

# West Eugene Wetlands Habitat Monitoring at Long Tom, Oxbow West, Speedway, and Vinci



2014

Report to the Bureau of Land Management,  
Eugene District

Report prepared by Erin Gray  
*Institute for Applied Ecology*



## PREFACE

This report is the result of a cooperative Challenge Cost Share project between the Institute for Applied Ecology (IAE) and a federal agency. IAE is a non-profit organization whose mission is conservation of native ecosystems through restoration, research and education. Our aim is to provide a service to public and private agencies and individuals by developing and communicating information on ecosystems, species, and effective management strategies and by conducting research, monitoring, and experiments. IAE offers educational opportunities through 3-4 month internships.



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**Cover photograph:** Habitat monitoring in the West Eugene Wetlands at Vinci

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## EXECUTIVE SUMMARY

This document summarizes habitat monitoring in the West Eugene Wetlands on land managed by the BLM Eugene District. In 2014, we monitored Long Tom, Oxbow West, Speedway, and Vinci to assess whether they were within the habitat targets for Threatened and Endangered species.

- While in the past plant community composition was dominated by introduced species at Long Tom, we noted a shift towards native species dominance in 2014.
- Oxbow West and Speedway experienced an increase in native species cover since previous years, but remained dominated by introduced species in 2014.
- The plant community at Vinci 1 had equal native/introduced species abundance, which differed from monitoring in 2013 where introduced species were more abundant. Vinci 2 has had greater cover of native species over the three years of monitoring, with increases in total native cover from 2013 to 2014.
- Both Vinci 1 and Vinci 2 experienced increases in native species post-fire, with the majority of percent change occurring in native forbs. Fire at Vinci also tended to increase introduced graminoids; percent change in introduced graminoid cover at Vinci 2 was 41% between 2013 and 2014.
- Cover of invasive species and litter exceeded the thresholds for management (maximum 50% cover for invasive species and 20% cover for litter) in habitat for *Lupinus oreganus*, *Erigeron decumbens*, and *Lomatium bradshawii* at all sites.
- Thresholds for woody vegetation exceeded at Long Tom with 35% woody cover in the area monitored.

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# Habitat sampling at Long Tom, Oxbow West, Speedway, and Vinci

REPORT TO THE BUREAU OF LAND MANAGEMENT, EUGENE DISTRICT

## INTRODUCTION

The West Eugene Wetlands (WEW) Project is a cooperative venture by the Bureau of Land Management (BLM), Eugene District, and others to protect and restore wetland ecosystems in the southern Willamette Valley of Oregon. This unique program involves a partnership between federal, state, and local agencies and organizations to manage lands and resources in an urban area for multiple public benefits. In 2005, the BLM developed a long term (10 year) land management implementation schedule for its parcels within the West Eugene Wetlands project area. This 10 year Environmental Assessment (EA) schedule outlines targets for habitat conditions and provides guidance on the priority of work for maintenance, enhancement, and restoration projects (BLM 2005). Within the EA, each parcel will be monitored to meet four habitat management targets. In general, these habitat targets include the following: (1) prevent woody vegetation encroachment, (2) prevent invasive plant spread, (3) prevent litter and thatch build up, and (4) maintain existing levels of native plant species diversity. When monitoring indicates that these targets are



Figure 1. *Lupinus oregonus* (LUOR, Kincaid's lupine)

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not being met based on the established thresholds, management actions may be triggered (further outlined in the EA NO. OR090-0503, Alternative D, pages 58-61). In addition, many of these sites provide habitat for species listed in *Recovery Plan for Threatened and Endangered Species in Western Oregon and Southwest Washington* (USFWS 2010).

The purpose of this project was to conduct monitoring at several sites in the West Eugene Wetlands (Table 1) to assess whether they were within the habitat targets for Threatened and Endangered species (including Kincaid's lupine, Figure 1). In 2014, we monitored four sites: Long Tom, Oxbow West (LUOR area, 1 plot), Speedway (1 plot), and Vinci 1 & 2 (2 plots). Monitoring previously occurred at these sites from 2009 to 2013. Sites were selected due to the time since last monitoring and also due to recent management history. For example, Oxbow West hadn't been monitored since 2009 in the lupine area whereas while Vinci was last monitored in 2013, however a fire occurred at the site in the fall of 2013 so monitoring post-fire was imperative.



Table 1. Monitoring schedule for West Eugene Wetlands T and E sites from 2007 through 2014. If no month is listed, then the site was not monitored through this project.

Site	Plot	2007	2008	2009	2010	2011	2012	2013	2014
Balboa	1 and 3			July			May		
Fir Butte	NE and SW	July			July			May (NE only)	
Fir Butte	SE			July			May		
Greenhill	1(S) and 2 (N)				July		May		
Hansen Meadow			July			May			
Hansen Woods			July			May			
Long Tom			July			May			May
North Taylor			July			May			
Oxbow West	ERDE (wetland)	July			July			May	
Oxbow West	LUOR (upland)			July					May
Speedway			July			May			May
Turtle Swale			July			May			
Vinci	Upland			July			May		
Vinci	Wetland 1 and 2	July			July			May	May

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## Sites

### Long Tom

Long Tom (Figure 2) occurs next to the North Taylor site and combined are eight acres in size. Long Tom was designated as an Area of Critical Environmental Concern (ACEC) in 1984 to protect quality native wetland prairie (USDI BLM 1995). These prairies host a population of the endangered *Lomatium bradshawii* (Bradshaw's desert-parsley), along with other rare species *Montia howellii* (Howell's montia) and *Horkelia congesta* (shaggy horkelia). Threats to these the prairies include invasion by *Cirsium vulgare*, encroachment by *Fraxinus latifolia* (Oregon ash), *Quercus garryana* var. *garryana* (Oregon white oak), and *Quercus kelloggii* (California black oak), and build-up of thatch. Given the on-going threat of encroachment by woody species, fire has been used as a management tool to maintain these prairies. Long Tom last burned in 2012.



