2008
Eastern Wet Prairie Enhancement	2003-2005	6.25	2006-2011
Emergent Enhancement	2003	0.29	2004-2008
Emergent Restoration	2003	0.13	2004-2008
Enhanced Wet Prairie and Forest, but we receive no credit (ODOT land)	2003 & 2004	2.50	N/A

4. Location

The Oxbow West Unit is located at the northern end of North Terry Street. It is bordered by Southern Pacific Railroad tracks to the north, Amazon Creek to the east, and Greenhill Technology Park to the south.

5. Baseline Conditions

The site was used as pasture and for hay production until the early to mid-1990s. Currently, the site contained approximately 51 acres of delineated wetlands, most of which is wet prairie of varying quality, with some smaller patches of forested and emergent wetland. Woody vegetation has colonized much of the wet prairie areas. Oxbow West also supports some of the largest known populations of rare and sensitive plants in west Eugene.

6. Focus of Prescriptions

Treatments at Oxbow West will enhance and restore wet prairie, forested, and emergent habitats. Wet prairie and forest enhancement will remove non-native and native woody vegetation, including reed canarygrass and fruit trees. The restoration and enhancement of the emergent area in the southeast will include the removal of fill material and reed canarygrass.

7. Site-Specific Management Goals

1. Protect and enhance existing rare plant populations where they occur and improve habitat suitable for expansion of these populations.
2. Enhance and restore native wet prairie and vernal pool communities where they are degraded.
3. Control exotic and woody vegetation in the wet and upland prairie.
4. Control exotic vegetation and selectively remove woody vegetation from the forested wetland areas.
5. Minimize the potential impacts to the site from future increased Greenhill Technology Park stormwater runoff.
6. Minimize human access onto the site while providing visual access from the bike path.

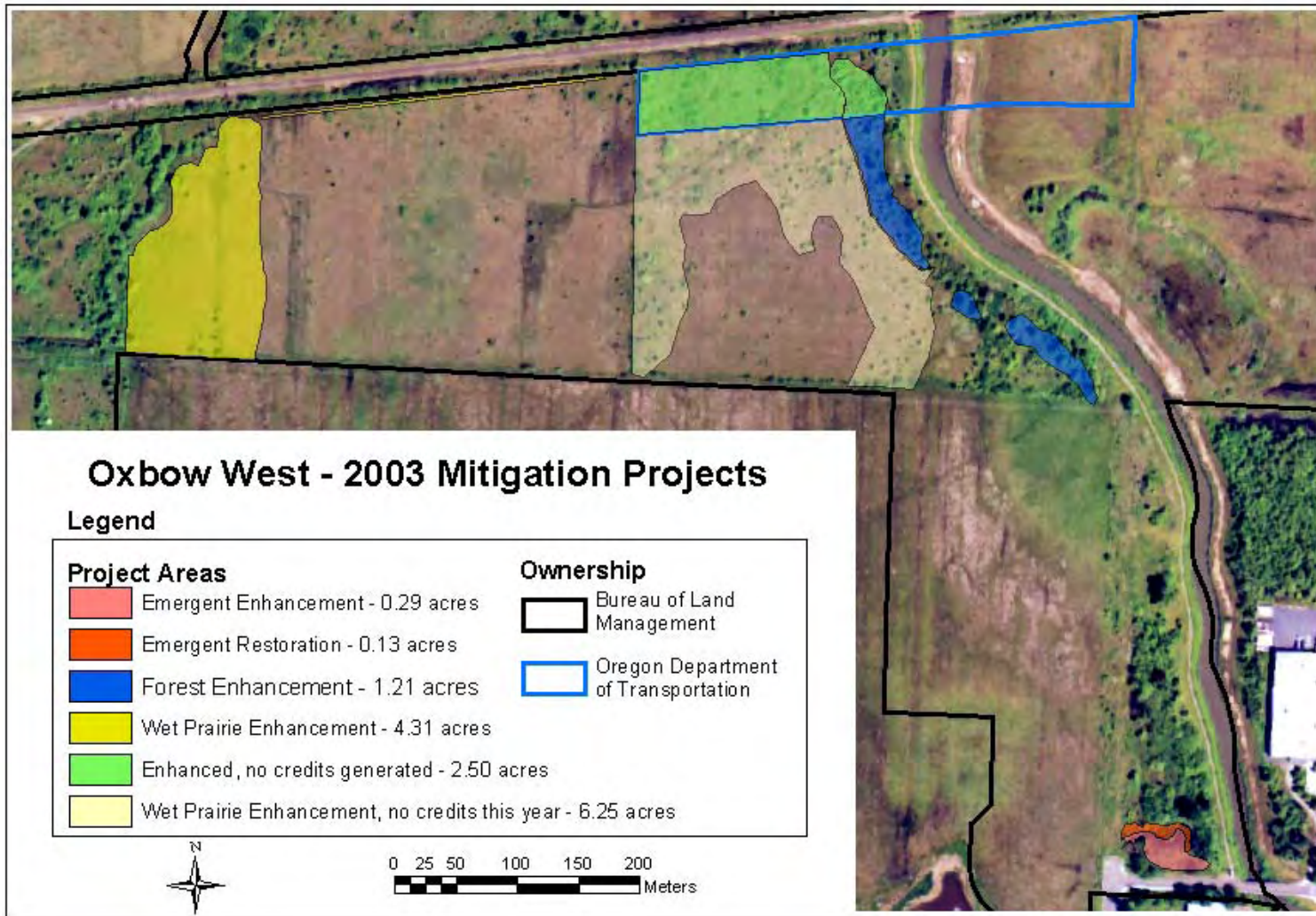


Figure 11.1. Oxbow West – Mitigation Projects Site Map. The map shows the enhancement and restoration areas labeled with their acreages. No credits will be generated from enhancement completed on land owned by the Oregon Department of Transportation. The wet prairie enhancement of 6.25 acres needs follow-up treatment in 2005—monitoring will begin in 2006.

B. 2004 Monitoring Summary

Four sections of the Oxbow West Unit are being managed as part of the mitigation bank; the western prairie enhancement, eastern prairie enhancement, eastern forest enhancement, and the southern panhandle restoration and enhancement (Figure 11.1). Wetland hydrology continues to persist in the enhancement areas and the southern panhandle restoration and enhancement area. Vegetation monitoring consisted of compiling species lists for each section, rare plant monitoring in the eastern prairie and eastern forest enhancement, as well as a seeding assessment in the southern panhandle restoration and enhancement. Monitoring in the eastern forest documented 448 *Sidalcea cusickii* ‘individuals’ in 2003 and 328 in 2004. *Sidalcea cusickii* reproduces vegetatively and through seed. It is likely that the difference in the number of ‘individuals’ is due more to the dry spring than to management treatment. The *Erigeron decumbens* var. *decumbens* population in the eastern prairie enhancement was surveyed for the first time in 2004. Within the macroplot, 66 crowns were observed with a total of 489 flowers. The seeding assessment in the southern restoration and enhancement revealed minimal seeding success. Only 22 species were observed and there was very low cover over the site. To improve the cover and diversity of the site, additional seed, rush and sedge plugs, and woody vegetation will be planted in the fall of 2004 and winter of 2005.

1. 2004 Management Actions

1. Maintenance crews spent 13 days applying shade cloth to patches of reed canarygrass.
2. Maintenance crews spent 2 day removing sucker regrowth from the enhancements.
3. Maintenance crews spent 2 days mowing the perimeter and sucker regrowth in the enhancements.
4. Sections of fence were removed from the southern perimeter.
5. 3,100 bareroot *Carex* spp. and *Juncus* spp. were planted in the Panhandle Restoration and Enhancement:

Species	Quantity
<i>Carex densa</i>	700
<i>Carex unilateralis</i>	450
<i>Juncus acuminatus</i>	850
<i>Juncus bolanderi</i>	200
<i>Juncus effusus</i> var. <i>pacificus</i>	300
<i>Juncus ensifolius</i>	600
Total	3,100

2. Management Actions for 2005

1. After shade cloth is removed, the areas will be seeded with an appropriate seed mix.
2. Suckers of removed trees and Armenia blackberry will be mowed or weedwacked.
3. The site perimeter will be mowed.
4. Exotics will be removed using hand tools from the southern panhandle restoration and enhancement.
5. The southern restoration and enhancement will be reseeded with an aggressive vernal pool/emergent mix.

- 6. The southern restoration and enhancement will be planted with willows, ash, and spiraea.

Table 11.2. Progress of the Oxbow West Panhandle Unit Restoration and Enhancement towards meeting the MOA vegetation standards. The most recent data for each section are compared to their relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site’s success in meeting the associated standard.

Site Characteristics and MOA Vegetation Standards	Restoration	Goal Met?
Site status in the monitoring period	Year 0 of 5	N/A
Most recent quantitative data collected in year:	N/A	N/A
50% native cover after 2 years	2005	N/A
70% native cover after 5 years	2008	N/A
75% of those species occurring at a 50% frequency rate or grater shall be from the Native Plant list	2008	N/A
70% of the planted species shall be alive and present at the end of the five year monitoring period	2008	N/A
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	2008	N/A
Emergent: min 5 native species occurring at 10% frequency rate or greater	2008	N/A

Table 11.3. Progress of the Oxbow West Unit East and West prairie enhancements, as well as, the forest enhancement towards meeting the vegetation standards. The most recent data for the enhancement are compared to their relevant vegetation standards from the MIP. A date in the cell indicates the year in which the data will be collected to evaluate the site’s success in meeting the associated standard. ‘LI’ refers to line-intercept cover data collection.

Site Characteristics and MIP Vegetation Standards	East Prairie Enhancement	Goal Met?	West Prairie Enhancement	Goal Met?
Site status in the monitoring period	Year -1 of 5	N/A	Year 0 of 5	N/A
Most recent quantitative data collected in:	2003	N/A	Only qualitative data will be collected	N/A
60% reduction of total shrub cover after 5 years	LI = 2009	N/A	N/A	N/A
70% reduction of tree density after 5 years	Census 2009	N/A	Photopoints 2008	N/A

Table 11.4. Progress of the Oxbow West Unit Forest Enhancement towards meeting the vegetation standard. The most recent data for the enhancement are compared to their relevant vegetation standard. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Site Characteristics and MIP Vegetation Standards	Enhancement Area	Goal Met?
Site status in the monitoring period	Year 0 of 5	N/A
Most recent quantitative data collected in:	2003	N/A
50% reduction of tree density after 5 years	2008	N/A

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil are estimated and mapped during site visits in early spring (March-May). A staff gauge was installed in the restoration in December of 2004. This is monitored monthly while standing water persists.

b) Results

The active mitigations, the forest enhancement, western wet prairie enhancement, and the southern restoration/enhancement, were monitoring on May 19, 2004. At that time, approximately 2% the forest enhancement was submerged and 100% of the area had saturated soils. The western prairie did not have any standing water, but nearly all contained saturated soils. The southern restoration/enhancement is largely vernal pool and emergent habitats. On May 29th, 56% of this mitigation area had standing water between 4 and 6 inches deep, while the remainder of the site had saturated soils.

2. Vegetation

2004 monitoring of Oxbow West mitigation projects included: (1) a species list compiled for each section that can be viewed in Appendix B, (2) *Sidalcea cusickii* population census in the eastern forest enhancement, (3) *Erigeron decumbens* var. *decumbens* macroplot census in the eastern prairie enhancement, and (4) a seeding assessment in the southern panhandle restoration and enhancement.

a) Forest Enhancement *Sidalcea cusickii* Census Methods

A census of the population is taken in late summer by counting the number of plants, the number of flowering spikes, and the number of vegetative 'individuals.' In 2004, the census data were collected on July 30th. Only the total number of plants was counted in 2003.

b) Results Forest Enhancement Results *Sidalcea cusickii* Census

The number of individuals observed in 2004 declined from 448 to 328 (Table 11.5). The may have resulted from changes in the habitat from tree thinning in the enhancement, but is more likely a reflection of the dry spring in 2004. The population will be censused annually to ensure management does not harm the population.

Table 11.5. Census data for *Sidalcea cusickii* in the Oxbow West forest enhancement. The total number *Sidalcea cusickii* individuals are present for 2003 and 2004. Additional data, including the number of flowering spikes and the number of vegetative individuals, are presented for 2004.

<i>Sidalcea cusickii</i>	2003	2004
Vegetative 'individuals'	No data	84
Flowering Spikes	No data	274
Total number of 'individuals'	448	328
% of plants reproductive	No data	74%

c) *Eastern Prairie Erigeron decumbens* var. *decumbens* Census Methods

A census of the population is taken annually, beginning in 2004. The number of crowns, flowers, and flowering crowns are recorded. Because the plant reproduced vegetatively as well as through seed, an individual crown is counted when the basal leaves are greater than 3.5 cm apart.

d) *Results of the Eastern Prairie Erigeron decumbens* var. *decumbens* Macroplot Census

The majority of the *Erigeron decumbens* var. *decumbens* population on Oxbow West lies to the south and west of the plot monitored for the mitigation. The larger portion of the population is part of an experiment to look at the effects of mowing and prescription burning and is not part of the mitigation. The macroplot monitored for the mitigation project contains the area where the plants are most concentrated outside of the experiment. The mitigation area was cleared of woody vegetation in the fall of 2003 and monitoring began in 2004. Within the plot, 64 flowering *Erigeron decumbens* var. *decumbens* plants and 2 plants without flowers were observed (Table 11.6). There were a total of 489 flowers. This is an average of 7.8 flowers per reproductive crown.

Table 11.6. Oxbow West *Erigeron decumbens* ssp. *decumbens* macroplot census results. Attributes for the *Erigeron decumbens* ssp. *decumbens* population on the eastern Oxbow West enhancement are given for 2004.

<i>Erigeron decumbens</i> ssp. <i>decumbens</i>	2004
Total # of crowns	66
Number of vegetative crowns	2
Total # flowers	489
% of reproductive crowns	94%
Avg. # of flowers per reproductive crown	7.8

e) *Southern Restoration and Enhancement Methods*

A seed assessment was done on July 29th noting the native species present and their abundance using the qualitative ratings of dominant, common, uncommon, and trace.

f) *Southern Restoration and Enhancement Seed Assessment Results*

The exact seed mixes spread over the southern enhancement and restoration were not well documented. It is therefore not possible to compare the seeding rate and species to those species and their abundance observed a year after planting. Consequently, the species observed are listed only with their abundance rating in Table 11.7. Of the 22 species were observed, 1 received a rating of 'common' and 21 were rated as 'trace.' The site was approximately 75% bare ground. Additional plantings for the fall of 2004 and winter of 2005 include sedge plugs, rush plugs, bare root willow, spiraea and ash plants, as well as vernal pool and emergent seed.

Table 11.7. Oxbow West Panhandle Restoration and Enhancement Seed Assessment.			
The table includes the species observed and their prominence.			
Species	Common Name	Habitat	Rank
<i>Agrostis exarata</i>	spike bentgrass	FACW	Trace
<i>Carex unilateralis</i>	one-sided sedge	FACW	Trace
<i>Deschampsia cespitosa</i>	tufted hairgrass	FACW	Uncommon
<i>Downingia elegans</i>	downingia	OBL	Trace
<i>Downingia yina</i>	downingia	OBL	Trace
<i>Eleocharis ovata</i>	ovoid spike-rush	OBL	Trace
<i>Epilobium densiflorum</i>	dense spike-primrose	FACW-	Trace
<i>Eryngium petiolatum</i>	coyote thistle	OBL	Trace
<i>Gnaphalium palustre</i>	lowland cudweed	FAC+	Trace
<i>Gratiola ebracteata</i>	bractless hedge-hyssop	OBL	Trace
<i>Hordeum brachyantherum</i>	meadow barley	FACW-*	Trace
<i>Juncus acuminatus</i>	slender rush	FACW-	Trace
<i>Juncus ensifolius</i>	swordleaf rush	FACW	Trace
<i>Juncus oxymers</i>	pointed rush	FACW+	Trace
<i>Lupinus rivularis</i>	stream lupine	FACU	Trace
<i>Madia elegans</i>	showy tarweed	NOL*	Trace
<i>Madia glomerata</i>	cluster tarweed	FACU+	Trace
<i>Madia sativa</i>	coast tarweed	NOL*	Trace
<i>Microseris laciniata</i>	cut-leaved microseris	NOL*	Trace
<i>Navarretia intertexta</i>	needle-leaved navarretia	FACW	Trace
<i>Prunella vulgaris</i>	self-heal	FACU+	Trace
<i>Psilocarphus elatior</i>	tall wooly-heads	FACW	Trace

Chapter 12: Stewart Pond, Grimes Pond, and Teal Slough Unit

A. Site Description

1. *Size:* 30 acres
2. *Ownership:* BLM
3. *Site Timeline:* **Table 12.1**

Section	Year of Construction	Acreage	Monitoring Period
Stewart Pond Extension	1995	1.80	1996-2004*
Ash woodland Expansion	1995	0.25	1996-2004*
Stewart Pond , Grimes Pond and Teal Slough Enhancement	1996	5.21	1996-2004*

*The monitoring period has been extended to allow for remedial action.

4. Location

The Stewart Pond, Grimes Pond, Teal Slough Unit of the Stewart Management Area is located along the western slope of Stewart Knoll, north of Stewart Road and south of the A3 Channel in west Eugene, Or.

5. Site History

This site has a variety of past land uses. The area of Stewart Pond was once used as part of a dairy farm. The water features in the north, Grimes Pond and Teal Slough, were created when gravel was excavated.

6. Focus of Prescriptions

In general, prescriptions applied to Stewart Pond, Grimes Pond and Teal Slough sought to integrate existing wetland areas located across the breath of the site. This objective was met through restoration, enhancement, and creation of emergent wetland. Measures to enhance wildlife habitat included placing logs in the ponds and planting dead trees along the fringe of the upland and wetland boundary to offer snags for birds to perch and nest in. Prescriptions were completed in 1995 and augmented in 2005.

7. Site-Specific Management Goals

1. Expand the existing emergent wetland.
2. Reduce concentrations of reed canarygrass at the site.
3. Increase the extent and suitability of habitat available for migratory birds and other wetland wildlife species.
4. Promote wildlife viewing and environmental education opportunities.
5. Expand the existing riparian woodland along the fringes of Teal Slough.