Figure 2. Long Tom monitoring site

### Oxbow West (upland)

The overall habitat quality of the remnant prairie at Oxbow West is good, and ongoing management efforts have helped reduce encroachment by woody species including *Pyrus communis*, *Fraxinus latifolia*, *Populus trichocarpa*, and other shrubs. Efforts are also being made to eradicate *Phalaris arundinacea*, an invasive graminoid that is expanding into the prairie from adjacent wet areas. Oxbow West supports a number of rare species, including *Erigeron decumbens*, *Lupinus oregonus*, *Cicendia quadrangularis*, and *Sidalcea cusickii*. The habitat has also been noted as having high potential for reintroduction of *Lomatium bradshawii*. The federally endangered *E. decumbens* is the most abundant rare plant at Oxbow West, occupying approximately five acres. Maintaining and improving the prairie habitat is the main objective for management at Oxbow West. Monitoring of the habitat occupied by *E. decumbens* occurred in 2007, 2010 and 2013. Monitoring of the upland prairie habitat occupied by *L. oregonus* last occurred in July 2009 and in May 2014. The habitat surrounding *L. oregonus* was recently treated with herbicide.

### Speedway

Speedway is a 50 acre site with populations of the *Erigeron decumbens* and *Lomatium bradshawii*, both federally endangered species. This site has been impacted intensively, having previously served as a racing drag strip. Remnant wet prairie is in poor to good condition depending of level of disturbance. There is severe erosion along channelized portions of Willow Creek and associated swales. Threats to this site include the invasive species *Cytisus scoparius* (Scots broom), *Cirsium arvense*, *Cirsium vulgare* (bull thistle), and *Rubus* spp.; encroachment by woody native species, including *Fraxinus latifolia* and *Crataegus douglasii* (Douglas' hawthorn); and impacts by dog walkers and transient campers.

## Vinci

Vinci is a relatively large parcel containing both wet prairie, upland prairie, and vernal pool habitats (Figure 3). Although the quality of the site is relatively high, it has been invaded by woody species such as *Pyrus communis*, *Fraxinus latifolia*, *Populus trichocarpa* and exotic herbaceous species including *Phalaris arundinacea* and *Dipsacus fullonum*. Vinci supports a number of rare species, including *E. decumbens*, *Sericocarpus rigidus*, and *Horkelia congesta* ssp. *congesta*. Monitoring of the wet prairie habitat (Vinci 1 & 2) previously occurred in 2007, 2010, 2013. Upland prairie habitat was monitored in 2009 was repeated in May 2012. Vinci was burned in the fall of 2013 and monitoring of the same area occurred in May 2014 so pre and post-fire comparisons could be made. Portions of Vinci 2 were impacted by a large area of shade cloth with Willamette Daisy seedlings planted within.

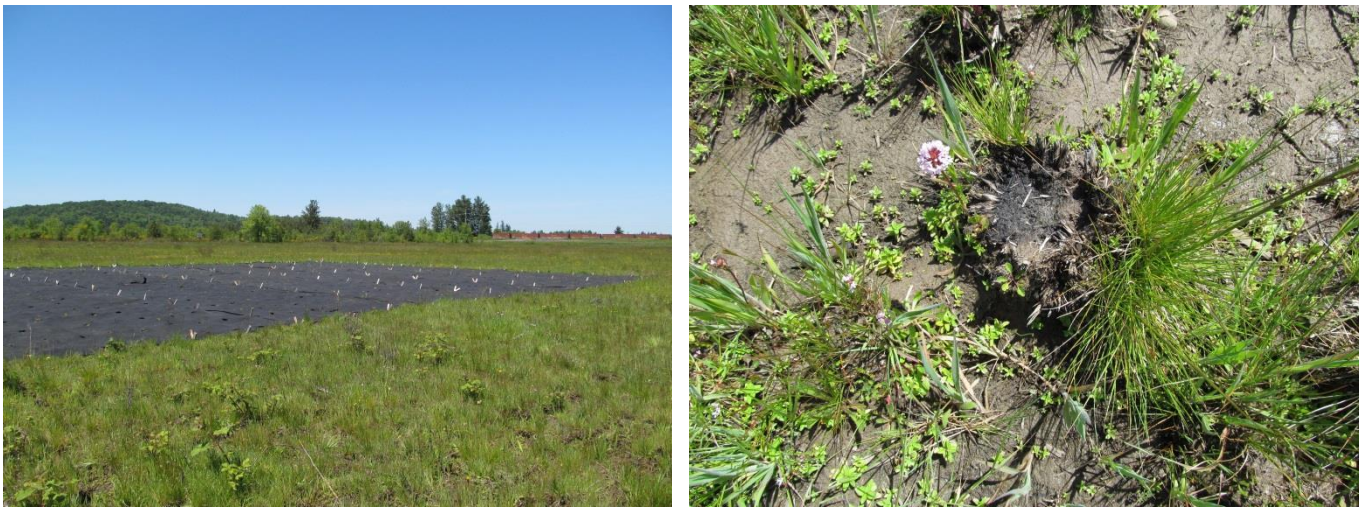


Figure 3. Area monitored at Vinci 2 (left), including shade cloth planting of *Erigeron decumbens*. Plants re-sprouting after the fire that occurred at Vinci in fall 2013 (right).