Stewart Pond

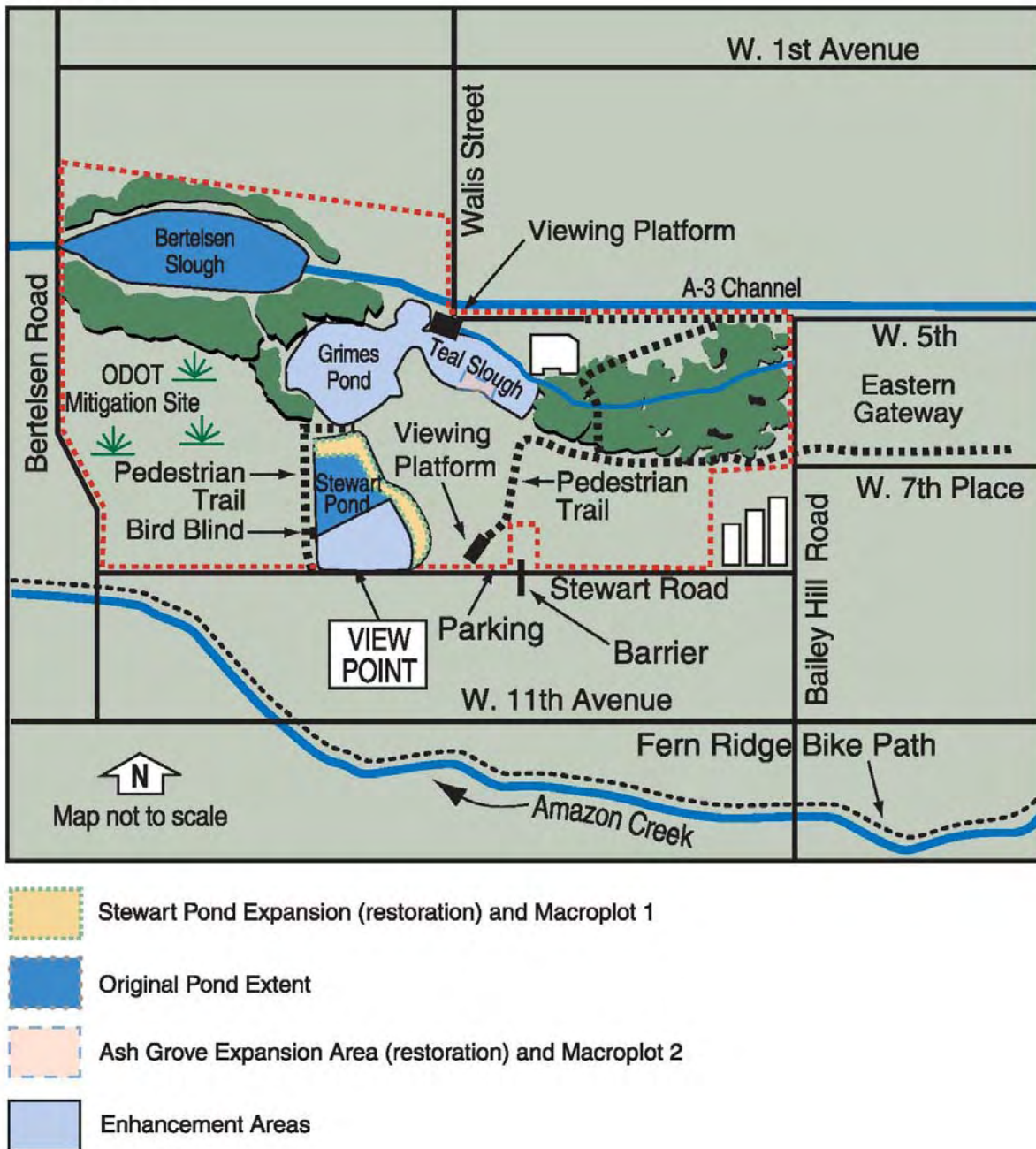


Figure 12.1. Stewart Pond, Grimes Pond, and Teal Slough Site Map. The original pond, the pond expansion, the slough expansion, and the enhancement areas are labeled with their associated macroplots.

B. 2004 Monitoring Summary

All segments of the Stewart Pond mitigation unit (Figure 12.1), except the forest expansion area, have either met or exceeded mitigation bank success criteria. All areas continue to show hydrology sufficient for the maintenance of its hydric soils and hydrophytic vegetation. The pond expansion restoration met all of the MOA and MIP vegetation goals for native species cover and species richness, as well as, the requirements for seed survival. The woodland expansion enhancement also met the native species cover goal and species diversity goal, but not its forest cover goal. The goal was to have 2 woody species with a combined cover of 25%. *Salix* spp. and *Populus trichocarpa* cover combined was 7.7%. In early winter 2005, hundreds of additional trees and shrubs (e.g., *Salix* spp., *Fraxinus latifolia*, *Populus trichocarpa*, and *Spirea douglasii*) were planted. Given a few more years, this site will meet the 25% tree cover goal.

Areas of Grimes Pond, Teal Slough and most of the original area covered by Stewart Pond are enhancement projects. All four qualitative mitigation bank goals for these areas have been fulfilled. The goals included (1) reducing concentrations of reed canarygrass on the emergent wetland, (2) promoting wildlife viewing and environmental education, (3) enhancing habitat for Western pond turtle, and (4) expanding the riparian woodland along the fringes of Teal Slough. The first goal has been achieved by implementing rotational tilling in the emergent areas and seeding with native annual forbs. This has reduced the quantity and vigor of reed canarygrass as well as promoted resurgence in native wetland vegetation. The second goal has been achieved through construction of facilities that allow access to the site (e.g., an observation blind, observation overlook, and trail system). This allows interested parties to visit the site for a variety of education programs. For example, the Willamette Resources and Educational Network, a WEW Partner, brings groups to visit the area between 10 to 20 times per year for general tours as well as bird and dragonfly watching. The third goal of enhancing habitat for the Western pond turtle was met by creating nesting mounds on the northeastern edge of Stewart Pond, and by placing coarse woody debris in Grimes Pond and Teal Slough in 1995 and 2005 to provide basking sites. The final goal, to expand the riparian area in Teal Slough was achieved by planting 28 Cottonwood, 490 Spirea, 39 ash, 10 nootka rose, and 3,498 willow in the slough.

1. 2004 Management Actions

Original Pond:

1. A section of the pond was mowed to prevent the reed canarygrass from producing seed.
2. A section of the pond was tilled to remove the reed canarygrass and provide shorebird habitat.
3. The tilled section of the pond was seeded with a high-density, emergent species planting mix.

Pond Expansion:

The area was hand weeded to remove reed canarygrass and pennyroyal.

Grimes Pond and Teal Slough:

1. The slough and pond were mowed and tilled to remove the reed canarygrass.
2. The slough pond was seeded with a high density, emergent species planting mix.
3. The deeper areas of the slough were planted with cottonwood trees, ash, and willows.

2. 2005 Management Actions

The Bureau of Land Management will assume management responsibility. They will continue to perform the actions below.

Original Pond:

1. The interior will be mowed to prevent the seed set of the reed canarygrass.
2. Areas of the pond will be tilled on a rotational basis to provide habitat for shorebirds and other waterfowl.

Pond Expansion:

Weed control will continue to be the maintenance focus within the pond expansion.

Grimes Pond and Teal Slough:

1. The success of the tree and shrub planting will be monitored. Where the number of surviving plants fall below stated contract numbers, the contractor is required to replace them.
2. Tree trunks will be placed in the pond and/or slough to serve as basking structures for Western Pond Turtles.

Table 12.2. Progress of the Stewart Pond Expansion Restoration towards meeting the MOA vegetation standards. The most recent data for each phase is compared to its relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site’s success in meeting the associated standard. ‘PI’ refers to point-intercept cover data collection.

Vegetation Standard in MOA	Stewart Pond Expansion Restoration	Goal Met?
Site status in the monitoring period	1996-2002, extended to 2003	N/A
Most recent quantitative data collected in:	PI - 2002 NF - 2003	N/A
70% native cover after 5 years	75%	Yes
75% of those species occurring at a 50% frequency rate or grater shall be from the Native Plant list	75%	Yes
70% of the planted species shall be alive and present at the end of the five year monitoring period	87%	Yes
Vernal Pool/Emergent: min 5 native species occurring at 10% frequency rate or greater	14	Yes

Table 12.3. Progress of the Stewart Pond Woodland Expansion Enhancement towards meeting the vegetation standards in the MIP. The most recent data for each phase is compared to its relevant vegetation standards. A date in the cell indicates the year in which the data will be collected to evaluate the site’s success in meeting the associated standard. ‘PI’ refers to point-intercept cover data collection.

Vegetation Standard	Woodland Expansion Enhancement	Goal Met?
Site status in the monitoring period	1996-2002, extended to 2003	N/A
Most recent quantitative data collected in:	PI – 2002 NF - 2003	N/A

70% native cover after 5 years	81%	Yes
Vernal Pool/Emergent: min 5 native species occurring at 10% frequency rate or greater	9	Yes
Forest: 2 woody species with combined cover of 25%	7.7%	No

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil were estimated and mapped during 2 site visits, the first in early spring and the second in late fall.

b) Results

Stewart Pond and its associated enhancements and restorations continue to exhibit hydrology sufficient for the development of hydric soils and hydrophytic vegetation. Despite monitoring occurring later in the season, twenty percent of the expansion area had soils that were visibly saturated to the surface on May 10th.

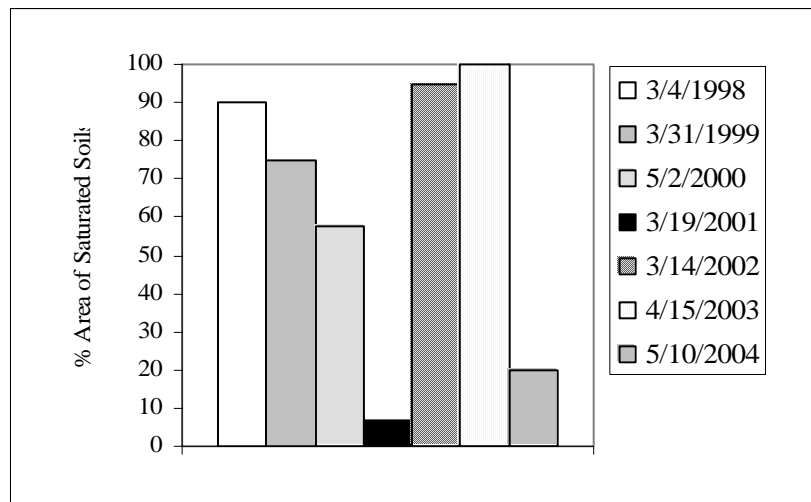


Figure 12.2. Spring standing water in the expansion of Stewart Pond. Percentage of the pond expansion with standing water in the early spring over the history of the restoration.

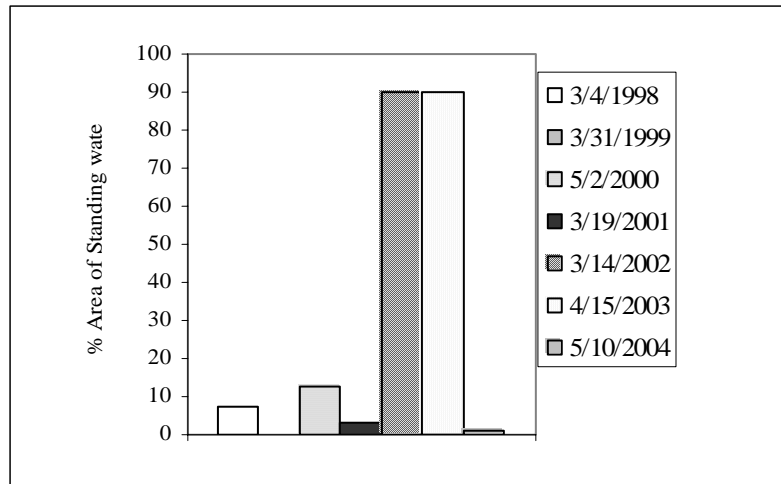


Figure 12.3. Spring saturated soils in expansion of Stewart Pond. Percentage of the Stewart Pond expansion with saturated soils in the early spring over the history of the restoration.

2. Vegetation

a) Methods

Point-intercept data were collected for the pond expansion and the ash swale extension on June 10th and 11th of 2002. A total of 238 point were collected in the pond expansion, while only 39 were collected in the ash swale expansion because it is small (1/4 of an acre). Nested frequency data were collected on July 31st and August 1st, 4th and 5th of 2003. A total of 124 plots were sampled in the expansion area and 33 were sampled in the expanded riparian woodland. Even though these data were collected in 2002 and 2003, they are included in the 2004 Annual Report so that all data used to assess the site's success at meeting the mitigation bank standards is in one report.

The general species list for the site was also updated and can be viewed in Appendix B.

b) Results

Point-intercept Sampling Results:

Both the Stewart Pond Expansion and the Ash Swale Expansion restorations met the 5th year performance standard of 70% cover of native vegetation. The relative percent cover of the native species in the pond expansion is 75%, while the relative percent cover of natives in the ash swale expansion is 80%. There is still a large proportion of introduced species covering in both areas (50% in the pond expansion and 35% in the swale expansion). *Agrostis alba/tenuis* and *Mentha pulegium* contribute heavily to the total cover of exotic species in both macroplots, but in contrast to other restorations, hand weeding appears to keep them from dominating the site.

Another vegetative performance standard states that at least 70% of the native species planted are to be present the final year of monitoring. The pond expansion exceeds this standard with 82% of the species planted being present. Only 41% of the species planted in the ash swale expansion were present this summer; however, many of the species planted were not appropriate for the hydrology of the area. Also, 33 native species were planted, and while 28 native species were present in the macroplot, the majority of these species colonized the site naturally.

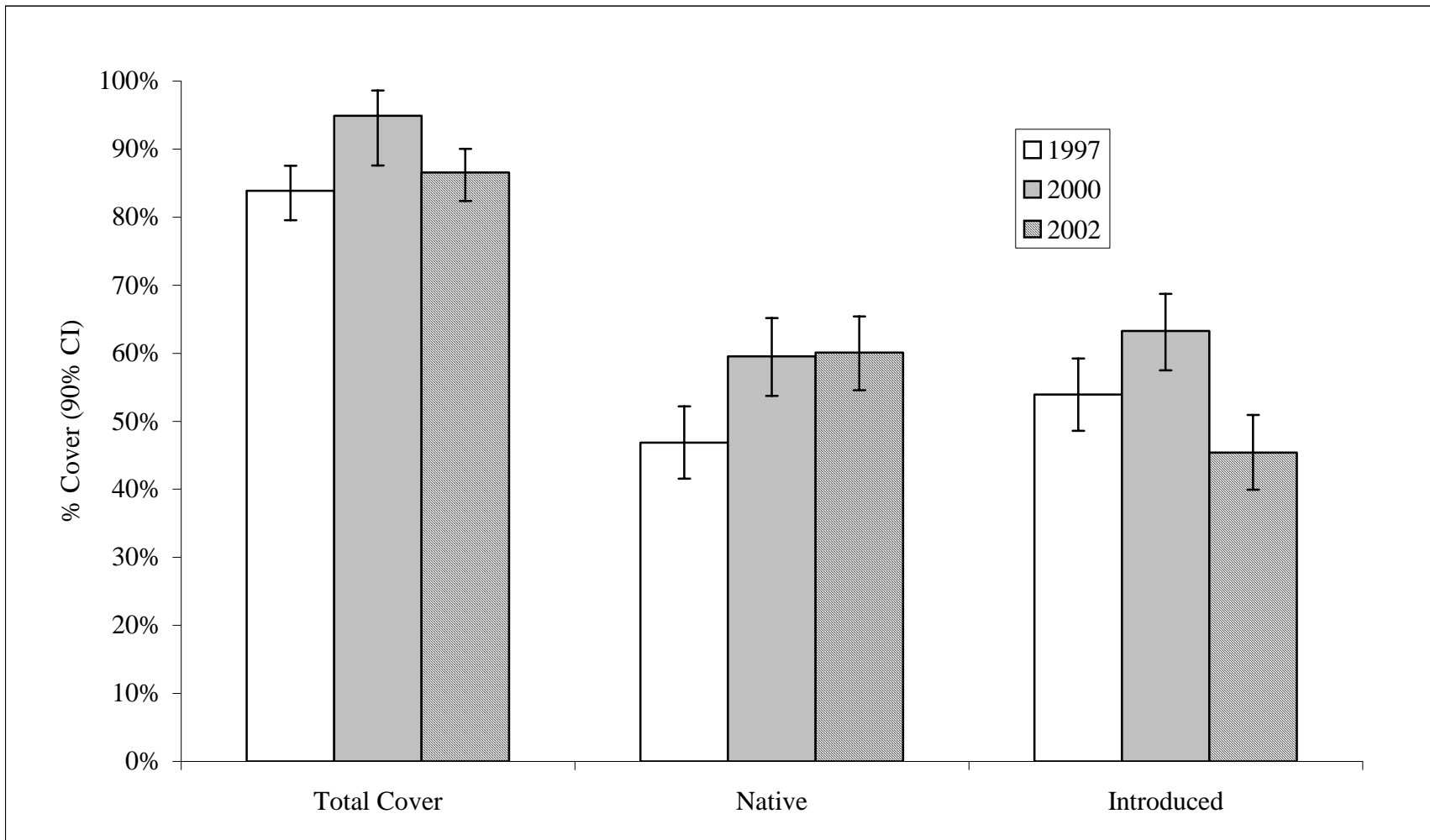


Figure 12.4. Percent cover of ground cover guilds in the Stewart Pond Expansion. The total percent cover of all vegetation, native species, and introduced species in the Stewart Pond Extension.

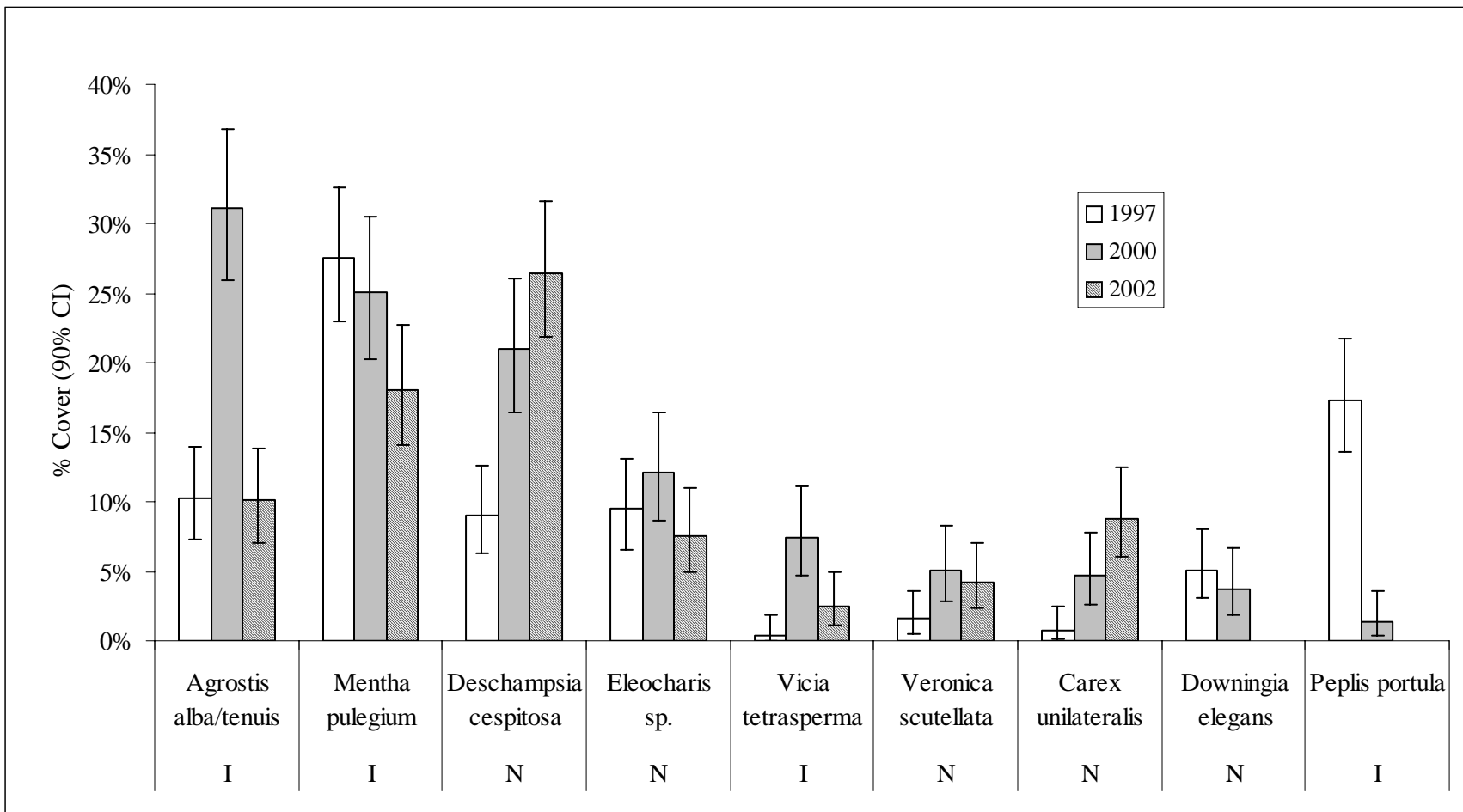


Figure 12.5. Species in the Stewart Pond Expansion with > 1% cover. All species in 2002 with greater than one percent cover are graphed for the pond extension. Each species is also labeled with either an 'N' or an 'I' to indicate whether it is a native or introduced species.

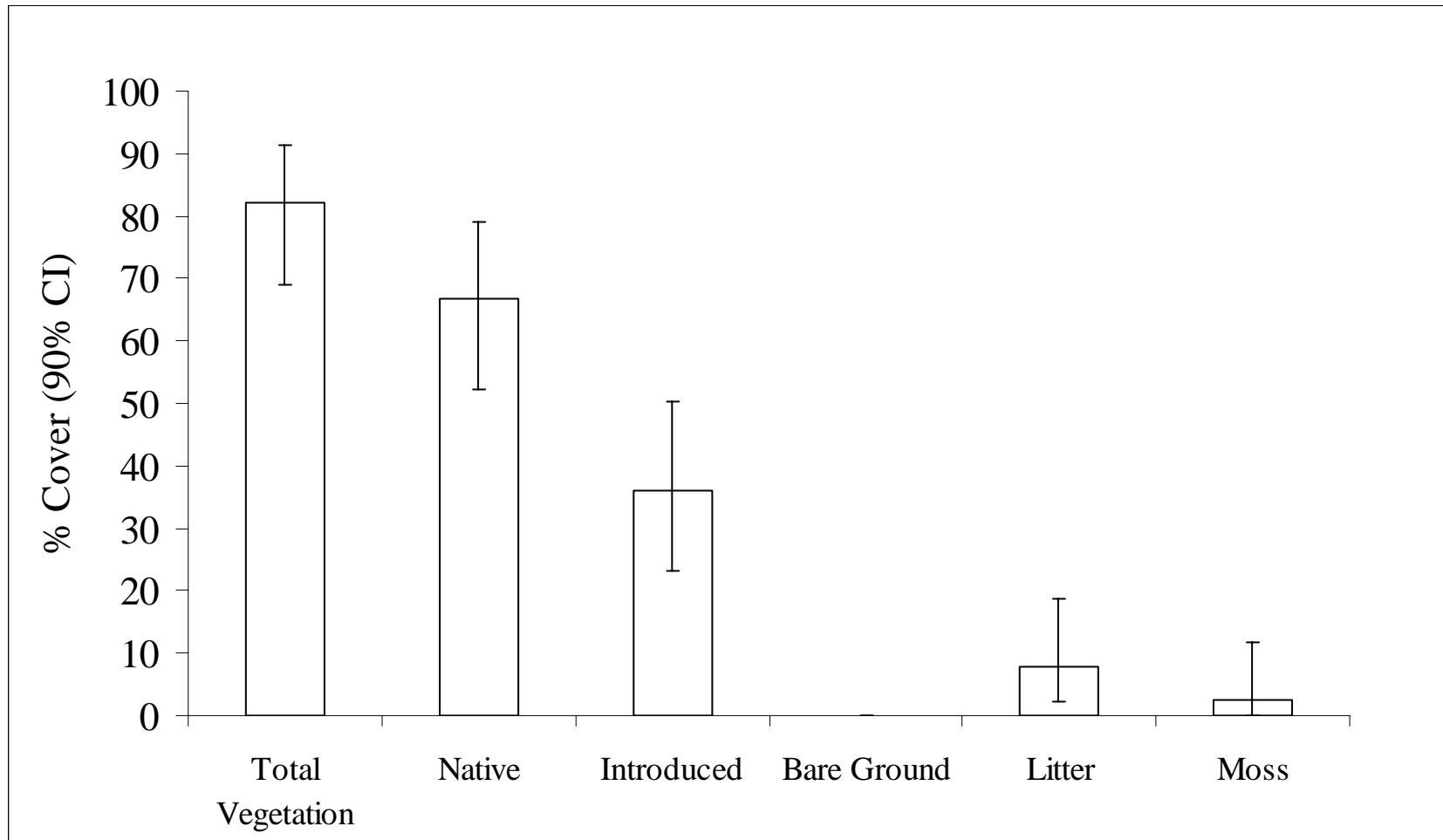


Figure 12.6. Percent cover of ground cover guilds in the Stewart Pond ash swale expansion. The total percent cover of all vegetation, native species, introduced species, bare ground, litter, and moss are reported for the Stewart Pond ash swale extension.

Nested Frequency Sampling Results:

Stewart Pond Expansion Restoration met all mitigation bank nested frequency standards. Of the species with greater than 50% frequency, 75% were native (Table 13.4). Standards require 5 species with a frequency of greater than 10% be vernal pool and/or emergent—the restoration had 14.

Stewart Pond Ash Swale Expansion area did not meet the MIP standards for native diversity. Of the species with greater than 50% frequency, 75% were not native. Three species had a frequency of greater than 50% and one was native. The other standard requires that 5 of the species with a frequency of greater than 10% be native vernal pool or emergent species. The restoration met this criterion with 9 qualifying species. (Table 13.5)

Table 12.4. Species Present with Greater than 10% Frequency in the Stewart Pond Expansion Restoration. All species present with > 10% frequency in the Stewart Pond Restoration Expansion are listed with their origin and 90% confidence limits. Habitat information is also listed for native species where ‘VP/E’ represents vernal pool and emergent habitats and ‘WP’ corresponds to wet prairie habitat.

Species	Origin	Frequency	Lower CI	Upper CI	Habitat
<i>Mentha pulegium</i>	I	74.19	66.93	80.57	
<i>Eleocharis palustris</i>	N	72.58	65.22	79.11	VP/E
<i>Deschampsia cespitosa</i>	N	65.32	57.67	72.42	WP
<i>Carex unilateralis</i>	N	58.06	50.29	65.55	VP/E
<i>Madia glomerata</i>	N	39.52	32.14	47.27	VP/E
<i>Juncus patens</i>	N	25.00	18.71	32.21	VP/E
<i>Veronica scutellata</i>	N	22.58	16.55	29.62	VP/E
<i>Juncus tenuis</i>	N	21.77	15.84	28.75	VP/E & WP
<i>Phalaris arundinacea</i>	I	21.77	15.84	28.75	
<i>Lactuca sp.</i>	I	21.77	15.84	28.75	
<i>Lotus unifolius</i>	N	20.97	15.13	27.88	WP
<i>Downingia spp.</i>	N	20.16	14.42	27.01	VP/E
<i>Agrostis exarata</i>	I	13.71	8.93	19.85	VP/E
<i>Juncus effuses</i>	N	12.90	8.26	18.94	VP/E
<i>Alopecurus pratensis</i>	I	12.90	8.26	18.94	
<i>Bidens frondosa</i>	N	12.10	7.61	18.01	VP/E
<i>Agrostis exarata</i>	N	11.29	6.96	17.09	VP/E
<i>Epilobium densiflora</i>	N	11.29	6.96	17.09	VP/E & WP
<i>Juncus ensifolius</i>	N	11.29	6.96	17.09	VP/E
<i>Juncus bolanderi</i>	N	10.48	6.31	16.15	VP/E

Table 12.5. Species Present with Greater than 10% Frequency in the Stewart Pond Ash Swale Expansion Restoration. All species present with > 10% frequency in the Stewart Pond Ash Swale Expansion are listed with their origin and 90% confidence limits. Habitat information is also listed for native species where 'VP/E' represents vernal pool and emergent habitats and 'WP' corresponds to wet prairie habitat.

Species	Origin	Frequency	Lower CI	Upper CI	Habitat
<i>Mentha pulegium</i>	I	72.73	15.49	12.24	
<i>Agrostis spp.</i>	I	69.70	15.65	12.85	
<i>Veronica scutellata</i>	N	57.58	15.72	14.65	VP/E
<i>Juncus patens</i>	N	45.45	14.96	15.61	VP/E
<i>Juncus effusus</i>	N	42.42	14.65	15.72	VP/E
<i>Beckmannia syzigachne</i>	N	39.39	14.28	15.78	VP/E
<i>Phalaris arundinacea</i>	I	39.39	14.28	15.78	
<i>Eleocharis palustris</i>	N	39.39	14.28	15.78	VP/E
<i>Carex obnupta</i>	N	36.36	13.86	15.79	VP/E
<i>Deschampsia cespitosa</i>	N	33.33	13.39	15.75	WP
<i>Epilobium ciliatum</i>	N	33.33	13.39	15.75	WP
<i>Bidens frondosa</i>	N	33.33	13.39	15.75	VP/E
<i>Epilobium densiflorum</i>	N	27.27	12.24	15.49	VP/E
<i>Lythrum portula</i>	I	21.21	10.81	14.96	
<i>Alopecurus pratensis</i>	I	18.18	9.95	14.58	
<i>Dipsacus fullonum</i>	I	18.18	9.95	14.58	
<i>Holcus lanatus</i>	I	18.18	9.95	14.58	
<i>Populus trichocarpa</i>	N	18.18	9.95	14.58	VP/E
<i>Leontodon taraxacoides</i>	I	15.15	8.99	14.10	
<i>Cirsium vulgare</i>	I	15.15	8.99	14.10	
<i>Lactuca seriola</i>	I	15.15	8.99	14.10	
<i>Rubus armeniacus</i>	I	12.12	7.87	13.50	

3. Wildlife Utilization

The Stewart and Grimes Ponds/ Teal Slough complex of wetlands continues to be the most utilized by wildlife of all the mitigation bank sites. While waterfowl such as mallard, northern pintail, widgeon, green-winged teal, and Canada goose are most common birds observed, hawks, coot, shorebirds, gulls, swallows, bufflehead, turkey vulture, ring-necked pheasant, greater yellowlegs, common snipe, belted kingfisher, violet-green swallow, scrub jay, American crow, and red-winged blackbird have all been seen at the site. Rotational tilling of the areas that had become colonized by reed canarygrass have improved the usage of the site by waterfowl and shorebirds. In addition, western pond turtles are using the area, and river otters have been observed using the ponds. (For a more complete list of species that use the site see the 1998 Annual Report.)

Chapter 13: Turtle Swale Unit

A. Site Description

1. *Size:* 60.5 acres
2. *Ownership:* BLM
3. *Site Timeline:* **Table 13.1**

Section	Construction Year	Acreage	Monitoring Period
Phase 1	2001	10.07	2002-2006
Phase 2	2002	11.62	2003-2007
Phase 3	To be determined	To be determined	To be determined

4. Location

Turtle Swale is Unit 1 of the 398 acres of the Lower Amazon Wetland Restoration and Enhancement Project. It occupies the area south of Royal Avenue between the Amazon Diversion Channel and the Amazon Creek in west Eugene, OR.

5. Site History

There have been a variety of past land uses on this site. The eastern tax lot was cultivated for ryegrass. The western tax lot below Turtle Swale appears to have been heavily cultivated. Portions of the site north of the swale were filled with a variety of urban debris and approximately 32,000 cubic yards of fill material. The remainder of this section may have been grazed, but appears not to have been tilled.

6. Focus of Prescriptions

The overall goal for the Turtle Swale Unit is to protect and enhance higher quality areas and their associated populations of rare species, while restoring the highly degraded areas that were historically wet prairie and emergent communities. This will be done by removing existing fill piles, the adjacent channel levees, colonies of reed canarygrass, and restoring the historic swale that runs east to west across the site.

7. Site-Specific Management Goals

1. Restore the emergent areas by eliminating or reducing concentrations of reed canarygrass.
2. Restore the historic swale running east to west across the site for western pond turtle habitat.
3. Protect and enhance the populations of rare plant species on the site. These species include *Aster curtus*, *Lupinus sulphureus* var. *kincaidii*, and *Asclepias fascicularis*.

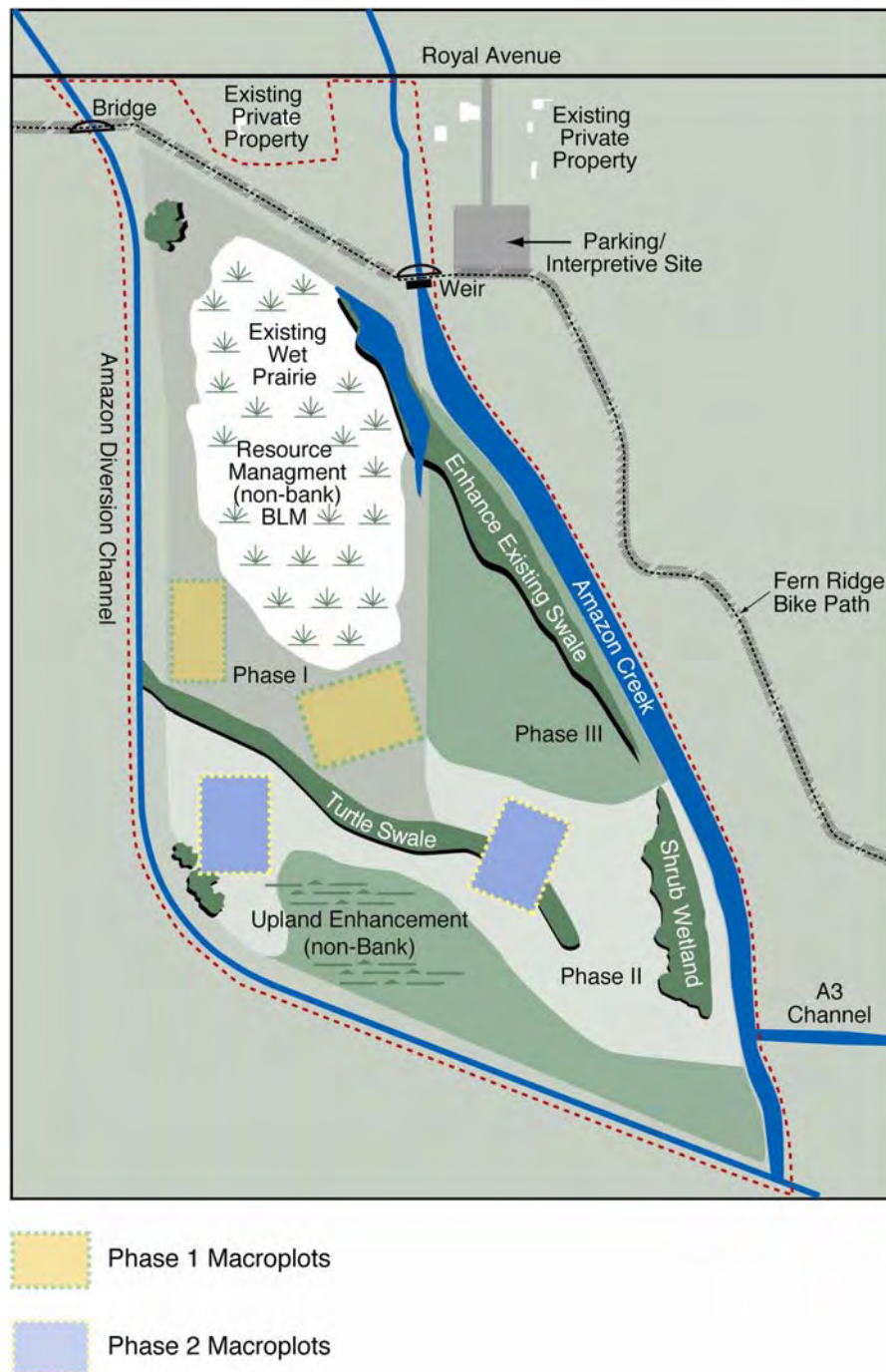


Figure 13.1. Turtle Swale Site Map. The phases, enhancement areas and pre-existing wet prairie areas are labeled. Community vegetation monitoring macroplots are labeled for phases 1 and 2.

B. 2004 Monitoring Summary

Turtle Swale Phase 1 has met 2nd-year vegetation and hydrology standards. No significant changes were observed this year (year 3).

Phase 2 appears to be progressing towards meeting hydrology and vegetation standards. Soil pits were dug in the spring and wetland hydrology was confirmed; the water table was within 12 inches of the soil surface well into the growing season. Point-intercept cover monitoring data were collected in two macroplots, one in the eastern and one in the western portion of the project area. Of the total vegetation, 77% was native in the eastern macroplot and 96% was native in the western macroplot. Both are well above the second year target of 50% native vegetation. The western section is largely free of weeds, but the eastern had significant populations of *Leontodon taraxacoides*, *Hypochaeris radicata*, and *Vulpia bromoides*. These will be treated in 2005.

1. 2004 Management Actions

Phase 1:

1. Maintenance crews spent 1 day removing exotics from the restoration area. The target species included reed canarygrass, annual ryegrass, six weeks fescue, St. John's wort, and pennyroyal.
2. The perimeter was mowed.

Phase 2:

1. Maintenance crews spent more than a month removing exotics from the restoration area. The main target species included St. John's wort, pennyroyal, hairy cat's ear, common velvet grass, tall fescue, common centaury, and non-native bentgrasses.
2. The perimeter of the site was mowed.

2. Management Actions for 2005

Phase 1:

1. Continue to remove reed canarygrass (*Phalaris arundinacea*) and Harding grass (*Phalaris aquatica*).
2. Mow project perimeter.

Phase 2:

1. Continue to hand weed non-natives from the restoration.
2. Flame six weeks fescue and hairy cat's ear and then replant in the fall.
3. Mow project perimeter.

Phase 3:

The proposed restoration in this area is currently on hold. In the interim, the goal is to control the spread of seed from this phase into the restorations through mowing.

Remnant Prairies (Non-mitigation Bank Areas):

Central Prairie Area

Continue to selectively remove woody vegetation from this area, focusing on exotics.

Amazon Creek ("A" Channel)

This area offers good Western pond turtle habitat, which could be improved on by minimizing woody vegetation along the banks and incorporating basking logs.

Remnant prairie (triangular area in southeast corner of site)

Remove pear and other exotic woody species and keep native trees and shrubs from expanding in this area.

Table 13.2. Progress of the Turtle Swale Unit restorations towards meeting the MOA vegetation standards. The most recent data for each phase is compared to its relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Vegetation Standard in MOA	Phase 1	Goal Met?	Phase 2	Goal Met?
Site status in the monitoring period	2002-2006	N/A	2003-2007	N/A
50% native cover after 2 years	MP 1 = 97% MP 2 = 91%	Yes	MP 1 = 96% MP 2 = 77%	Yes
70% native cover after 5 years	2006	TBD	2007	TBD
75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list	2006	TBD	2007	TBD
70% of the planted species shall be alive and present at the end of the five year monitoring period	2006	TBD	2007	TBD
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	2006	TBD	2007	TBD
Emergent: min 5 native species occurring at 10% frequency rate or greater	2006	TBD	2007	TBD

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil were estimated and mapped for Phases 1 and 2 during a site visit in early spring. Staff gauges were installed in two locations in Phase 1 and monitoring of these gauges began in 2003. Hydrology monitoring for Phase 2 began in 2003 as well. Soil pits were dug in the spring of 2004.

b) Results

Phase 1

The location and duration of saturated and inundated soils was relatively unchanged from 2003. On March 29th of 2004, 43% of Phase 1 had standing water and 85% of the site had saturated soils to the ground surface (Figure 13.2 and 13.3). In 2003, the site was 100% saturated and 75% standing water. The difference is likely due to the dry spring. The emergent areas in the northeast and northwest corners of Phase 1 were inundated well into the growing season (Figures 13.4 and 13.5).