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## METHODS

In May 2014, five plots were sampled to estimate vegetation cover in the West Eugene Wetlands. Vinci contained two plots and Oxbow West (upland), Long Tom, and Speedway each had one (Figure 4, Table 2). Plot dimensions varied by site and were based on established infrastructure (e.g. conduit or other permanent markers, Table 2). The sampling scheme at each site was selected so that (1) the maximum amount of habitat would be sampled, and (2) there would be at least 200 points per plot (Table 2). The origin was placed in the southeast corner of each plot (Figure 5). For Long Tom, the first sample point along each transect was randomly located between 0m and 4m, and systematically located every 2m (Figure 6). For Oxbow West (upland), the first transect running perpendicular to the baseline was randomly located between 0m and 4m (Figure 7). Subsequent transects were placed every 2m along the baseline, with areas impacted by herbicide avoided as to not confound the data. In 2014, 173 points were monitored for Speedway (Figure 8); though this was less than the desired 200 points, 173 points within the relatively small area (50m x 50m) collected a representative sample. At Speedway, the first sample point along each transect was randomly located between 0m and 4m, and systematically located every 2m (Figure 8). For Vinci 1 (Figure 9), the first transect running perpendicular to the baseline was randomly located between 0m and 4m. Subsequent transects were placed every 3m along the baseline. At Vinci 2 (Figure 9), the first transect was selected randomly between 0 and 4 m, with each transect running every 4 meters. Due to the shade cloth present in part of the plot for an *E. decumbens* outplanting, we randomly sampled in areas not impacted by the shade cloth to monitor within (Figure 10).

The point-intercept sampling method was selected for this project because it provides an unbiased quantitative description of plant communities in an efficient manner (City of Eugene 1997). Although some species with less than 0.5% cover were likely missed, this method provides a consistent manner in which to efficiently sample a large area. We used a monopod that utilized a laser light (Synergy Resource Solutions, Inc.) to sample the vegetation at each point. We adjusted the height of the monopod so that it was above the vegetation canopy at every site. At each point, we recorded every species intercepted by the laser light and the nature of the substrate (bare ground, litter, or moss). Cover can exceed 100% due to multiple species intercepting the laser light.

Species nomenclature, growth habit, and provenance were obtained from the USDA Plants Database (<http://plants.usda.gov>). We calculated the percent cover within each plot by totaling the “hits” for each component (each species, growth habit group, and cover type), dividing by the total number of sampling points per plot, and multiplying by 100. We timed our surveys (May) early to document early-season species, including some of those that are listed threatened and endangered, however we may have missed some later-season species. Surveys have been conducted at multiple times throughout the growing season to yield a greater understanding of the plant community over time (Table 1)

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Table 2. Characteristics of habitat sampling plots in 2014

Site	Plot origin (Lat/Long, WGS 84)	Plot dimensions	# samples
Long Tom	44.141833, -123.296281	37m x 30m	245
Oxbow West (ERDE)	44.054518, -123.187815	24m x 35m	216
Speedway	44.046747, -123.172807	50m x 50m	173
Vinci (wetland)			
Plot 1	44.051923, -123.204899	65m x 50m	203
Plot 2	44.053367, -123.204644	85m x 50m	269

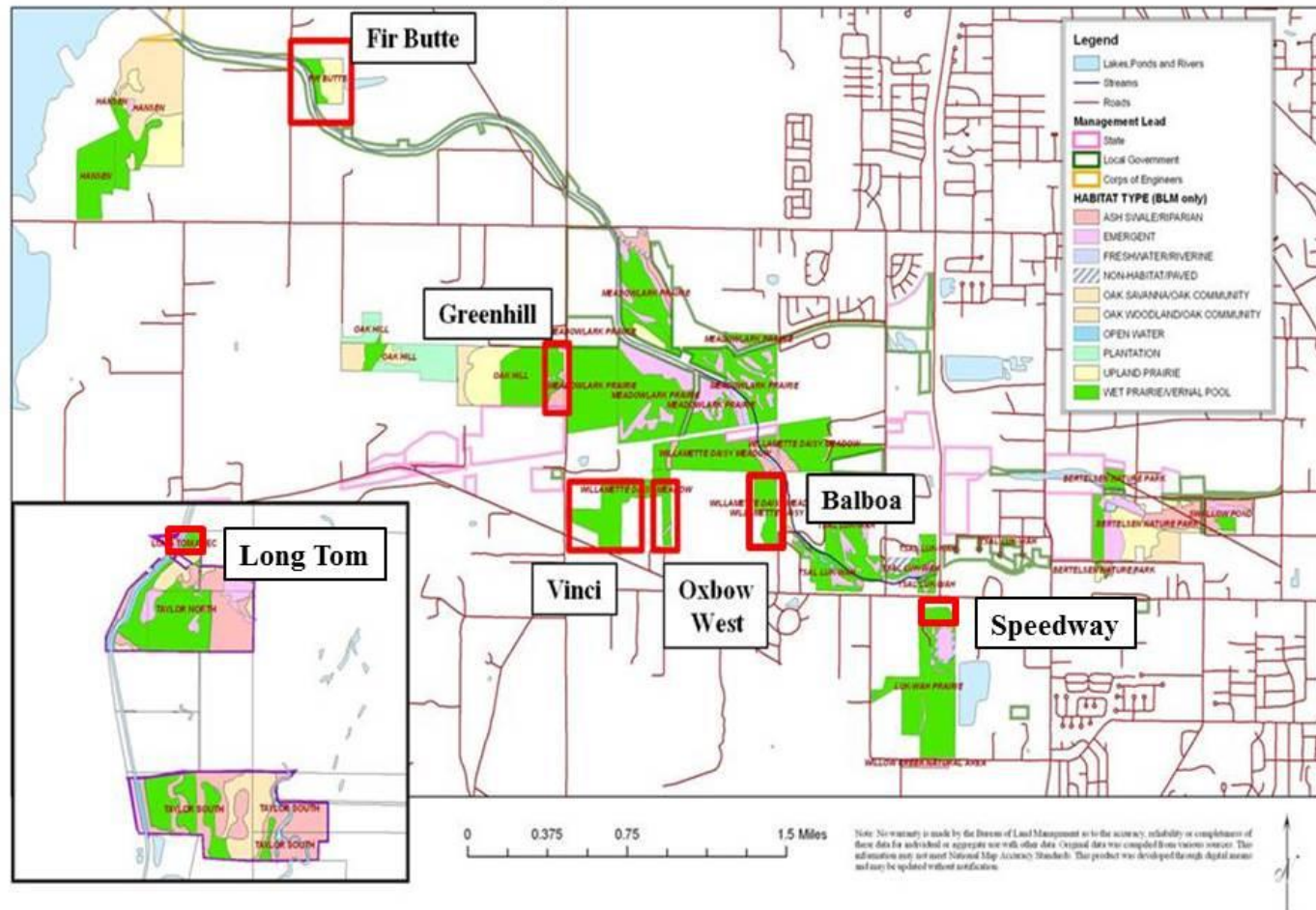


Figure 4. Monitoring sites described in this project. Sites monitored in 2014 include Long Tom, Oxbow West, Speedway, and Vinci. Balboa, Fir Butte, and Greenhill were not monitored in 2014.

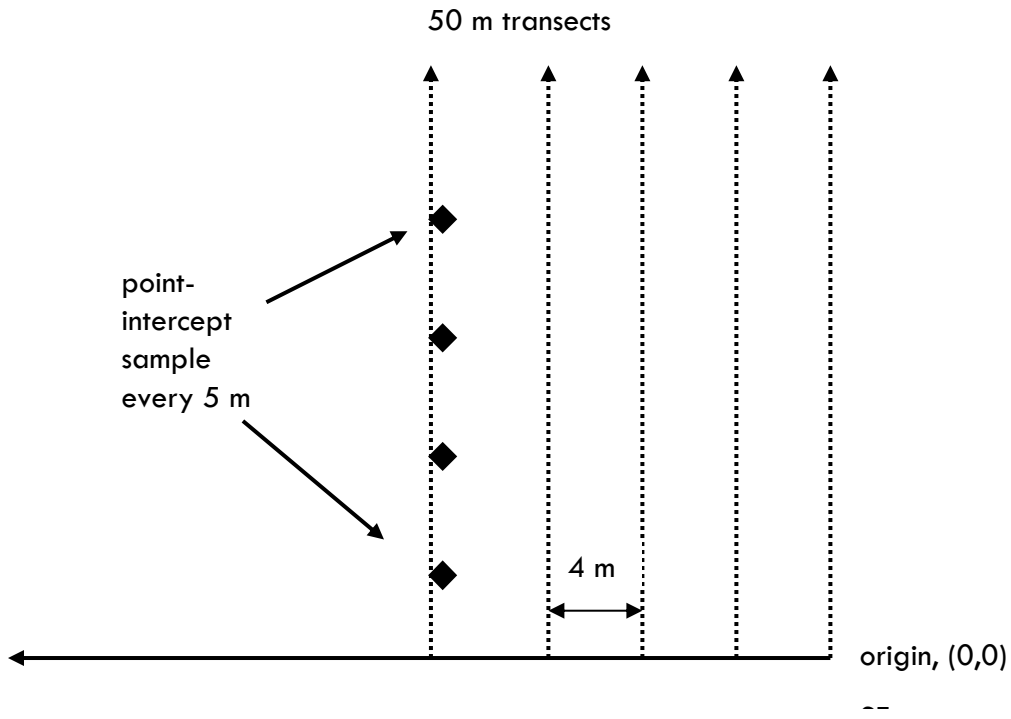


Figure 5. Example design of a sampling plot.

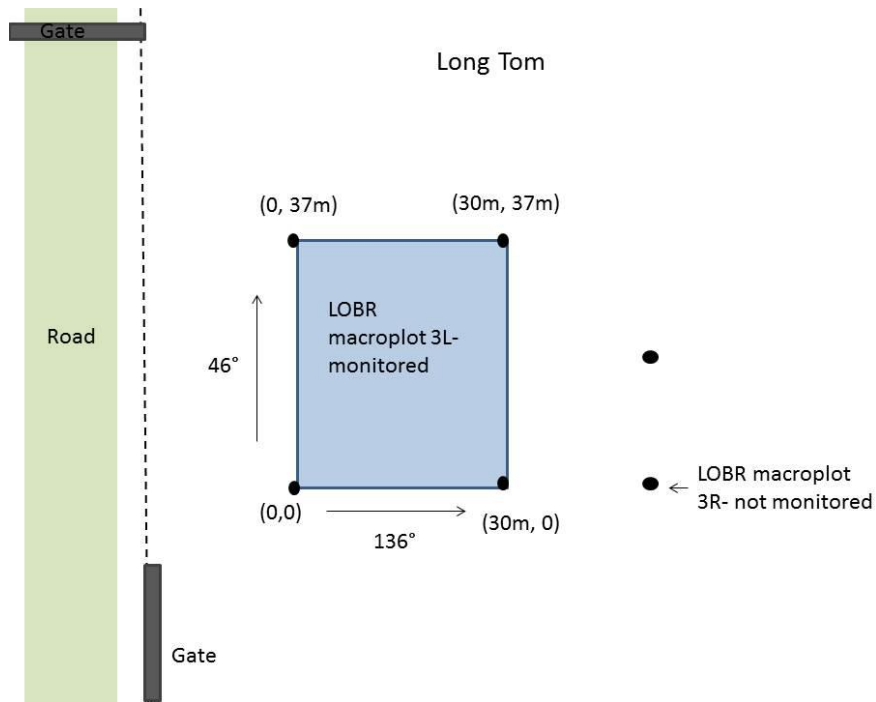


Figure 6. Location of sampling plot at Long Tom. Area monitored was occupied by the endangered *Lomatium bradshawii*.