Phase 2

On March 29th of 2004, 35% of Phase 2 was inundated and approximately 78% of the site's soil was saturated to the soil surface (Figure 13.6 and 13.7). This is less than the previous year, but likely due to

the dry spring. Soil pits were dug in Phase 2 on March 29th and checked on April 1st. The depth to the water table ranged from 5 to 10 inches below the soil surface; therefore, hydrology appears to be sufficient to support the continued development of hydric soils. Pits will be dug again in the spring of the fifth year to confirm maintenance of the appropriate hydrology.

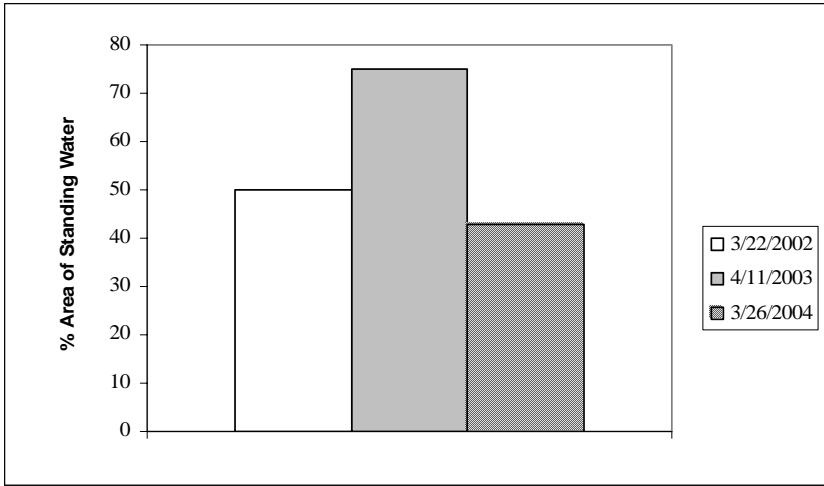


Figure 13.2. Spring standing water in Phase 1 of the Turtle Swale Unit. Percentage of Phase 1 with standing water in the late spring over the history of the restoration.

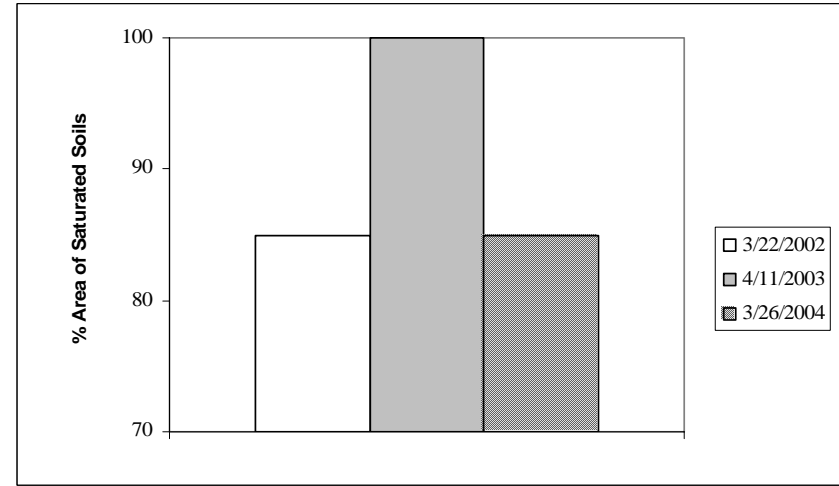


Figure 13.3. Spring saturated soils in Phase 1 of the Turtle Swale Unit. Percentage of the Phase 1 with saturated soils in the late spring over the history of the restoration.

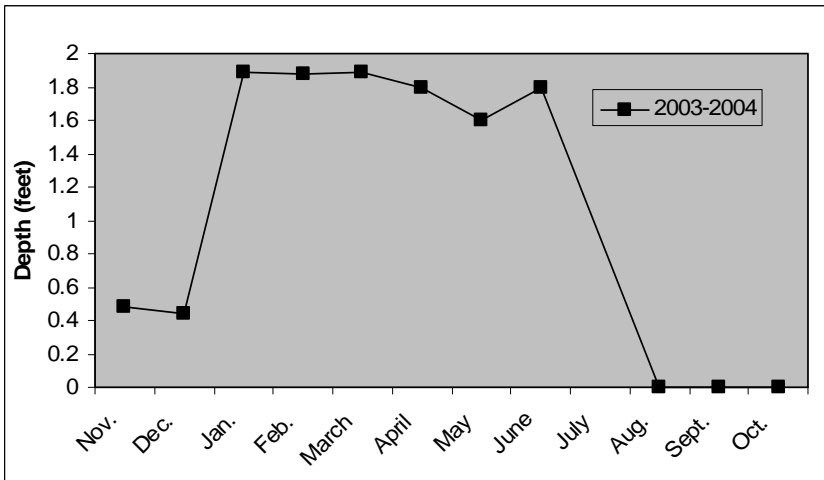


Figure 13.4. Turtle Swale Phase 1 inundation levels in the eastern section during 2003-2004. Depth of inundation throughout the year in the eastern section in 2003-2004.

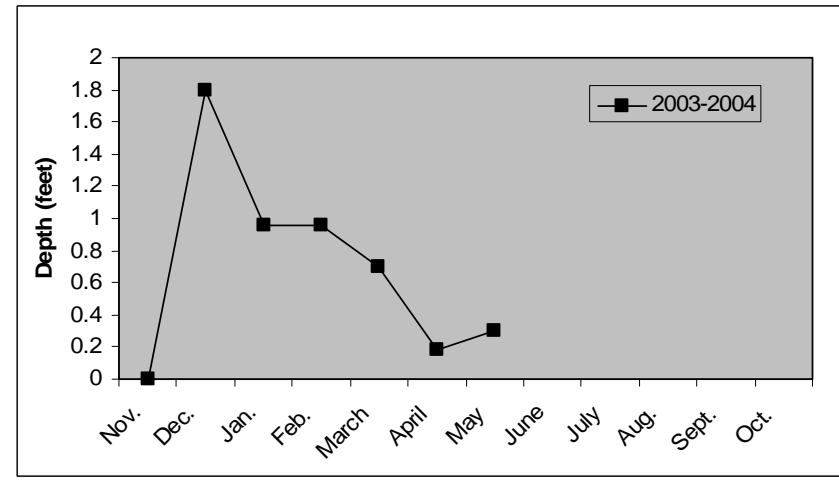


Figure 13.5. Turtle Swale Phase 1 inundation levels in the western section during 2003-2004. Depth of inundation throughout the year in the western in 2003-2004.

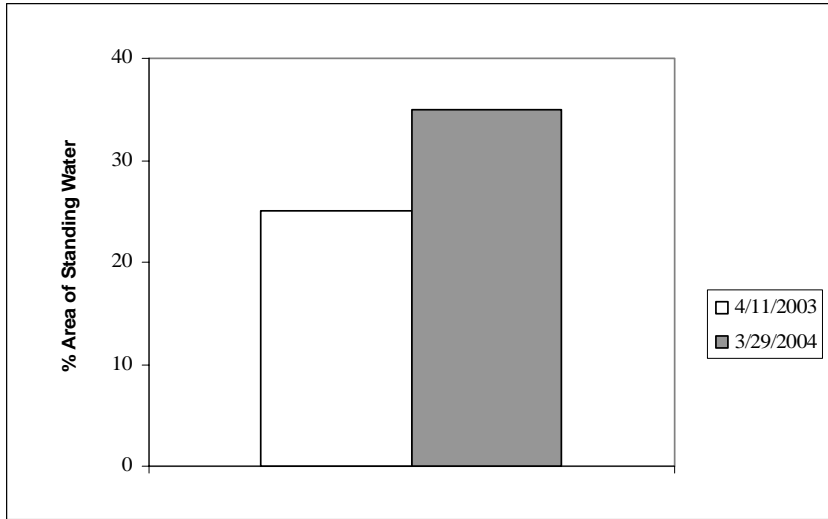


Figure 13.6. Spring standing water in Phase 2 of the Turtle Swale Unit. Percentage of Phase 2 with standing water in the late spring over the history of the restoration.

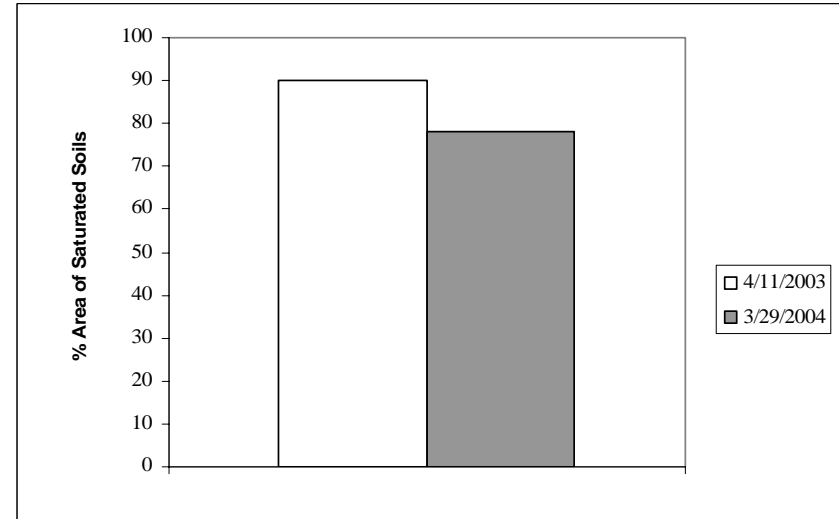


Figure 13.7. Spring saturated soils in Phase 2 of the Turtle Swale Unit. Percentage of the Phase 2 with saturated soils in the late spring over the history of the restoration.

2. Vegetation

a) Methods

No quantitative monitoring occurred in 2004 for Phase 1. Point-intercept data were collected in two macroplots in Phase 2. Macroplot 1 was sampled on July 15th of 2004 for a total of 200 points. Macroplot 2 was sampled on July 16th of 2003 for a total of 201 points.

A general plant species list for each phase was also updated and can be viewed in Appendix B.

b) Results

Results of Phase 2 Point-intercept Cover Sampling:

Data from both macroplots show that Phase 2 meets the 2nd-year vegetation standards of 50% native species cover (Figure 13.8). Of the total vegetation, Macroplot 1 is 96% native and Macroplot 2 is 77% native. Both macroplots are dominated by *Deschampsia cespitosa* (macroplot 1 = 18.0%, $14.0\% \leq \mu \leq 22.9\%$; macroplot 2 = 16.4%, $12.3\% \leq \mu \leq 21.3\%$). In macroplot 1, all species with greater than 2% cover are native (Figure 13.9). In macroplot 2, *Alopecurus geniculatus* (2.0; $0.7\% \leq \mu \leq 4.5\%$), *Hypochaeris radicata* (2.0; $0.7\% \leq \mu \leq 4.5\%$), *Leontodon taraxacoides* (8.5; $5.5\% \leq \mu \leq 12.4\%$), and *Vulpia bromoides* (8.5; $5.5\% \leq \mu \leq 12.4\%$) are the non-natives with greater than 2% percent cover (Figure 13.9).

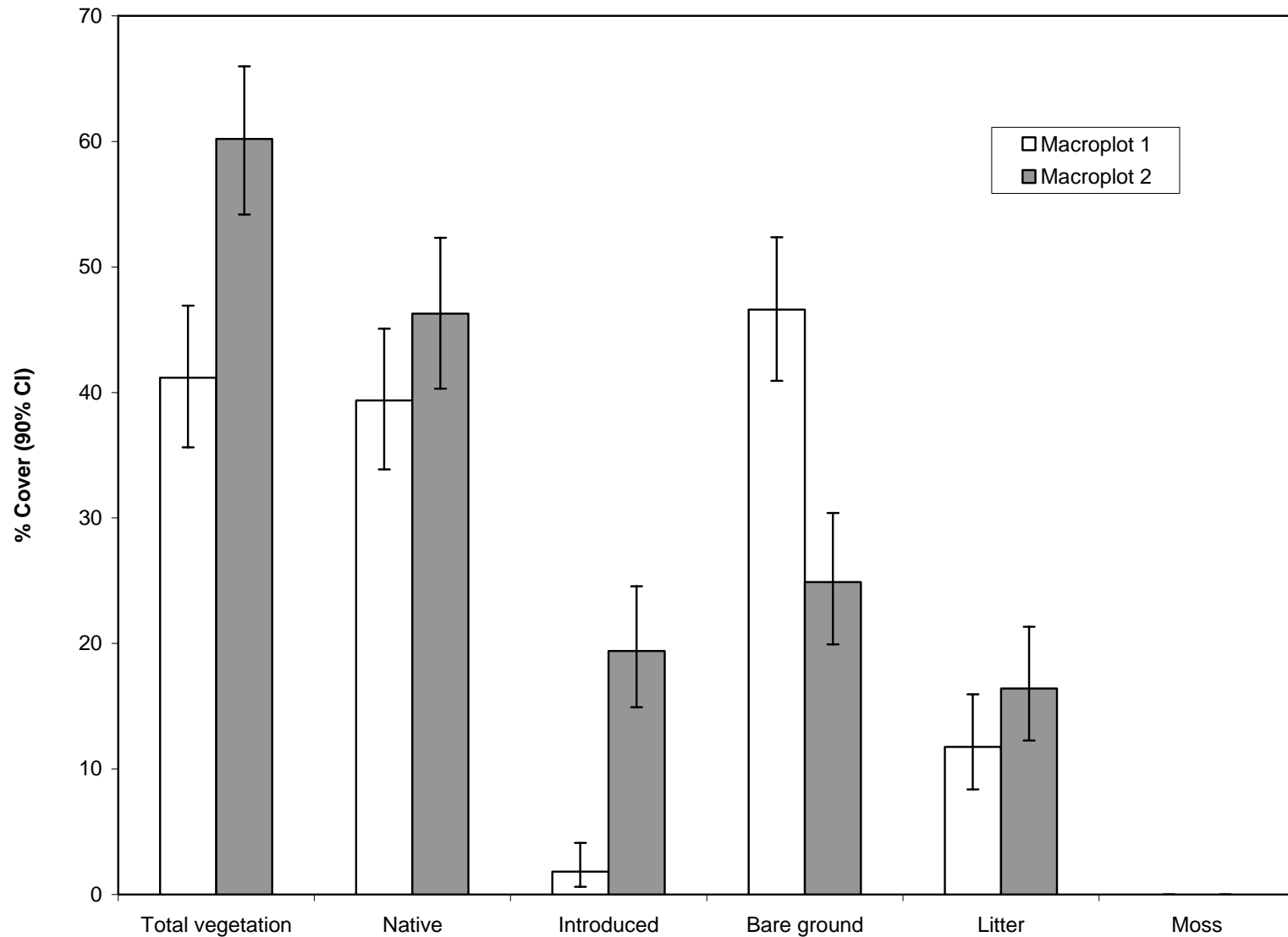


Figure 13.8. Percent cover of ground cover guilds in Macroplots 1 & 2 of the Turtle Swale Phase 2 Enhancement. The total percent cover of all vegetation, native species, introduced species, bare ground, litter and moss are graphed for macroplots 1 & 2 of the Turtle Swale Phase 2 Enhancement.

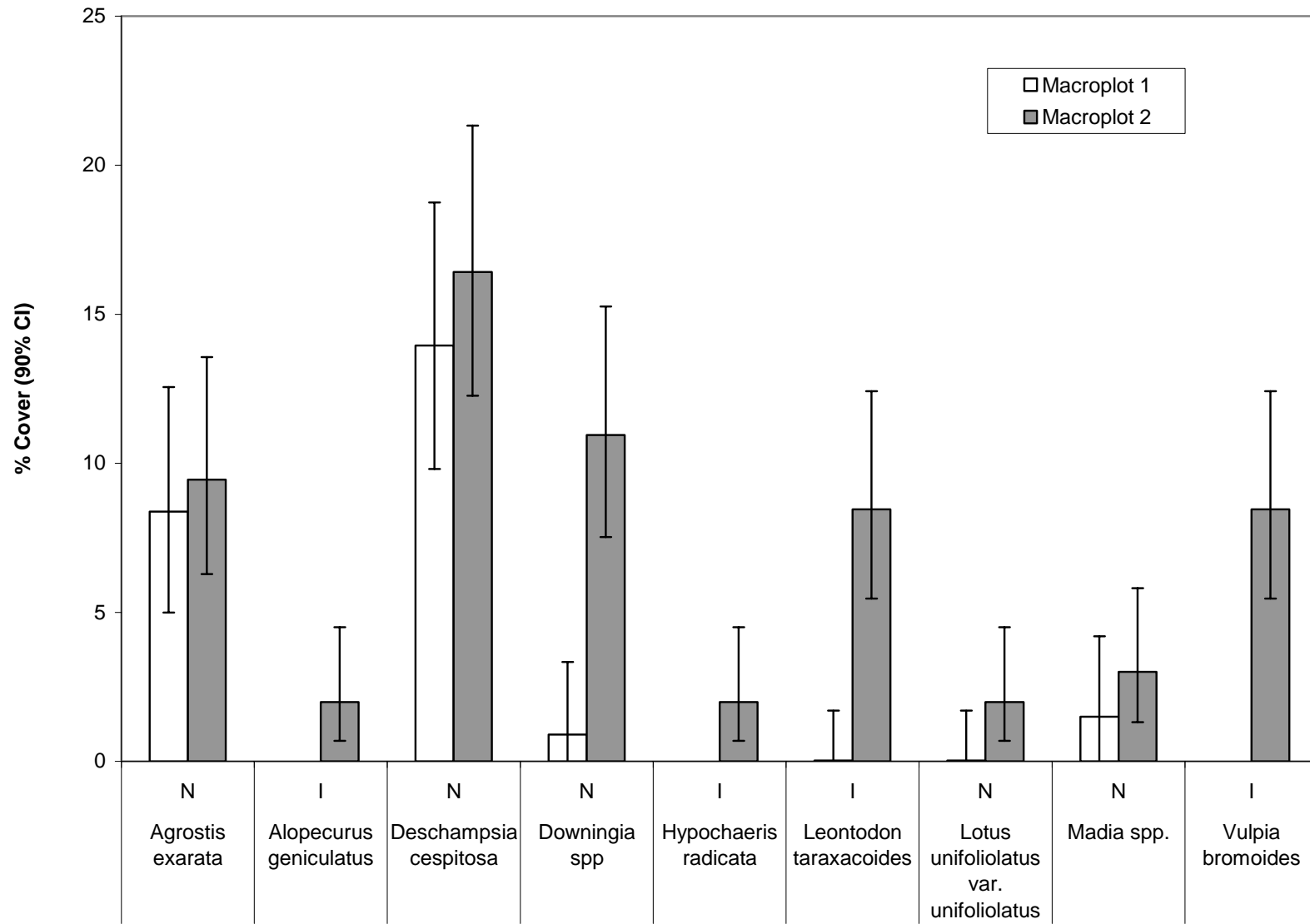


Figure 13.9. Species in the Turtle Swale Phase 1 Enhancement, Macroplot 1 & 2, with > 2% cover. All species in 2004 with greater than one percent cover are graphed for Turtle Swale Phase 2 Enhancement, Macroplots 1 & 2.

3. Wildlife Utilization

The large amount of contiguous habitat of the Lower Amazon Restoration Project, of which Turtle Swale is a part, attracts large numbers and a wide variety of wildlife. Specific sightings for Turtle Swale include killdeer and their nests, redwing blackbirds, green heron, great blue heron, mallards, red-tailed hawks, and osprey.