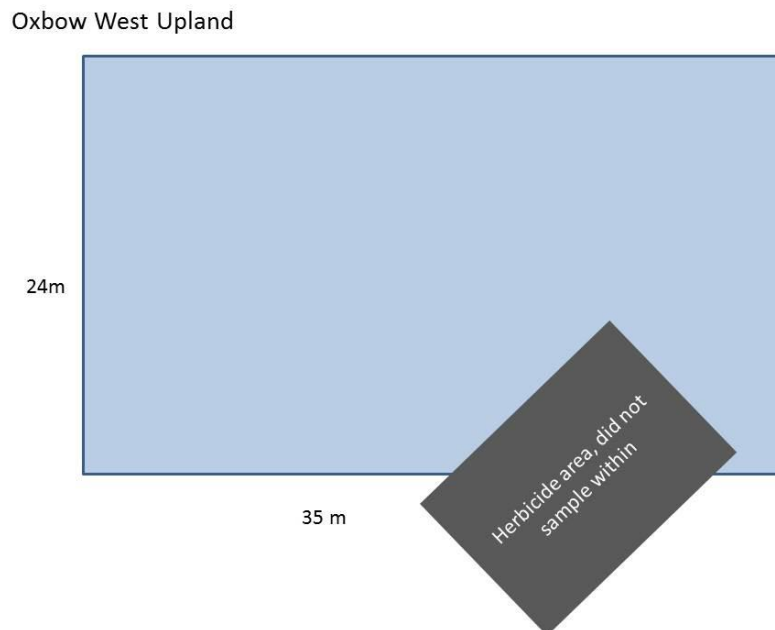


Figure 7. Location of the sampling plot at Oxbow West Upland. The area in blue was occupied by Kincaid's lupine and monitored in 2014. A portion of this area impacted by herbicide was not monitored.



Speedway Rare Plant Locations

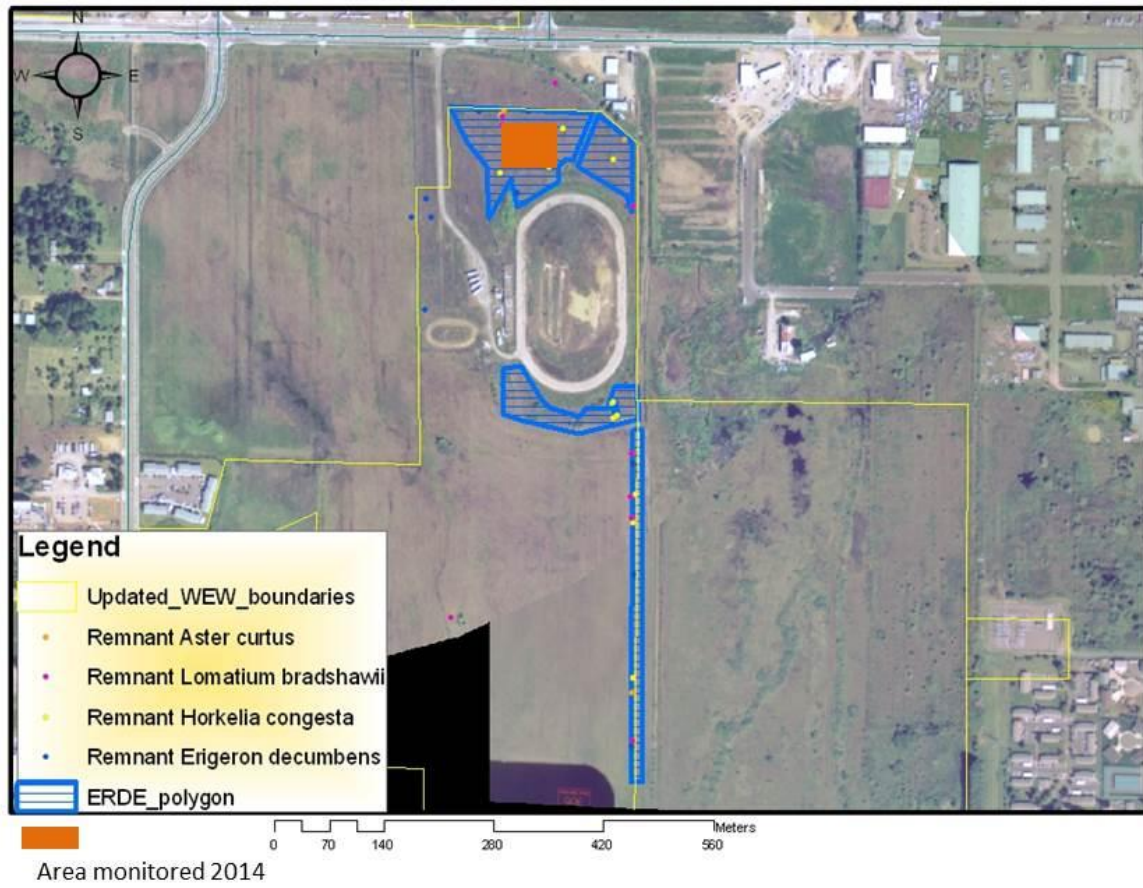
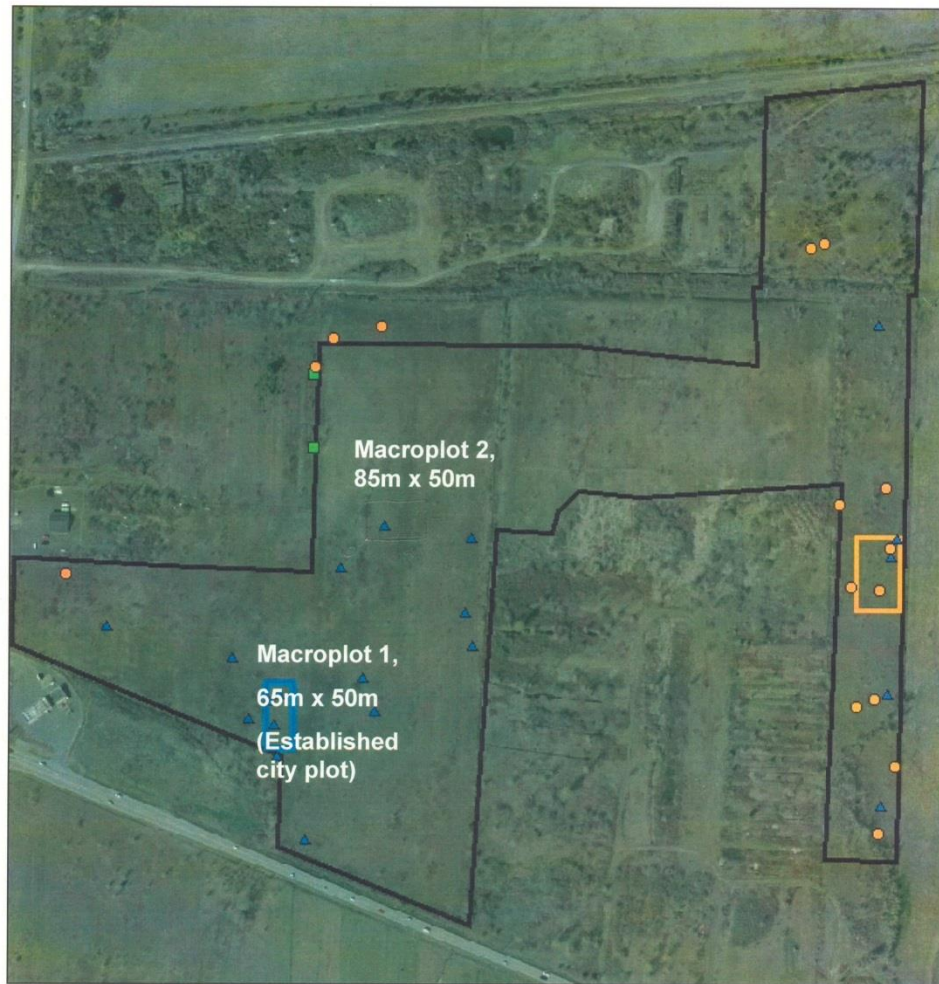


Figure 8. Location of sampling plot at Speedway (orange) monitored in 2014.

Vinci Unit: Bureau of Land Management  
Rare Plant Populations and Macroplots

Vinci



**Legend**

- Aster curtus
- ▲ Erigeron decumbens var. decumbens
- Horkelia congesta ssp. congesta
- Aster curtus
- Erigeron decumbens var. decumbens
- Parcel Boundary

0 80 160 320 Meters



Map created by Jean Jancaitis  
Data collected by Jean Jancaitis, Heather Ladd, and Marcia Cutler  
P:\Natural Resources\Wetlands Program\Jancaitis\GIS\  
Vinci\Vinci\_Rare\_Plants.pdf

Figure 9. Location of monitoring plots at Vinci 1 & 2, monitored in 2014.

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Vinci 2

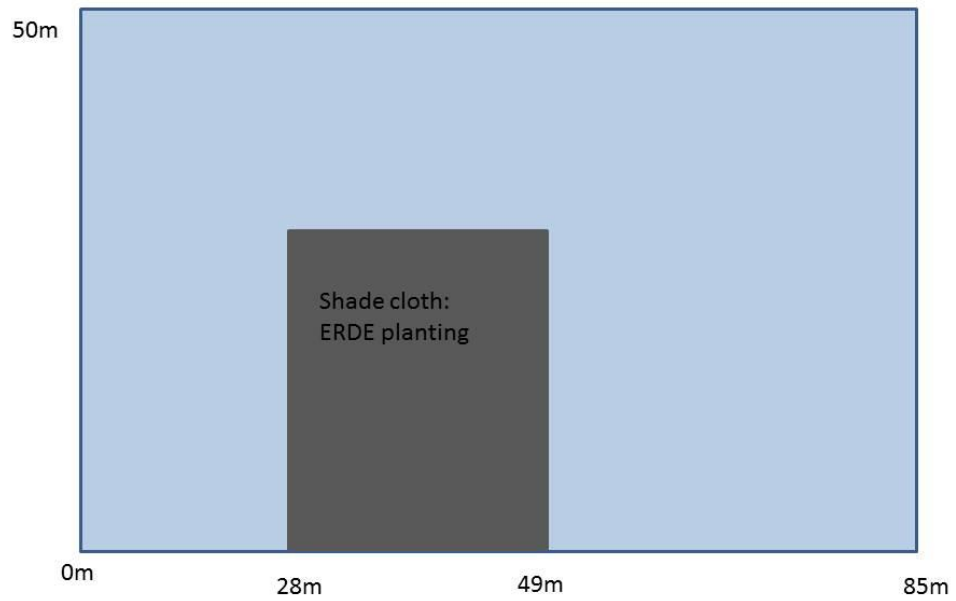


Figure 10. Area monitored at Vinci 2 (blue). The grey area was not monitored because it was covered with shade cloth for an *Erigeron decumbens* (ERDE) planting.

## RESULTS AND DISCUSSION

### Sites

Table 3. Mean cover of substrate categories from 2014 monitoring at all sites.

	Long Tom	Oxbow West	Speedway	Vinci1	Vinci2
Rock	0.0	0.0	0.6	0.0	0.0
Bareground	80.8	1.9	76.3	90.6	88.5
Moss	10.6	78.7	17.9	8.4	1.5
Litter	93.5	97.7	95.4	47.8	60.2