Chapter 14: Willow Corner Unit

A. Site Description

1. *Size:* 6.4 acres
2. *Ownership:* City of Eugene
3. *Site Timeline:* **Table 14.1. Willow Corner Unit site timeline.**

Section	Treatment and Construction Years	Acreage	Monitoring Period
Wet Prairie Restoration	2003	6.15	2004-2008
Emergent Enhancement	2003	0.20	2004-2008
Upland Restoration	2003	0.05	2004-2008

4. Location

The Willow Corner Unit is located at the southwestern corner of 18th Avenue and Bertelsen Road. It is bordered to the west and south by land owned by The Nature Conservancy.

5. Baseline Conditions

Historically, the site was likely dominated by wet prairie, with a minor component of upland prairie. However, over the past two decades, large quantities of fill material were dumped and spread out over the area in anticipation of future commercial development. Cottonwood, willows, and Himalayan blackberry grew on top of the fill to make up the majority of the vegetation.

6. Focus of Prescriptions

Approximately 50,000 cubic yards of material was removed from 6.4 acres of land owned by the City of Eugene and approximately 6.5 acres owned by The Nature Conservancy. The area was then planted with appropriate seed mixes and augmented with plugs.

7. Site-Specific Management Goals

1. Restore native wet prairie vegetation to areas where fill was removed.
2. Control invasive plant species in areas immediately adjacent to the proposed restoration to prevent their spread into the newly graded areas. This includes reed canarygrass, harding grass, pennyroyal, teasel, Scot's broom, and Himalayan blackberry.
3. Enhance existing wet prairie vegetation by removing exotic species and re-establishing native wet prairie species.
4. Minimize impacts to existing adjacent wetland and upland prairie areas and rare plant populations during restoration and enhancement activities.

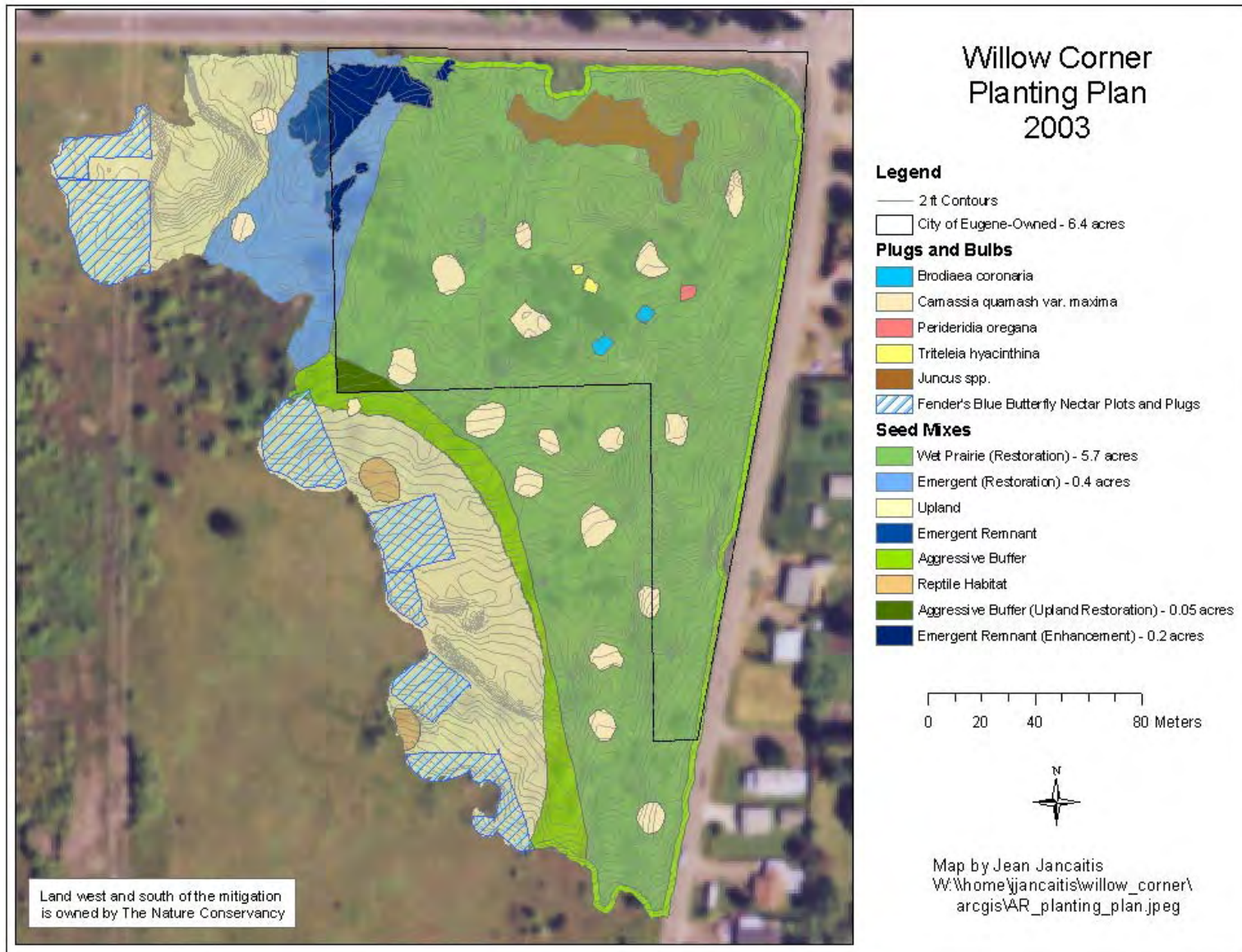


Figure 14.1. Willow Corner Unit – 2003 Project Map and Planting Plan. The map shows the mitigation, on land owned by the City of Eugene, labeled with the number of acres mitigated. The map also illustrates the planting plan for the entire restoration. No credits will be generated from restoration completed on land owned by The Nature Conservancy.

B. 2004 Monitoring Summary

The establishment of wetlands hydrology and vegetation appear to be on track to meet mitigation bank standards. Hydrology in a normal rainfall year will likely support the development of hydric soil and the seeding assessment showed 70% of the species planted in the wet prairie habitat were present the year after sowing.

1. 2004 Management Actions

1. Over a month was spent hand weeding non-native species from the restoration.
2. The perimeter of the site was mowed.

2. Management Actions for 2005

1. Continue to hand weed non-native species from the restoration.
2. Mow the perimeter of the site.
3. Reseed swales and vernal pools in the northern section of the site.

Table 14.2. Progress of the Willow Corner Unit Restoration and Enhancement towards meeting the MOA vegetation standards. The most recent data for each section are compared to their relevant vegetation standards from the Bank MOA. A date in the cell indicates the year in which the data will be collected to evaluate the site's success in meeting the associated standard.

Vegetation Standard in MOA	Restoration	Goal Met?
Site status in the monitoring period	2004-2008	N/A
70% native cover after 5 years	2005	TBD
75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list	2008	TBD
70% of the planted species shall be alive and present at the end of the five year monitoring period	2008	TBD
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	2008	TBD
Emergent: min 5 native species occurring at 10% frequency rate or greater	2008	TBD

C. Monitoring Results

1. Hydrology

a) Methods

Hydrology monitoring in 2004 included mapping the location and depth of surface saturation and inundation in early spring

b) Results

The site drains from south to north along three main routes. Each route is a shallow swale that, when full, is approximately 3ft wide and 4 inches deep. There are a series of vernal pools along each drainage that can reach 8 inches deep and emergent areas in the northern portion of the restoration that fill to over a foot deep. The majority of the site is a mosaic of vernal pool and wet prairie; however, there is an upland buffer along the eastern perimeter.

The spring of 2004 was dryer than average which made it difficult to assess the hydrology of the site. On March 24th, approximately 10% of the site was inundated and 25% was saturated to the soil surface. The site will be monitored in subsequent years to assure the wetland hydrology has been established across the site.

2. Vegetation

a) Methods

A seeding assessment was completed on June 23 and July 26 of 2004. Each species seeded that was observed during the site visit was given a value of 'Dominant,' 'Common,' 'Uncommon,' or 'Trace.'

b) Seeding Assessment Results

Four seed mixes were planted in the Willow Corner restoration area (Tables 14.3-14.6): 1) 5.6 acres of wet prairie, 2) 0.34 acres of vernal pool, 3) 0.17 of emergent and 4) 0.27 acres of aggressive wet prairie buffer. Of the 43 species seeded in the wet prairie mix, 2 were 'Dominant,' 6 were 'Common,' 8 were 'Uncommon,' 14 were in 'Trace' amounts, and 13 were absent. In the vernal pool mix, 20 species were planted—3 were 'Dominant,' 4 were 'Common,' 6 were 'Uncommon,' 7 were in 'Trace' amounts, and 0 were absent. Of the 27 emergent species planted, 3 were 'Dominant,' 4 were 'Common,' 1 was 'Uncommon,' 7 were in 'Trace' amounts, and 12 were absent. Of the 5 species planted in the aggressive wet prairie mix, 0 were 'Dominant,' 2 were 'Common,' 1 was 'Uncommon,' 1 was in 'Trace' amounts, and 1 was absent. The success of seeding at Willow Corner was similar to that of other sites; however, there were areas in the northern portion of the site that had little vegetation. These areas were located in the swales and vernal pools. They will be seeded again in the winter of 2005.

Table 14.3. Willow Corner Wet Prairie Mix. 5.6 acres were seeded with a wet prairie mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.				
Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Agrostis exarata</i>	D	1155.75	206.4	5.2%
<i>Aster hallii</i>	T	1340	239.3	6.1%
<i>Beckmannia syzigachne</i>	T	546.05	97.5	2.5%
<i>Brodiaea coronaria</i>		33.5	6.0	0.2%
<i>Brodiaea hyacinthina</i>	T	33.5	6.0	0.2%
<i>Camassia leichtlinii</i>		670	119.6	3.0%
<i>Camassia quamash</i>	T	670	119.6	3.0%
<i>Carex densa</i>		546.05	97.5	2.5%
<i>Danthonia californica</i>	T	1340	239.3	6.1%

Table 14.3. Willow Corner Wet Prairie Mix. 5.6 acres were seeded with a wet prairie mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Deschampsia cespitosa</i>	C	1507.5	269.2	6.8%
<i>Downingia elegans & yina</i>	C	167.5	29.9	0.8%
<i>Downingia yina</i>		167.5	29.9	0.8%
<i>Epilobium densiflorum</i>	D	670	119.6	3.0%
<i>Eriophyllum lanatum</i>	U	1022.42	182.6	4.6%
<i>Grindelia integrifolia</i>	U	603	107.7	2.7%
<i>Hordeum brachyantherum</i>	U	1005	179.5	4.6%
<i>Juncus ensifolius</i>	C	67	12.0	0.3%
<i>Juncus nevadensis</i>		3.35	0.6	0.0%
<i>Juncus tenuis</i>		268	47.9	1.2%
<i>Lomatium nudicaule</i>		335	59.8	1.5%
<i>Lotus formosissimus</i>	T	33	5.9	0.1%
<i>Lotus unifolius</i>		100.5	17.9	0.5%
<i>Lupinus polyphyllus</i>	T	201	35.9	0.9%
<i>Luzula comosa</i>	T	33.5	6.0	0.2%
<i>Madia glomerata</i>	C	234.5	41.9	1.1%
<i>Madia sativa</i>	U	167.5	29.9	0.8%
<i>Microseris laciniata</i>	C	2010	358.9	9.1%
<i>Microsteris gracilis</i>	T	26.8	4.8	0.1%
<i>Orthocarpus bracteosus</i>	U	67	12.0	0.3%
<i>Castilleja tenuis</i>	U	33.5	6.0	0.2%
<i>Panicum acuminatum ssp. fasciculatum</i>	U	100.5	17.9	0.5%
<i>Perideridia oregana</i>		167.5	29.9	0.8%
<i>Plagiobothrys figuratus</i>	U	402	71.8	1.8%
<i>Poa scabrella</i>		134	23.9	0.6%
<i>Potentilla gracilis</i>	T	2010	358.9	9.1%
<i>Prunella vulgaris</i>	C	670	119.6	3.0%
<i>Pyrocoma racemosa</i>		72.36	12.9	0.3%
<i>Ranunculus occidentalis</i>	T	670	119.6	3.0%
<i>Ranunculus orthorhynchus</i>		268	47.9	1.2%
<i>Rumex salicifolius</i>	T	201	35.9	0.9%
<i>Saxifraga oregana</i>		53.6	9.6	0.2%
<i>Sisyrinchium idahoense</i>	T	134	23.9	0.6%
<i>Wyethia angustifolia</i>	T	2010	358.9	9.1%
<i>Zigadenous venenosus</i>		134	23.9	0.6%

Table 14.4. Willow Corner Vernal Pool Mix. 0.34 acres were seeded with a vernal pool mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Agrostis exarata</i>	D	387	1138.6	12.8%
<i>Alopecurus geniculatus</i>	U	52	151.8	1.7%
<i>Beckmannia syzigachne</i>	U	258	759.1	8.6%
<i>Deschampsia cespitosa</i>	C	645	1897.6	21.4%
<i>Downingia elegans & yina</i>	C	129	379.5	4.3%
<i>Downingia yina</i>	C	129	379.5	4.3%
<i>Epilobium densiflorum</i>	C	258	759.1	8.6%
<i>Eryngium petiolatum</i>	T	129	379.5	4.3%
<i>Gnaphalium palustre</i>	U	26	75.9	0.9%
<i>Gratiola ebracteata</i>	U	267	785.6	8.9%
<i>Juncus acuminatus</i>	D	90	265.7	3.0%
<i>Juncus bolanderi</i>	U	26	75.9	0.9%
<i>Juncus ensifolius</i>	D	26	75.9	0.9%
<i>Lasthenia glaberrima</i>	T	65	189.8	2.1%
<i>Navarretia intertexta</i>	T	104	305.5	3.4%
<i>Plagiobothrys figuratus</i>	U	155	455.4	5.1%
<i>Psilocarphus elatior</i>	T	26	75.9	0.9%
<i>Rorripa curvisiliqua</i>	T	77	227.7	2.6%
<i>Rumex salicifolius</i>	T	77	227.7	2.6%
<i>Veronica peregrina</i>	T	90	265.7	3.0%

Table 14.5. Willow Corner Emergent Mix. 0.17 acres were seeded with an emergent mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Agrostis exarata</i>	D	102	598.9	8.9%
<i>Beckmannia syzigachne</i>		272	1597.2	23.9%
<i>Carex densa</i>	T	102	598.9	8.9%
<i>Downingia elegans and D. yina</i>	D	17	99.8	1.5%
<i>Eleocharis ovata</i>		7	39.9	0.6%
<i>Eleocharis palustris</i>		44	258.8	3.9%
<i>Epilobium densiflorum</i>	D	68	399.3	6.0%
<i>Eryngium petiolatum</i>	T	15	87.8	1.3%
<i>Gentiana sceptrum</i>		3	20.0	0.3%
<i>Glyceria occidentalis</i>		136	798.6	11.9%
<i>Gnaphalium palustre</i>	C	7	39.9	0.6%
<i>Hordeum brachyantherum</i>	T	102	598.9	8.9%

Table 14.5. Willow Corner Emergent Mix. 0.17 acres were seeded with an emergent mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Juncus acuminatus</i>	C	24	139.8	2.1%
<i>Juncus bolanderi</i>		7	39.9	0.6%
<i>Juncus ensifolius</i>		7	39.9	0.6%
<i>Juncus oxymersis</i>		20	119.8	1.8%
<i>Juncus patens</i>		20	119.8	1.8%
<i>Ludwigia palustris</i>		14	79.9	1.2%
<i>Madia glomerata</i>	C	10	59.9	0.9%
<i>Myosotis laxa</i>	U	3	20.0	0.3%
<i>Navarretia intertexta</i>	C	3	20.0	0.3%
<i>Polygonum hydropiperoides</i>		34	199.6	3.0%
<i>Ranunculus alismafolius</i>	T	41	239.6	3.6%
<i>Rorripa curvisiliqua</i>	T	10	59.9	0.9%
<i>Rumex salicifolius</i>	T	20	119.8	1.8%
<i>Veronica scutellata</i>	T	51	299.5	4.5%

Table 14.6. Willow Corner Aggressive Buffer Mix. 0.27 acres were seeded with an aggressive buffer mix. The table includes the species seeded, a qualitative assessment of their prevalence on the site (Dominant, Common, Uncommon, or Trace), the total grams seeded, the number of grams used per acre, and the percentage of each mix the seed occupied.

Species	Rank	Weight (grams)	grams/acre	% of Mix
<i>Agrostis exarata</i>	C	109	490.0	13.34%
<i>Deschampsia cespitosa</i>	C	130	581.75	15.84%
<i>Elymus glaucus</i>	U	571	2562.67	69.78%
<i>Prunella vulgaris</i>	T	4	19.85	0.54%
<i>Wyethia angustifolia</i>		4	19.85	0.54%

Chapter 15: Willow Creek Confluence Unit

A. Site Description

1. *Size:* 4.2 acres
2. *Ownership:* BLM
3. *Site Timeline:* **Table 15.1. Willow Creek Confluence Unit site timeline.**

Section	Year of Construction	Monitoring Period
Phase 1-East	1995	1996-2004*
Phase 1-West	1995	1996-2004*
Phase 2	1997	1998-2004*
Phase 3	1997	1998-2004*

*The monitoring period was extended because phases were combined for monitoring.

4. Location

The Willow Creek component of the BLM Wetland Field Office Management Area is located on the south side of Amazon Creek at the confluence of Willow and Amazon Creeks. The site sits on the northwestern corner of the intersection of Beltline Rd. with West 11th Ave.

5. Site History

Historically, 2-3' of fill material was deposited and spread across the site in preparation for development. In the past fifty years the site has been used for agriculture, as a parking lot, and as a storage yard.

6. Focus of Prescriptions

Restoration of wet prairie has been accomplished through a number of activities. Approximately 15,000 cubic yards of fill were removed from the site to expose the original hydric soils. Laying back the banks of Willow Creek allowed the expansion of the low flow channel and created a terraced riparian zone enhanced the riparian corridor along Willow Creek. A small backwater pond at the confluence of Willow Creek and Amazon Creek was created. The swale running west to east that conveys surface water flows from wetlands to the east of Beltline Road was widened and enhanced with willow plantings. The entire site was seeded with native wet prairie, vernal pool, emergent, and deep-water species.

7. Site-Specific Management Goals

1. Restore native wet prairie by removing fill down to the original hydric soil surface.
2. Expand the riparian zone along Willow Creek by excavating a wider channel and planting riparian vegetation.
3. Create wildlife habitat.
4. Create a narrow riparian habitat that conveys surface flows from wetlands east of Beltline Road across the site to the Willow Creek/Amazon Creek confluence, and that allows natural filtration prior to entering Willow Creek.