#### Long Tom

The plant community at Long Tom was dominated by introduced species in 2008 and 2011, however species composition has shifted towards native species dominance in 2014 (Figure 11). A fire occurred at this site in 2012 which could have aided in the increase in native species. Long Tom was extremely diverse in comparison to all other sites monitored; of the 51 species found in this plot, thirty one were native, and 22 were introduced. These trends were different than in 2008 and 2011 where total cover was dominated by introduced species. This was a very diverse site with a high abundance of native forbs (16), the most abundant including *Camassia quamash* (4%), *Allium amplexans* (8.2%), and *Microseris laciniata* (8.6%). The endangered *Lomatium bradshawii* was present in the plots but was not picked up in our sampling. Native graminoids were composed of various species of *Carex* as well as *Deschampsia cespitosa* (7.8%) and *Danthonia californica* (11.8%). This site had high shrub cover, which though native can act as a threat to rare prairie species. Native shrubs and trees included *Fraxinus latifolia* (6.5%), *Spiraea douglasii* (7.8%), and *Quercus garryana* (3.7%). At the site there was high cover of *Bromus* sp. (11%) with unknown nativity. The most abundant introduced forbs were *Vicia sativa* (4.5%), *Trifolium dubium* (4.9%), and *Sherardia arvensis* (5.7%). Introduced graminoids were dominated by *Festuca arundinacea* (11.8%) and *Anthoxanthum odoratum* (6.1%). While introduced graminoids had higher cover than native graminoids prior to the burn in 2012, the relationship changed in 2014. *Rubus armeniacus* was the introduced shrub with the highest cover at 10.2%. Total cover was much greater in 2008 than in 2011 and 2014; this is likely an artifact of the monitoring timing, where monitoring in 2008 occurred in July, and could have picked up more late-season species. These data suggest that Long Tom did benefit greatly by the fire that occurred there in 2012, with higher abundances of native species in all categories. Despite the increase in native species at the site, litter cover was high at 93.5% (Table 3). While Long Tom experienced a decrease in woody/shrub cover from 2008 to 2011, 2014 had the highest cover (35%), composed primarily of increases in shrubs (Figure 11).

## Long Tom

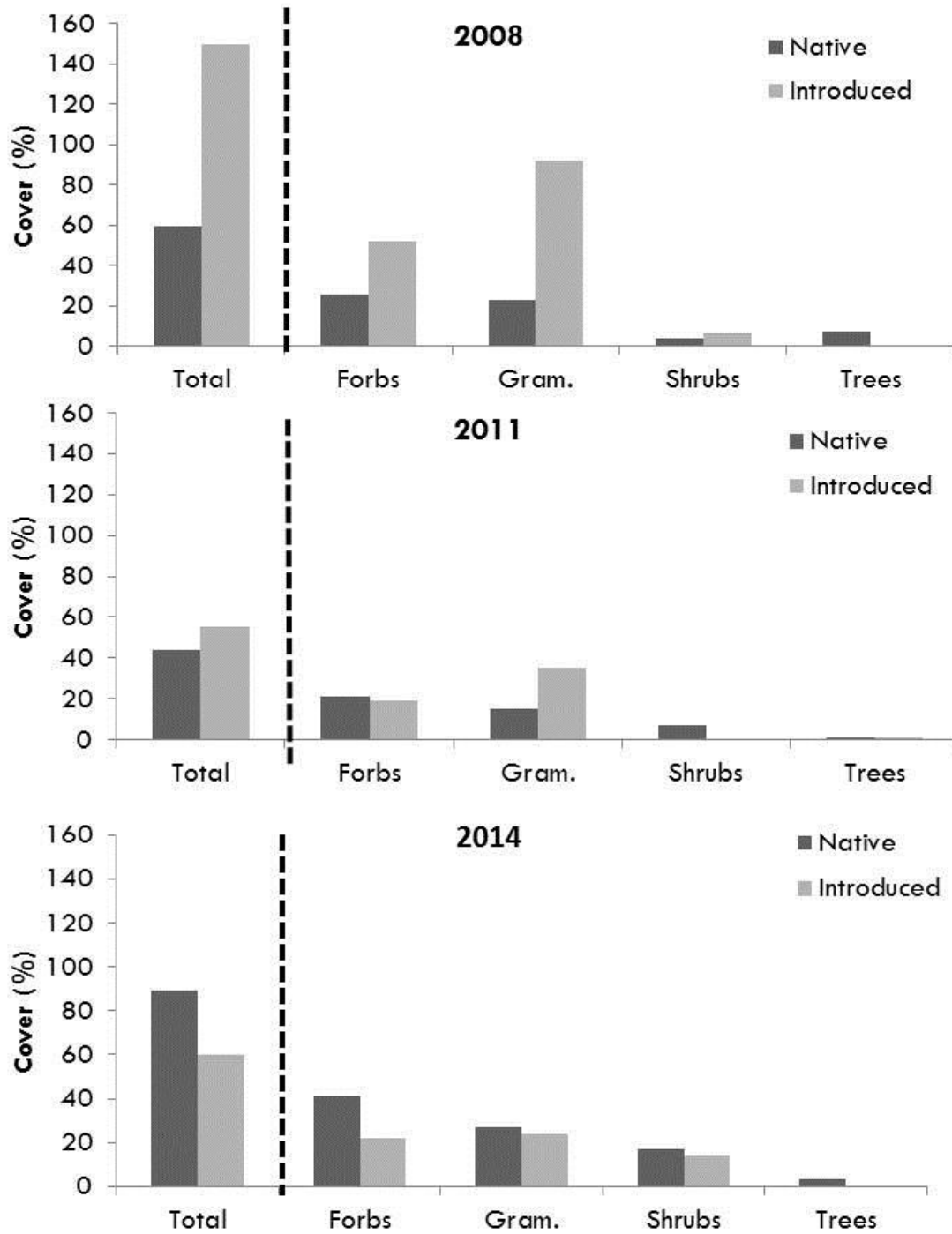


Figure 11. Percent cover of native and introduced species, by growth habit, at Long Tom in 2008 (July), 2011 (May) and 2014 (May). Note the y-axis range (0-160).