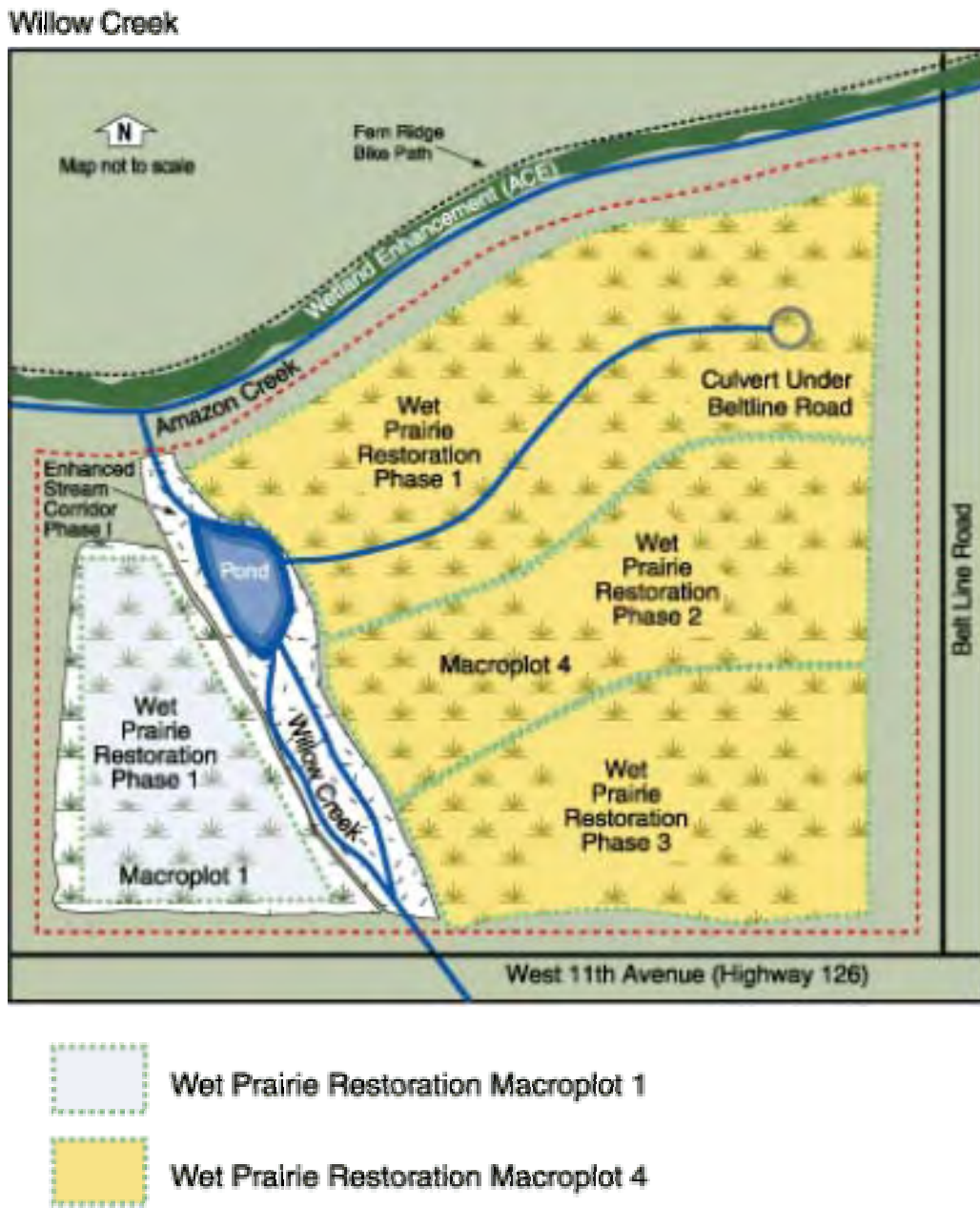


Figure 15.1. Willow Creek Confluence Site Map. All phases of the restoration for Willow Creek Confluence Unit are labeled with their associated macroplots.

B. 2004 Monitoring Summary

Willow Creek Confluence has met all mitigation bank criteria except one. It has wetland hydrology, supports predominantly native hydrophytic vegetation, and many of the species planted are present on the mitigation. However, it did not meet the criterion that 75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list—50% of species met this threshold.

1. 2004 Management Actions

1. The site perimeter was mowed.
2. Plugs of *Agrostis exarata*, *Deschampsia cespitosa*, and *Lupinus rivularis* were planted in areas that had been solarized.
3. A maintenance crew spent four days hand weeding the Willow Creek Unit.

2. Management Actions for 2005

Management will be the responsibility of the Bureau of Land Management.

Table 15.2. Progress of the Willow Confluence Unit towards meeting the MOA vegetation standards. The most recent data for each phase is compared to its relevant vegetation standards from the Bank MOA.

Vegetation Standard in MOA	Willow Confluence	Goal Met?
Site status in the monitoring period	Final year	N/A
Most recent quantitative data collected in:	2004	N/A
50% native cover 70% native cover after 5 years	82%	Yes
75% of those species occurring at a 50% frequency rate or greater shall be from the Native Plant list	50%	No
70% of the planted species shall be alive and present at the end of the five year monitoring period	75%	Yes
Wet Prairie: minimum of 10 native species occurring at 10% frequency rate or greater	16	Yes
Emergent: min 5 native species occurring at 10% frequency rate or greater	5	Yes

C. Monitoring Results

1. Hydrology

a) Methods

The extent of standing water and saturated soil were estimated and mapped during site visits in the 2nd quarter (April-June) and the 4th quarter (Oct.-Dec.).

b) Results

The eastern side of Willow Creek continues to function as a mixture of vernal pool and wet prairie habitat. It contains numerous large pools (~3-10 ft. in diameter) that reach up to 4 inches deep. The western side of Willow Creek holds more water until later in the growing season. Here the pools reach up to 8 inches deep and cover the majority of the site. It functions more as a mixture of emergent wetland and vernal pool habitat in the south and grades into wet prairie in the north. In years with normal winter rainfall, the depth and duration of saturation and inundation observed on the site is sufficient to support hydric soils and wetland vegetation development.

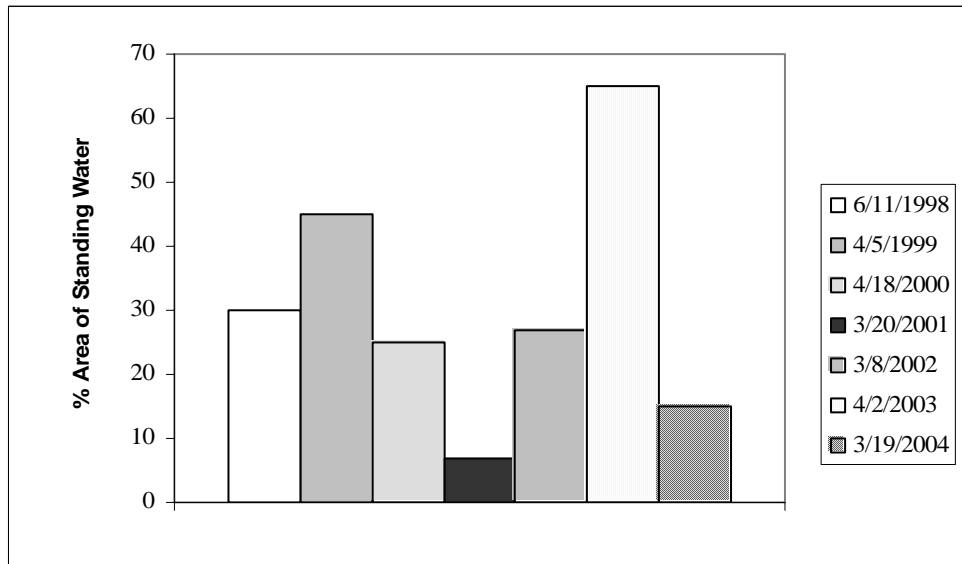


Figure 15.2. Spring standing water in the Willow Creek Confluence Unit. Percentage of the site with standing water in the early spring over the history of the restoration.

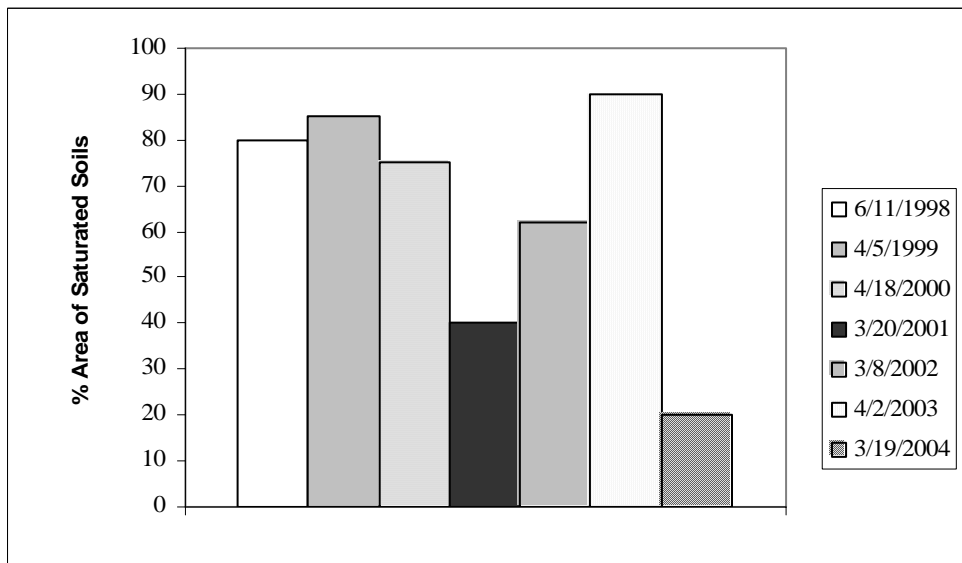


Figure 15.3. Spring saturated soils in the Willow Creek Confluence Unit. Percentage of the site with surface saturated soils in the early spring over the history of the restoration.

2. *Vegetation*

a) *Methods*

Quantitative vegetation data were collected June 15th through 17th and June 30th through July 2nd of 2004. This included both point-intercept (205 samples) and nested frequency (164 samples) data collection. A species list was compiled for the entire site and can be viewed in Appendix B. A total of 56 native species and 38 non-native species were recorded within the restoration.

b) *Results*

The results of point-intercept sampling for Willow Confluence are represented in Figures # and #. Of the total cover, 91.2% ($89.2\% < \mu < 94.0\%$), 82 % was native. This meets the mitigation bank criterion that 70% of the total vegetative cover be native by the final year of monitoring. The two dominant native species in the restoration were *Deschampsia cespitosa* at 34.5% ($30.6\% < \mu < 38.6\%$) and *Lotus unifoliolatus* with 7.7% ($5.6\% < \mu < 10.2\%$).

Table 15.3 displays the species detected during nested frequency data collection with frequencies of greater than 10%. Of those 33 species, 15 were from the native plant list of West Eugene, 18 were not native. Of the native species occurring in Willow Creek Confluence with a frequency of greater than 10%, 10 were wet prairie species, 3 were wet prairie/vernal pool, and 3 were vernal pool species. Thus, the mitigation bank goal of 10 wet prairie species and 5 vernal pool species with greater than 10% frequency was met.

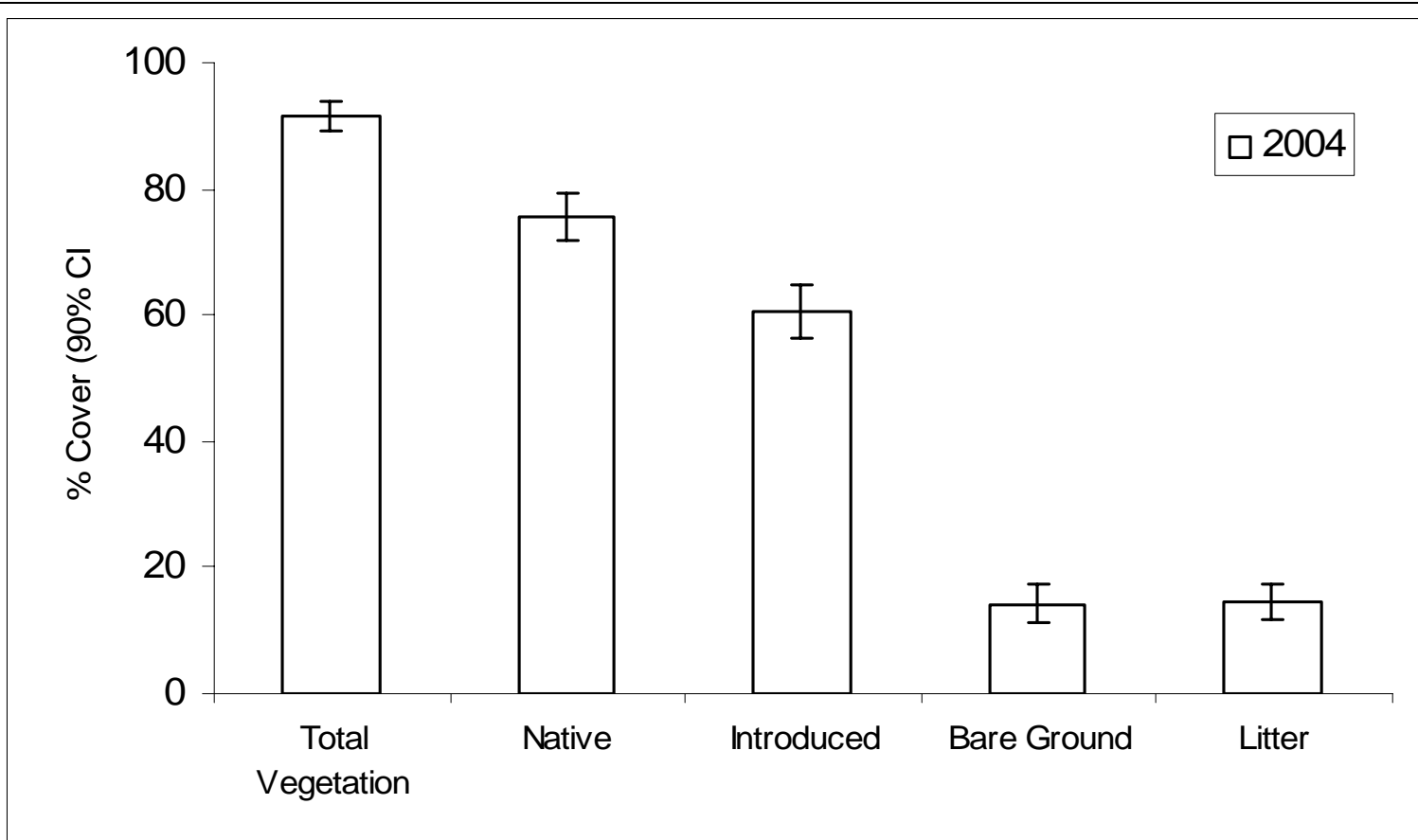


Figure 15.4. Percent cover of ground cover guilds on the Willow Creek Confluence Unit. Total percent cover, native, introduced, bare ground, litter, and moss percent covers are graphed for the final year of the monitoring period for the Willow Creek Confluence Unit.

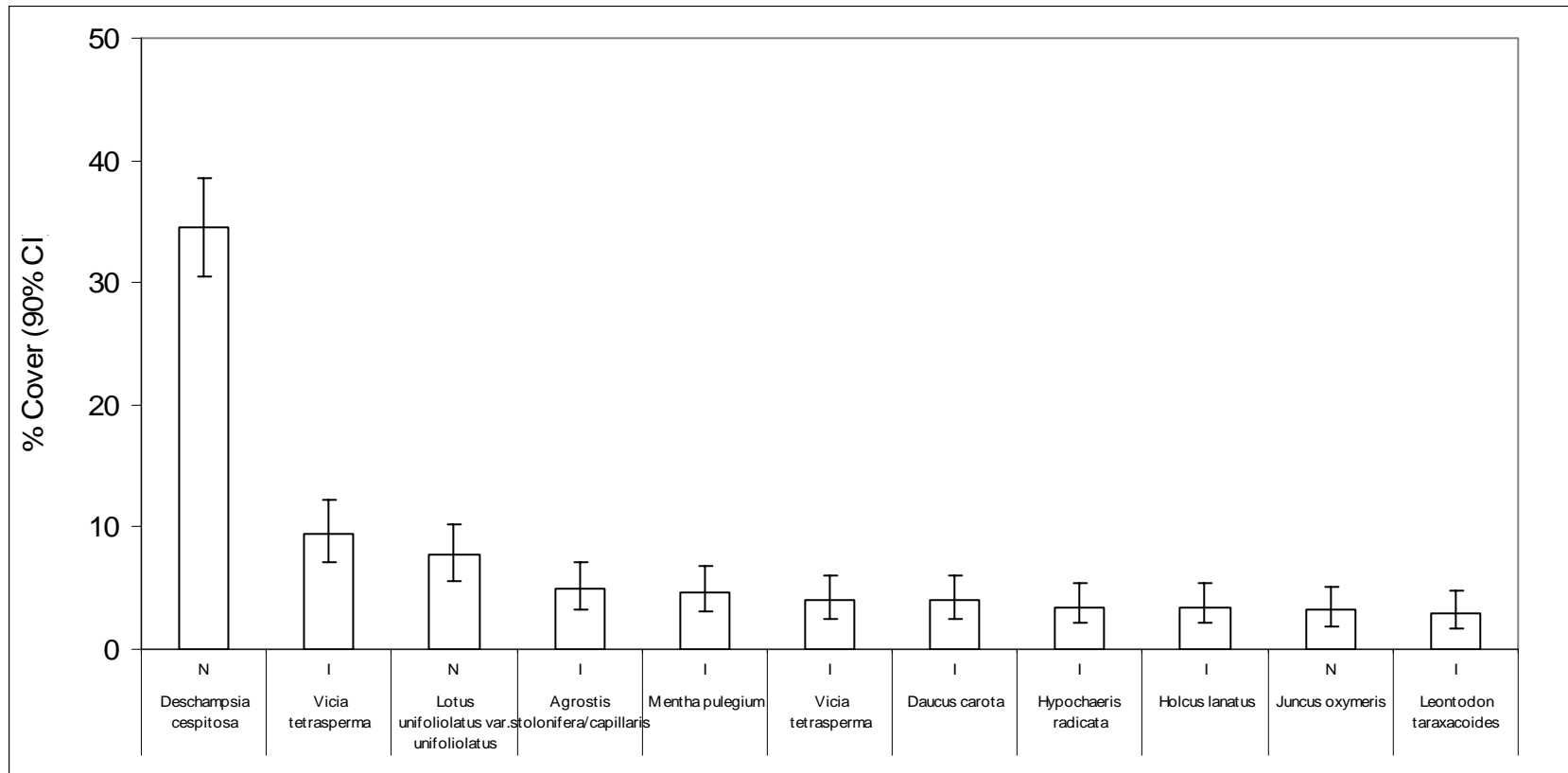


Figure 15.5. All species on the Willow Creek Confluence Unit with > 5% cover. All native species in 2004 with greater than 5 percent cover are graphed for 2004.

Table 15.3. Species present with greater than 10% frequency in Willow Creek Confluence. All species present with > 10% frequency in Willow Creek Confluence are listed with their origin and 90% confidence limits. Habitat information is also listed for native species where ‘WP’ refers to species present in wet prairie, ‘VP’ represents vernal pool habitats, ‘E’ represents emergent habitats, and ‘WP’ corresponds to wet prairie habitat.

Scientific Name	Origin	Frequency	Lower Limit	Upper Limit	Habitat
<i>Deschampsia cespitosa</i>	N	87.64	83.82	90.82	WP
<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	N	65.17	60.08	70.01	WP
<i>Daucus carota</i>	I	59.18	53.98	64.22	
<i>Vicia tetrasperma</i>	I	58.80	53.60	63.85	
<i>Hypochaeris radicata</i>	I	28.46	23.93	33.36	
<i>Madia</i> spp.	N	44.57	39.44	49.79	WP/VP
<i>Aira caryophylla</i>	I	44.19	39.08	49.41	
<i>Holcus lanatus</i>	I	40.07	35.06	45.26	
<i>Leontodon taraxacoides</i>	I	40.07	35.06	45.26	
<i>Juncus tenuis</i>	N	39.70	34.69	44.88	WP
<i>Agrostis stolonifera/capillaris</i>	I	37.45	32.52	42.60	
<i>Mentha pulegium</i>	I	34.46	29.63	39.54	
<i>Parentucellia viscosa</i>	I	34.46	29.63	39.54	
<i>Leucanthemum vulgare</i>	I	34.08	29.27	39.16	
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	N	32.21	27.48	37.23	WP
<i>Centaurea erythraea</i>	I	28.09	23.58	32.97	
<i>Epilobium brachycarpum</i>	N	27.72	23.22	32.58	WP
<i>Vulpia bromoides</i>	I	26.59	22.17	31.41	
<i>Galium trifidum</i>	N	24.34	20.07	29.05	WP
<i>Geranium dissectum</i>	I	22.47	18.33	27.08	
<i>Sonchus asper</i>	I	21.35	17.29	25.89	
<i>Epilobium ciliatum</i>	N	20.22	16.26	24.70	WP
<i>Trifolium dubium</i>	I	20.22	16.26	24.70	
<i>Cirsium vulgare</i>	I	17.60	13.87	21.89	
<i>Grindelia integrifolia</i>	N	17.60	13.87	21.89	WP/VP
<i>Microseris laciniata</i>	N	16.48	12.85	20.68	WP
<i>Juncus oxymers</i>	N	16.10	12.51	20.27	VP
<i>Agrostis exarata</i>	N	15.73	12.18	19.87	WP/VP
<i>Galium parisiense</i>	I	13.48	10.17	17.41	
<i>Epilobium densiflorum</i>	N	11.61	8.53	15.35	WP
<i>Danthonia californica</i>	N	11.24	8.20	14.93	WP
<i>Downingia elegans</i>	N	10.86	7.88	14.51	VP
<i>Festuca arundinacea</i>	I	10.86	7.88	14.51	

3. Wildlife Utilization

Wildlife use was similar to previous years (see 1998-2003 Annual Reports).

Appendix A. Monitoring Methods

Overview

A mitigation bank monitoring strategy was developed in the spring of 1997 describing mitigation goals and monitoring objectives common to all sites, site-specific goals, and monitoring objectives for existing restoration and enhancement projects. A standard field protocol for qualitative quarterly site monitoring was implemented in the fall of 1997. As new Mitigation Improvement Plans (MIPs) were written, mitigation goals and monitoring objectives were added. Improvements to the protocol were made based on field experiences in 1998. The standard plan and the protocol for quantitative vegetative monitoring were both developed in 1994 (see 1994 Annual Report for details).

A discussion of each type of monitoring is provided in the following sections.

Quarterly Monitoring

Photopoints

Purpose: Photos document surface hydrology and vegetation structure during each season, and allow comparisons between post-treatment years.

Method:

- Permanent photostations are established with metal stakes in a sufficient number to provide photo coverage of most restored and enhanced areas at all current sites.
- Photographs are taken quarterly and documented by photopoint number and compass bearing (and landmarks).

Hydrology

Purpose: Assess whether wetland hydrology is established within the restoration site. The extent of soil saturation during the growing season (March 18 – November 26) is an important factor in establishment and growth of hydrophytic vegetation.

Method:

1. Quarterly site visits during the fall, winter, and spring have included a brief description of the location, extent, and depth of standing water at each site.
2. The timing of the quarterly visits in the fall and spring should correspond with the beginning and end of the growing season, if possible.
3. The winter visit should document the maximum standing water depth and extent in emergent pools.
4. Water depth is recorded monthly beginning in October and running through May from the 1 or 2 staff gauges installed at most sites.

Vegetation Monitoring

Overall Goal: Assess the establishment of hydrophytic vegetation within restoration sites and monitor the status of hydrophytic vegetation in enhancement sites.

Species Lists

Purpose: Assess the status of each site in meeting the following Bank MOA performance standard: The standard reads that, "At least 70 percent of the planted or seeded native plants shall be present at the end of the five year monitoring period."

Method:

1. The species list should be collected once early in the growing season (late May to mid-June) and once late in the growing season (early to mid-August).
2. A species list is compiled by thoroughly walking through a site while filling out the species checklist.

Seed Assessments

Purpose: To provide an early qualitative assessment of seeding success.

Method:

1. The assessment should take place once early in the growing season (late May to mid-June) and once late in the growing season (early to mid-August).
2. Each native species is noted, while also recording whether its presence in the restoration is 'Dominant,' 'Common,' 'Uncommon,' or present only in 'Trace' amounts."

Point-intercept Sampling

Purpose: To address the performance criteria for species importance in wetland restorations given in the MOA as: "...the restored wetland shall be dominated by native plant species where their total represents at least 50% cover after 2 years and 70% cover 5 years."

Method:

1. The area (or areas) chosen to represent the site's progress are delineated by a macroplot (or macroplots) that are sampled in the 2nd and 5th years.
2. The sampling method within each macroplot is referred to as systematic sampling with a random start.
 - a. The maximum point spacing is computed to fit 200 points (explained below in number 3) in each macroplot.
 - b. One side of the macroplot is chosen as the baseline (X), from which transects are run at 90 degrees (Y). The location of the first transect along the baseline is chosen randomly from between 0 and 5 m, while the first sampling location along the Y axis is also selected randomly from between 0 and 4 m.
3. Each observation (or point) is obtained by lowering a vertical cylindrical metal rod with a sharp pin at the tip to note which species are covering the ground at that location.
4. The habitat type of each point is also noted (emergent, vernal pool, *Deschampsia cespitosa* dominated wet prairie, side slope, or old field).
5. 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 points. Cover estimates are given with 90% binomial confidence intervals.

Frequency Sampling

Purpose: To assess the progress of each site in meeting the Bank MOA performance standard on species type, which states that, "Of the plant species occurring at a 50% frequency rate or greater, at least 75% shall be from the Native Plant list of the West Eugene Wetlands Plan." These data are also used to assess the site's progress on the diversity and structure goals for wet prairie and emergent habitats. A minimum of 10 native species should occur at 10% frequency rate or greater in wet prairie, while a minimum of 5 native species should occur at a 10% frequency rate or greater in emergent habitats.

Method:

1. Macroplot setup and sampling are similar to the point-intercept methods; however, only 100 observations are required.
2. Each observation consists of noting the presence of each species in a 1 x 1m frame.

3. To obtain the frequency value for each species, the number of times a species is observed within the frame is divided by the total number of frames observed (100). Frequency estimates are also reported with 90% binomial confidence intervals.

Line-intercept Sampling

Purpose: To assess the progress of each site in meeting goals of woody vegetation removal for enhancement areas. For these site-specific goals, refer to the MIP for the enhancement of interest.

Method:

1. The line-intercept method is utilized for estimating the percent cover of shrubs in an enhancement area.
2. Transects are run perpendicular to the macroplot baseline. The segments of the transect that are covered by shrubs are recorded.
3. The percent cover of each shrub species is computed by dividing the length of all transects covered by that species by the combined length of all the transects.

Rare Plant Census

Purpose: To monitor the population changes of the rare and endangered species on Bank enhancement areas. Where applicable, these data will also be used to assess the effects of management actions on the populations of rare species.

Methods for *Erigeron decumbens* var. *decumbens*, *Lomatium bradshawii*, and *Horkelia congesta* ssp. *congesta*:

1. Macroplots were delineated around the entire populations of these rare species where they occur. The macroplot is divided into 1m² plots, and all plots are sampled.
2. The total number of crowns (plants > 3.5 cm apart), flowers, and reproductive crowns are recorded for *Erigeron decumbens* var. *decumbens*. The total number of crowns, flowering stems per crown, and reproductive crowns are recorded for *Horkelia congesta* ssp. *congesta*. For *Lomatium bradshawii*, the total number of plants, leaves and flowering stalks are counted.

Methods for *Aster curtus*:

All populations at Oxbow West and Balboa

1. Each population is marked by a rebar placed approximately in the center of the populations.
2. The total number of ramets? is obtained by dividing the populations into sections and counting all individuals in each section.

Populations that fall within macroplots for other rare species (North Greenhill Ash Grove and Balboa)

1. The macroplot is divided into 1m² plots, and all plots are sampled.
2. The presence or absence of *Aster curtus* is noted in each plot. The frequency of *Aster curtus* is obtained for each macroplot. (The total number of ramets is not obtained.)

Methods *Lupinus sulphureus* ssp. *kincaidii*:

1. Macroplots were delineated around the entire population. The macroplot is divided into 1m² plots, and all plots are sampled.
2. The total number of leaves and inflorescences are tallied for the macroplot by counting them in each plot.

Wildlife Surveys

Purpose: To document wildlife usage in restoration and enhancement sites.

Method: Volunteers and the wetland staff make note of wildlife sightings as they occur.

Appendix B. Species Lists for all Mitigation Bank Sites. The species observed on each site are recorded by noting the section of the restoration or enhancement area in which they were found.

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
		Project Section	P1 North	P1 South	P2	P2 Sod Removal	P2 Solarization	P3 Sod Removal		East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	P2	
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	R
Scientific Name	Common Name	Origin																
<i>Acer macrophyllum</i>	bigleaf maple	N																
<i>Achillea millefolium</i>	yarrow	N			X													
<i>Agrostis exarata</i>	spike bentgrass	N	X	X	X	X	X	X	X			X	X			X	X	X
<i>Agrostis stolonifera/capillaris</i>	fiorin (bentgrass)	I	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
<i>Aira caryophyllea</i>	silver hairgrass	I	X	X	X	X	X	X	X	X			X			X	X	X
<i>Alisma lanceolatum</i>	narrowleaf waterplantain	I		X	X			X								X		
<i>Alisma trivale</i>	waterplantain	N		X	X			X	X						X			X
<i>Allium amplexans</i>	slimleaf onion	N			X	X				X	X		X					
<i>Alnus rubra</i>	red alder	N							X									
<i>Alopecurus geniculatus</i>	water foxtail	I	X	X	X			X	X	X	X	X	X	X		X	X	X
<i>Alopecurus pratensis</i>	meadow foxtail	I	X			X	X	X	X			X	X	X	X	X	X	
<i>Amelanchier alnifolia</i>	western serviceberry	N	X			X	X		X	X	X							
<i>Anagallis arvensis</i>	scarlet pimpernel	I						X	X									X
<i>Anaphalis margaritacea</i>	pearly-everlasting	N																
<i>Anthemis cotula</i>	mayweed chamomile	I																X
<i>Anthoxanthum odoratum</i>	sweet vernalgrass	I	X	X	X	X	X		X	X			X	X				X
<i>Anthriscus caucalis</i>	bur-chervil	I																
<i>Arrhenatherum elatius</i>	tall oatgrass	I							X									
<i>Aster curtus</i>		N								X			X					
<i>Aster hallii</i>	Hall's aster	N	X		X	X		X	X	X			X			X	X	X
<i>Avena fatua</i>	wild oat	I																
<i>Baccharis pilularis</i>	coyote brush	N							X									
<i>Barbarea orthoceras</i>	wintercress	N							X									
<i>Beckmannia syzigachne</i>	American sloughgrass	N	X	X	X			X	X		X	X		X	X	X	X	X
<i>Berberis aquifolium</i>	tall Oregon grape	N																
<i>Bidens cernua</i>	nodding beggars-tick	N							X									
<i>Bidens frondosa</i>	leafy beggars-tick	N			X	X			X					X			X	X
<i>Brassica campestris</i>	field mustard	I																
<i>Briza minor</i>	little quaking-grass	I	X		X	X	X	X	X	X			X				X	X
<i>Brodiaea coronaria</i>	harvest brodiaea	N			X													

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
		Project Section	P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization		P3 Sod Removal	East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	
Scientific Name	Common Name	Origin																
<i>Bromus carinatus</i>	California brome	N							X									
<i>Bromus hordeaceus</i>	soft brome	I			X			X										
<i>Bromus rigidus</i>	ripgut brome	I										X						
<i>Bromus sitchensis</i>	sitka brome	N			X				X									
<i>Calandrinia ciliata</i>	red maids	N																
<i>Callitriche heterophylla</i>	water starwort	N																
<i>Callitriche stagnalis</i>	pond water-starwort	I																
<i>Camassia leichtlinii</i>	tall camas	N				X				X	X		X			X	X	
<i>Camassia quamash</i>	common camas	N	X	X	X	X				X							X	X
<i>Cardamine oligosperma</i>	little western bittercress	N			X													
<i>Cardamine penduliflora</i>	Willamette V. bittercress	N																
<i>Carex densa</i>	dense sedge	N	X	X	X	X			X	X	X		X	X		X	X	X
<i>Carex echinata</i>	muricate sedge	N																
<i>Carex feta</i>	green-sheath sedge	N			X				X				X	X				X
<i>Carex lanuginosa</i>	wooly sedge	N																
<i>Carex obnupta</i>	slough sedge	N										X	X	X	X	X		X
<i>Carex ovalis</i>	hare sedge	I	X		X	X			X	X	X		X	X				
<i>Carex species</i>	sedge	N	X															X
<i>Carex stipata</i>	sawbeak sedge	N							X									
<i>Carex tumulicola</i>	foothill sedge	N																
<i>Carex unilateralis</i>	one-sided sedge	N	X	X	X	X			X		X	X	X	X	X	X	X	X
<i>Castilleja tenuis</i>	hairy owl-clover	N	X		X		X		X		X					X	X	X
<i>Centaureum erythraeae</i>	common centaury	I	X		X		X	X	X						X	X		X
<i>Centaureum muhlenbergii</i>	monterey centaury	N	X						X									X
<i>Centunculus minimus</i>	chaffweed	N							X									X
<i>Cerastium glomeratum</i>	sticky chickweed	I	X		X	X				X	X	X	X	X		X	X	X
<i>Chamomilla suaveolens</i>	pineapple weed	N																
<i>Cichorium intybus</i>	chicory	I							X									
<i>Cirsium arvense</i>	Canada thistle	I			X										X			X
<i>Cirsium vulgare</i>	bull thistle	I	X		X										X			X
<i>Cicendia quadrangularis</i>	Timwort	N	X	X	X		X		X									X
<i>Convolvulus arvensis</i>	bindweed	I							X			X						

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
		Project Section	P1 North	P1 South	P2	P2 Sod Removal	P2 Solarization	P3 Sod Removal		East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	P2	
			R	R	R													
Restoration or Enhancement																		
Scientific Name	Common Name	Origin																
<i>Crataegus monogyna</i>	English hawthorn	I				X			X	X	X			X	X			X
<i>Crataegus suksdorfii</i>	black hawthorn	N				X			X		X							X
<i>Crataegus suksdorfii X monogyna</i>	Hybrid hawthorn	I	X	X		X				X	X	X	X	X				X
<i>Cuscuta sp.</i>	dodder								X									
<i>Cynosurus cristatus</i>	crested dogtail	I																X
<i>Cynosurus echinatus</i>	hedgehog dogtail	I			X													
<i>Cyperus acuminatus</i>	short-pointed flatsedge	N							X									
<i>Cyperus eragrostis</i>	tall flatsedge	I																
<i>Cyperus squarrosus</i>	awned flatsedge	N																
<i>Cytisus scoparius</i>	broom	I				X							X					X
<i>Dactylis glomerata</i>	orchard-grass	I																
<i>Danthonia californica</i>	California oatgrass	N	X		X	X	X		X	X	X		X			X	X	X
<i>Daucus carota</i>	Queen Anne's lace	I	X		X	X			X				X				X	X
<i>Delphinium menzeisii</i>	Menzies' larkspur	N							X									
<i>Deschampsia cespitosa</i>	tufted hairgrass	N	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
<i>Deschampsia danthonioides</i>	annual hairgrass	N	X		X											X	X	
<i>Deschampsia elongata</i>	slender hairgrass	N							X									
<i>Dianthus armeria</i>	Deptford pink	I			X				X									X
<i>Dipsacus fullonum</i>	teasel	I	X	X	X		X		X	X					X	X		X
<i>Downingia elegans</i>	showy downingia	N			X				X	X		X		X			X	X
<i>Downingia yina</i>	Willamette downingia	N	X						X			X						X
<i>Echinochloa crus-galli</i>	large barnyard-grass	I							X									
<i>Eleocharis acicularis</i>	needle spike-rush	N				X			X									
<i>Eleocharis obtusa</i>	common spike-rush	N		X	X	X			X			X		X	X			
<i>Eleocharis palustris</i>	common spikerush	N	X	X	X	X			X					X	X			X
<i>Eleocharis quadrangulata</i>	squarestem spikerush	N							X									
<i>Elymus glaucus</i>	blue wildrye	N			X				X									X
<i>Epilobium brachycarpum</i>	autumn willowherb	N	X		X		X		X	X	X	X	X	X	X	X	X	X
<i>Epilobium ciliatum</i>	hairy willowherb	N		X	X	X			X	X	X	X	X	X	X		X	X
<i>Epilobium densiflorum</i>	dense spike-primrose	N	X		X	X	X		X	X		X			X		X	X
<i>Epilobium pygmaeum</i>	smooth willowherb	N							X	X								

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner	
		Project Section	P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization		P3 Sod Removal	East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1		P2
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R		
Scientific Name	Common Name	Origin																	
<i>Equisetum sp.</i>	horsetail	N			X				X										
<i>Eriophyllum lanatum</i>	wooly sunflower	N	X	X	X	X	X		X	X	X		X			X	X	X	
<i>Eryngium petiolatum</i>	coyote thistle	N	X	X	X	X			X	X	X			X		X	X	X	
<i>Festuca arundinacea</i>	tall fescue	I	X	X	X		X	X	X	X		X	X		X			X	
<i>Fragaria virginiana</i>	strawberry	N				X			X										
<i>Fraxinus latifolia</i>	Oregon ash	N				X			X		X		X	X	X				
<i>Galium aparine</i>	catchweed	I				X							X	X					
<i>Galium parisiense</i>	wall bedstraw	I	X		X				X				X					X	
<i>Galium trifidum</i>	small bedstraw	N				X			X						X			X	
<i>Galium triflorum</i>	sweet scented bedstraw	N																	
<i>Gentiana sceptrum</i>	staff gentian	N							X										
<i>Geranium dissectum</i>	cut-leaved geranium	I	X		X		X	X	X		X	X	X	X			X	X	
<i>Geranium spp.</i>	geranium	I																	
<i>Geum macrophyllum</i>	Oregon avens	N							X										
<i>Glyceria occidentalis</i>	western mannagrass	N		X	X				X	X				X		X	X	X	
<i>Gnaphalium palustre</i>	lowland cudweed	N	X		X				X			X			X		X	X	
<i>Gnaphalium purpureum</i>	purple cudweed	I							X	X								X	
<i>Gnaphalium uliginosum</i>	marsh cudweed	I							X										
<i>Gratiola ebracteata</i>	bractless hedge-hyssop	N	X	X	X	X	X		X	X	X		X	X	X		X	X	X
<i>Grindelia integrifolia</i>	Willamette V. gumweed	N	X	X	X		X		X	X	X						X	X	X
<i>Heracleum lanatum</i>	cow parsnip	N							X	X	X								
<i>Heterocodon rariflorum</i>	heterocodon	N							X										
<i>Holcus lanatus</i>	velvet grass	I	X		X	X			X		X	X	X		X	X	X	X	
<i>Hordeum brachyantherum</i>	meadow barley	N	X		X		X		X		X	X			X	X	X	X	
<i>Hordeum geniculatum</i>	Mediterranean barley	I							X										
<i>Hypericum anagalloides</i>	bog or trailing St. John's-wort	N							X										
<i>Hypericum perforatum</i>	St. John's-wort	I	X		X	X			X			X		X			X	X	
<i>Hypochaeris radicata</i>	false dandelion	I	X	X	X	X	X		X		X				X	X	X	X	
<i>Isoetes nutalli</i>	Nuttall's quillwort	N																	

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
	Project Section	P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization	P3 Sod Removal		East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	P2	
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	R
Scientific Name	Common Name	Origin																
<i>Isoetes sp.</i>	quillwort	N																
<i>Juncus acuminatus</i>	tapered rush	N		X				X	X			X		X	X	X	X	X
<i>Juncus articulatus</i>	jointed rush	N		X														
<i>Juncus bolanderi</i>	Bolander's rush	N							X						X	X	X	X
<i>Juncus bufonius</i>	toad rush	N	X			X		X	X			X	X		X	X	X	X
<i>Juncus effusus</i>	soft rush	N		X	X				X	X		X		X	X	X	X	X
<i>Juncus ensifolius</i>	swordleaf rush	N						X	X			X						X
<i>Juncus marginatus</i>	grass-leaf rush	I							X			X						X
<i>Juncus nevadensis</i>	Nevada rush	N		X				X		X							X	
<i>Juncus oxymeris</i>	pointed rush	N		X				X	X			X			X	X		X
<i>Juncus patens</i>	spreading rush	N		X					X		X		X	X	X	X	X	X
<i>Juncus tenuis</i>	slender rush	N	X	X	X	X	X		X	X	X	X	X	X		X	X	X
<i>Kickxia elatine</i>	cancerwort	I	X						X									X
<i>Koeleria cristata</i>	prairie junegrass	N							X									
<i>Lactuca saligna</i>	willow lettuce	I	X															X
<i>Lactuca serriola</i>	prickly lettuce	I			X										X			X
<i>Lamium purpureum</i>	red dead-nettle	I							X									
<i>Lasthenia glaberrima</i>	smooth lasthenia	N	X	X	X	X		X	X							X	X	X
<i>Lathyrus aphaca</i>	yellow vetch	I																
<i>Lathyrus latifolius</i>	everlasting pea	I							X									
<i>Lathyrus sphaericus</i>	grass pea-vine	I														X	X	X
<i>Leersia oryzoides</i>	cutgrass	N																
<i>Leontodon taraxacoides</i>	hairy hawkbit	I	X		X	X		X	X	X		X			X		X	X
<i>Lepidium sp.</i>	peppergrass																	
<i>Leucanthemum vulgare</i>	oxeye daisy	I	X		X			X	X								X	X
<i>Lindernia anagallidea</i>	false-pimpernel	N																
<i>Linum bienne</i>	pale flax	I	X		X	X			X	X			X			X		X
<i>Lolium multiflorum</i>	Italian ryegrass	I			X											X		X
<i>Lolium perenne</i>	perennial ryegrass	I																
<i>Lomatium nudicaule</i>	barestem desert-parsley	N			X	X			X							X		X
<i>Lonicera hispidula</i>	hairy honeysuckle	N																
<i>Lotus corniculatus</i>	bird'sfoot trefoil	I	X									X	X					
<i>Lotus formosissimus</i>	seaside lotus	N		X	X	X	X	X		X	X		X	X				X

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
		Project Section	P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization		P3 Sod Removal	East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	
Scientific Name	Common Name	Origin																
<i>Lotus micranthus</i>	small-flowered deervetch	N			X	X		X									X	
<i>Lotus pinnatus</i>	meadow deervetch	N																
<i>Lotus unifoliatius</i>	Spanish-clover	N	X	X	X	X	X	X	X		X	X	X	X		X	X	X
<i>Ludwigia palustris</i>	water purslane	N						X	X									X
<i>Lupinus bicolor</i>	field lupine	N	X	X	X				X							X	X	
<i>Lupinus polyphyllus</i>	bigleaf lupine	N							X									
<i>Lupinus rivularis</i>	stream lupine	N			X	X	X	X	X			X				X	X	X
<i>Luzula comosa</i>	field woodrush	N				X	X											X
<i>Lysimachia nummularia</i>	moneywort	I																
<i>Lythrum hyssopifolia</i>	hyssop loosestrife	I			X													X
<i>Lythrum portula</i>	water-purslane	I			X										X		X	
<i>Lythrum salicaria</i>	purple loosestrife	I																
<i>Madia elegans</i>	showy tarweed	N			X				X		X	X				X	X	X
<i>Madia glomerata</i>	cluster tarweed	N	X		X	X		X	X	X		X	X	X	X	X	X	X
<i>Madia sativa</i>	coast tarweed	N	X		X				X			X		X	X	X	X	X
<i>Malus fusca</i>	western crab-apple	N							X									
<i>Melilotus alba</i>	white sweetclover	I							X									
<i>Mentha pulegium</i>	pennyroyal	I	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Mentha spicata</i>	spearmint	I																X
<i>Microseris laciniata</i>	cut-leaved microseris	N	X	X	X	X	X	X	X	X		X				X	X	X
<i>Mimulus guttatus</i> var. <i>depauperatus</i>	depauperate monkeyflower	N																X
<i>Moenchia erecta</i>	moenchia	I	X		X	X	X	X	X	X								
<i>Montia fontana</i>	water chickweed	N																
<i>Montia linearis</i>	narrow-leaved montia	N	X				X	X	X	X	X		X			X		
<i>Myosotis discolor</i>	yellow & blue forget me not	I	X		X	X			X	X		X	X	X				X
<i>Myosotis laxa</i>	small-flowered forget me not	N			X				X		X		X	X	X			X
<i>Myosotis verna</i>		N							X									
<i>Myosurus minimus</i>	least mouse-tail	N							X									
<i>Navarretia intertexta</i>	needle-leaved navarretia	N	X	X	X	X		X	X			X	X				X	X

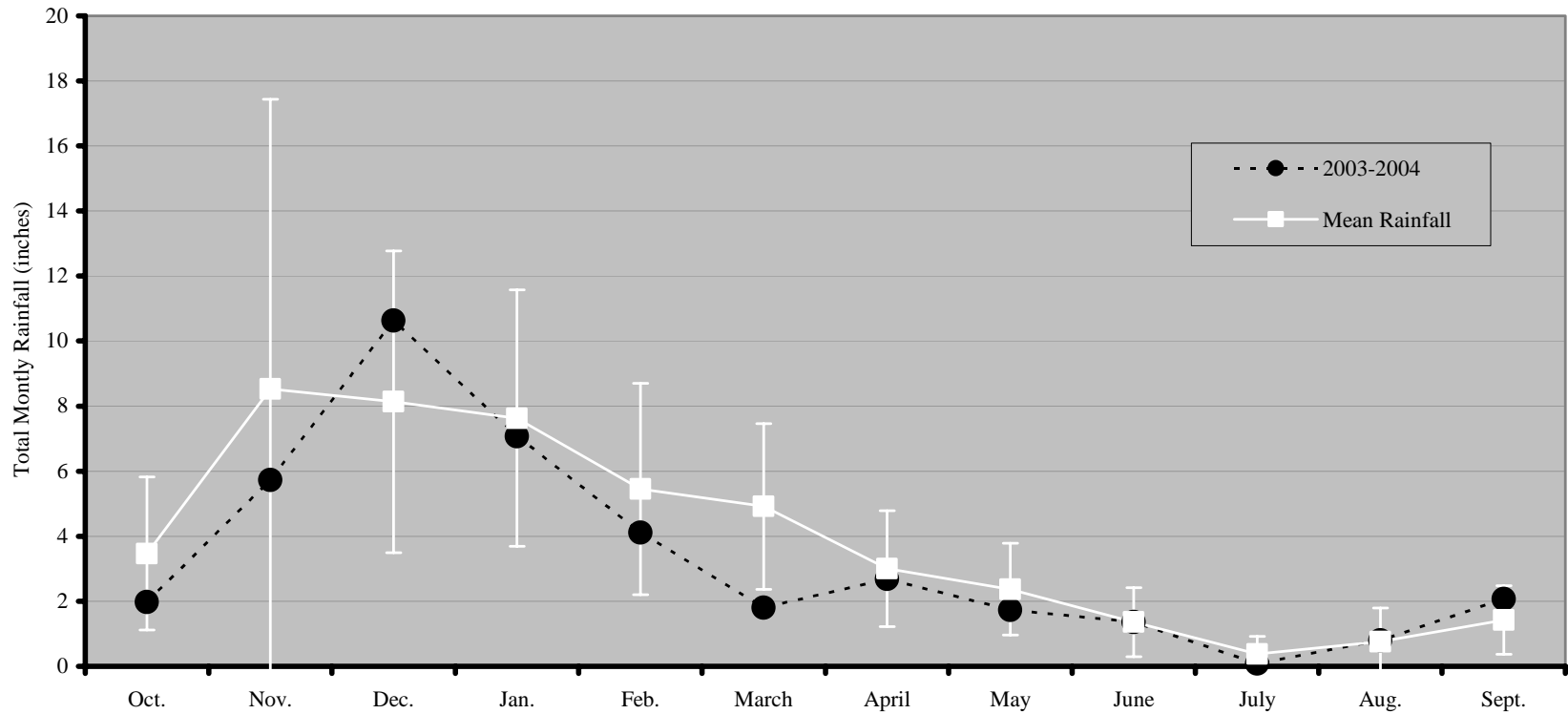
	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
		Project Section	P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization		P3 Sod Removal	East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	
Scientific Name	Common Name	Origin																
<i>Navarretia squarrosa</i>	skunkweed	N	X														X	
<i>Nemophila menziesii</i>	baby blue eyes	N							X									
<i>Nemophila parviflora</i>	small flower nemophila	N																
<i>Oenanthe sarmentosa</i>	Pacific water-parsley	N																
<i>Orthocarpus bracteosus</i>	rosy owl-clover	N	X	X	X	X		X	X							X	X	X
<i>Panicum acuminatum</i> ssp. <i>fascicularis</i>	western witchgrass	N				X		X									X	X
<i>Panicum capillare</i>	common witchgrass	N		X	X	X		X	X	X			X			X	X	
<i>Parentucellia viscosa</i>	yellow parentucellia	I	X		X		X	X	X				X	X	X	X	X	X
<i>Perideridia gairdneri</i>	yampah or false-carraway	N																
<i>Perideridia oregana</i>	Oregon yampah	N							X									
<i>Phalaris aquatica</i>	Harding grass	I	X									X						X
<i>Phalaris arundinacea</i>	reed canarygrass	I	X			X			X	X	X	X		X	X	X		X
<i>Phleum pratense</i>	timothy	I							X									
<i>Phlox gracilis</i>	pink microsteris	N	X	X	X	X	X	X	X	X	X		X			X	X	X
<i>Pinus ponderosa</i>	ponderosa pine	N																X
<i>Physocarpus capitatus</i>	Pacific ninebark	N																
<i>Plagiobothrys figuratus</i>	fragrant popcorn-flower	N	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
<i>Plagiobothrys scouleri</i>	Scouler's popcorn-flower	N																
<i>Plantago lanceolata</i>	English plantain	I				X			X									X
<i>Plantago major</i>	common plantain	I							X									
<i>Plectritis congesta</i>	rosy plectritis	N							X									
<i>Poa annua</i>	annual bluegrass	I			X													X
<i>Poa compressa</i>	Canada bluegrass	I	X															
<i>Poa triviale</i>	Kentucky bluegrass	I																
<i>Polygonum aviculare</i>	doorweed	I																X
<i>Polygonum douglasii</i>	douglas knotweed	N																X
<i>Polygonum hydropiperoides</i>	marshpepper smartweed	N																
<i>Polygonum persicaria</i>	heartweed	I						X										X

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
		Project Section	P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization		P3 Sod Removal	East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	
Scientific Name	Common Name	Origin																
<i>Polypogon monspeliensis</i>	rabbitfoot polypogon	I																
<i>Polystichum munitum</i>	western swordfern	N			X													
<i>Populus trichocarpa</i>	black cottonwood	N	X	X	X	X		X	X	X				X	X		X	
<i>Potentilla gracilis</i>	slender cinquefoil	N	X	X		X		X			X		X				X	
<i>Prunella vulgaris</i>	self-heal	N	X	X	X	X	X	X	X	X		X	X			X	X	
<i>Prunus sp.</i>	"Thundercloud" plum	I				X				X	X							
<i>Pseudotsuga menziesii</i>	Douglas-fir	N							X									
<i>Psilocarphus spp.</i>	wooly heads	N							X			X					X	
<i>Pyrus communis</i>	pear	I				X												
<i>Pyrus malus</i>	apple	I							X									
<i>Quercus garryana</i>	Oregon white oak	N																
<i>Quercus kelloggii</i>	California black oak	N																
<i>Ranunculus alismaefolius</i>	water-plantain buttercup	N															X	
<i>Ranunculus aquatilis</i>	white water buttercup	N											X				X	
<i>Ranunculus flammula</i>	creeping buttercup	N															X	
<i>Ranunculus occidentalis</i>	western buttercup	N			X		X		X							X	X	
<i>Ranunculus orthorhynchus</i>	straight beaked buttercup	N	X	X	X	X	X	X	X		X					X	X	
<i>Ranunculus repens</i>	creeping buttercup	I																
<i>Ranunculus sceleratus</i>	celery-leaf butter-cup	N							X									
<i>Ranunculus uncinatus</i>	little buttercup	N																
<i>Rhamnus purshiana</i>	cascara	N								X	X							
<i>Rorippa curvisiliqua</i>	western yellowcress	N	X	X	X		X		X					X	X	X	X	
<i>Rorippa nasturtium-aquaticum</i>	watercress	N																
<i>Rosa eglanteria</i>	sweetbriar	I							X									
<i>Rosa multiflora</i>	many flowered rose	I				X					X			X			X	
<i>Rosa nutkana</i>	Nootka rose	N		X		X				X	X	X	X			X	X	
<i>Rosa pisocarpa</i>	peafruit rose	I																
<i>Rubus armeniacus</i>	Himalayan blackberry	I	X	X	X	X		X	X	X	X	X	X	X	X		X	

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
		Project Section	P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization		P3 Sod Removal	East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	
Scientific Name	Common Name	Origin																
<i>Rubus laciniatus</i>	evergreen blackberry	I															X	
<i>Rubus ursinus</i>	Pacific blackberry	N							X									
<i>Rumex acetocella</i>	sheep sorrel	I	X	X	X	X	X	X		X			X			X	X	
<i>Rumex conglomeratus</i>	clustered dock	I																
<i>Rumex crispus</i>	curly dock	I	X		X	X		X	X		X		X	X		X	X	
<i>Rumex salicifolius</i>	willow dock	N	X	X	X				X							X	X	
<i>Salix geeyeriana</i>	Geyer willow	N							X									
<i>Salix hookeriana</i>	Hooker willow	N							X									
<i>Salix lasiandra</i>	Pacific willow	N																
<i>Salix piperi</i>	Piper's willow	N																
<i>Salix scouleriana</i>	Scouler willow	N																
<i>Salix sessilifolia</i>	Northwest willow	N																
<i>Salix sitchensis</i>	Sitka willow	N									X			X				
<i>Salix sp.</i>	willow	N	X		X			X	X			X	X	X	X		X	
<i>Sanicula sp.</i>	sanicle																	
<i>Sanquisorba occidentalis</i>	annual burnet	N							X									
<i>Saxifraga integrifolia</i>	swamp saxifrage	N	X							X			X					
<i>Saxifraga oregana</i>	bog saxifrage	N				X					X		X					
<i>Scirpus americanus</i>	bulrush	N																
<i>Scirpus microcarpus</i>	small-fruited bulrush	N																
<i>Scirpus tabernaemontani</i>	softstem bulrush	N																
<i>Senecio jacobea</i>	tansy ragwort	I	X			X		X					X	X	X		X	
<i>Senecio sylvaticus</i>	wood groundsel	I																
<i>Senecio vulgaris</i>	old-man-in-the-spring	I							X									
<i>Sherardia arvensis</i>	blue field-madder	I	X							X								
<i>Sidalcea campestris</i>	meadow sidalcea	N																
<i>Sidalcea cusickii</i> ssp. <i>purpurea</i>	Cusick's checker-mallow	N									X							
<i>Sidalcea virgata</i>	rose checker-mallow	N																
<i>Sisyrinchium californicum</i>	golden-eyed grass	I																
<i>Sisyrinchium hitchcockii</i>	Hitchcock's blue-eyed grass	N																
<i>Sisyrinchium idahoense</i>	Idaho blue-eyed grass	N	X	X		X				X	X			X			X	

	Site	Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
		Project Section	P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization		P3 Sod Removal	East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	
	Restoration or Enhancement	R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	
Scientific Name	Common Name	Origin																
<i>Sitanion hystrix</i>	squirrel-tail bottlebursh	N																
<i>Solanum dulcamara</i>	climbing nightshade	I																
<i>Solidago canadensis</i>	Canada goldenrod	N																
<i>Sonchus asper</i>	prickly sow-thistle	I	X						X				X		X	X	X	
<i>Sorghum halapense</i>	Johnson grass	I																
<i>Sparganium emersum</i>	simplestem bur-reed	N																
<i>Spergula arvensis</i>	stickwort	I																
<i>Spergularia rubra</i>	red sandspurry	I																
<i>Spiraea douglasii</i>	Douglas spirea	N			X				X							X	X	
<i>Spiranthes romanzoffiana</i>	ladies-tresses	N																
<i>Stellaria media</i>	chickweed	I																
<i>Symphocarpos albus</i>	snowberry	N			X													
<i>Taraxicum officinale</i>	dandelion	I	X	X	X	X		X	X				X		X	X	X	
<i>Toxicodendron diversiloba</i>	poison oak	N			X				X	X			X		X		X	
<i>Trichostema lanceolatum</i>	vinegar weed	N						X										
<i>Trifolium dubium</i>	least hop clover	I	X	X	X				X				X	X	X	X	X	
<i>Trifolium hybridum</i>	hybrid clover	I																
<i>Trifolium pratense</i>	red clover	I						X									X	
<i>Trifolium repens</i>	white clover	I										X						
<i>Trifolium subterraneum</i>	subterranean clover	I		X														
<i>Trifolium variegatum</i>	white-tip clover	N						X										
<i>Triphysaria versicolor ssp. versicolor</i>	johnnytuck	N															X	
<i>Triteleia hyacinthina</i>	hyacinth brodiaea	N																
<i>Typha latifolia</i>	cat-tail	N			X			X			X	X				X		
<i>Verbascum blattaria</i>	moth mullein	I															X	
<i>Verbascum thapsus</i>	common mullein	I																
<i>Veronica americana</i>	American speedwell	N						X	X				X					
<i>Veronica arvensis</i>	wall speedwell	I																
<i>Veronica peregrina</i>	purslane speedwell	N	X		X				X	X						X	X	
<i>Veronica scutellata</i>	marsh speedwell	N			X			X	X	X	X		X	X	X		X	
<i>Viburnum ellipticum</i>	Oregon viburnum	N																

Site		Balboa				Greenhill			Nolan	Oxbow West				Stewart Pond		Turtle Swale		Willow Corner
Project Section		P1 North	P1 South	P2		P2 Sod Removal	P2 Solarization	P3 Sod Removal		East Prairie	Eastern Ash Swale	Panhandle	West Prairie	Expansion	Swale Expansion	P1	P2	
Restoration or Enhancement		R	R	R	E	E	E	E	R	E	E	E & R	E	E	R	R	R	R
Scientific Name	Common Name	Origin																
<i>Vicia cracca</i>	bird vetch	I	X						X		X					X		X
<i>Vicia hirsuta</i>	hairy vetch	I		X														X
<i>Vicia sativa</i>	common vetch	I	X		X				X		X		X	X				X
<i>Vicia tetrasperma</i>	slender vetch	I	X		X	X		X	X		X	X	X		X	X	X	X
<i>Vulpia bromoides</i>	barren fescue	I	X		X			X	X								X	X
<i>Vulpia myuros</i>	rat-tail fescue	I							X									
<i>Vulpia sp. (annual)</i>	annual fescue	I							X									
<i>Wyethia angustifolia</i>	narrow-leaf mule's ears	N	X	X	X	X			X								X	X
<i>Zigadenus venenosus</i>	death camas	N		X		X												



Appendix C. Monthly rainfall totals for Eugene Airport during 2003-2004 compared to the mean and standard deviation of monthly rainfall between 1940 and 2004.