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### **Oxbow West (Upland)**

Oxbow West remained dominated by introduced species in 2014, however native species did increase in cover between 2009 and 2014 (Figure 12). Species richness was very similar between introduced species and native species at Oxbow West (15 species and 14 species, respectively), however total native cover was roughly half of that introduced species (Figure 12). The most abundant native species at Oxbow West was the rare *Lupinus oreganus* (13%), which nearly doubled in cover from 2009 (6.6%). Other dominant native species included forbs *Potentilla gracilis* (6.5%), and *Heracleum lanatum* (3.2%), graminoids *Danthonia californica* (10.2%) and *Deschampsia cespitosa* (2.8). The most abundant introduced species were the forbs *Daucus carota* (5%) and *Leucanthemum vulgare* (14.4%). The species with the highest overall cover was the introduced graminoid *Festuca arundinacea* (43%). Introduced shrubs included *Rosa eglanteria* (7.4). Total cover was much less than in 2009, this was likely due to the timing of monitoring where monitoring in July could have picked up more late-season species, which could have accounted for the greater cover of introduced species. Litter/thatch cover was greater than in any other site monitored in 2014 (97.7%); while there were only marginal amounts of bare ground cover (2%), moss cover was relatively high covering 78.7% under the dense litter mat (Table 3).

## Oxbow West

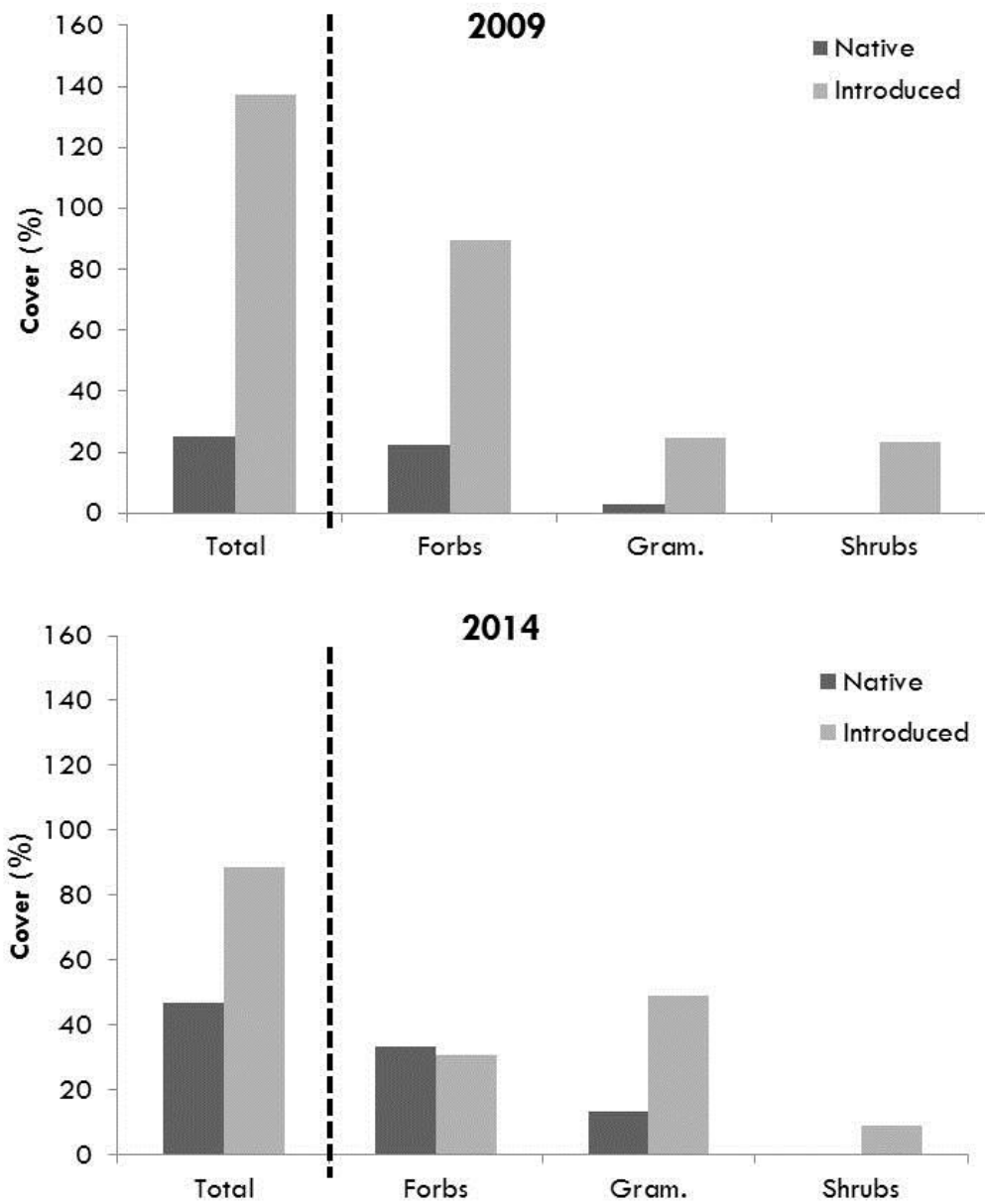


Figure 12. Percent cover of native and introduced species, by growth habit, at Oxbow West in 2009 and 2014. Note the y-axis range (0-160).

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## Speedway

Total cover of introduced species was slightly greater than native species cover in 2014 (Figure 13), with 14 native species and 11 introduced species present in 2014. Despite more native species richness, cover of introduced species remained greater than natives across all years monitored (Figure 13). The most dominant native species included graminoids *Danthonia californica* (20.2%) and *Deschampsia cespitosa* (6.4%), with the remainder of native species had cover values of less than 3%. Introduced species were dominated by the forb *Hypochaeris radicata* (15.6%) and the graminoid *Anthoxanthum odoratum* (23.7%). In 2014, forbs were composed primarily of introduced species, which was similar to previous years (Figure 13). Graminoids, however, shifted toward slight native dominance in 2014 as compared to previous years. Total cover decreased from 2008 to the 2011 and 2014 values, which is likely an artifact of differences in monitoring timing, where 2008 monitoring occurred in July. While we did not pick it up in our plots, the rare *Erigeron decumbens* was present in the surrounding area. Speedway had high cover of litter (95.4%) with a relatively high cover of bare ground under a thick litter mat (76.3%, Table 3).



## Speedway

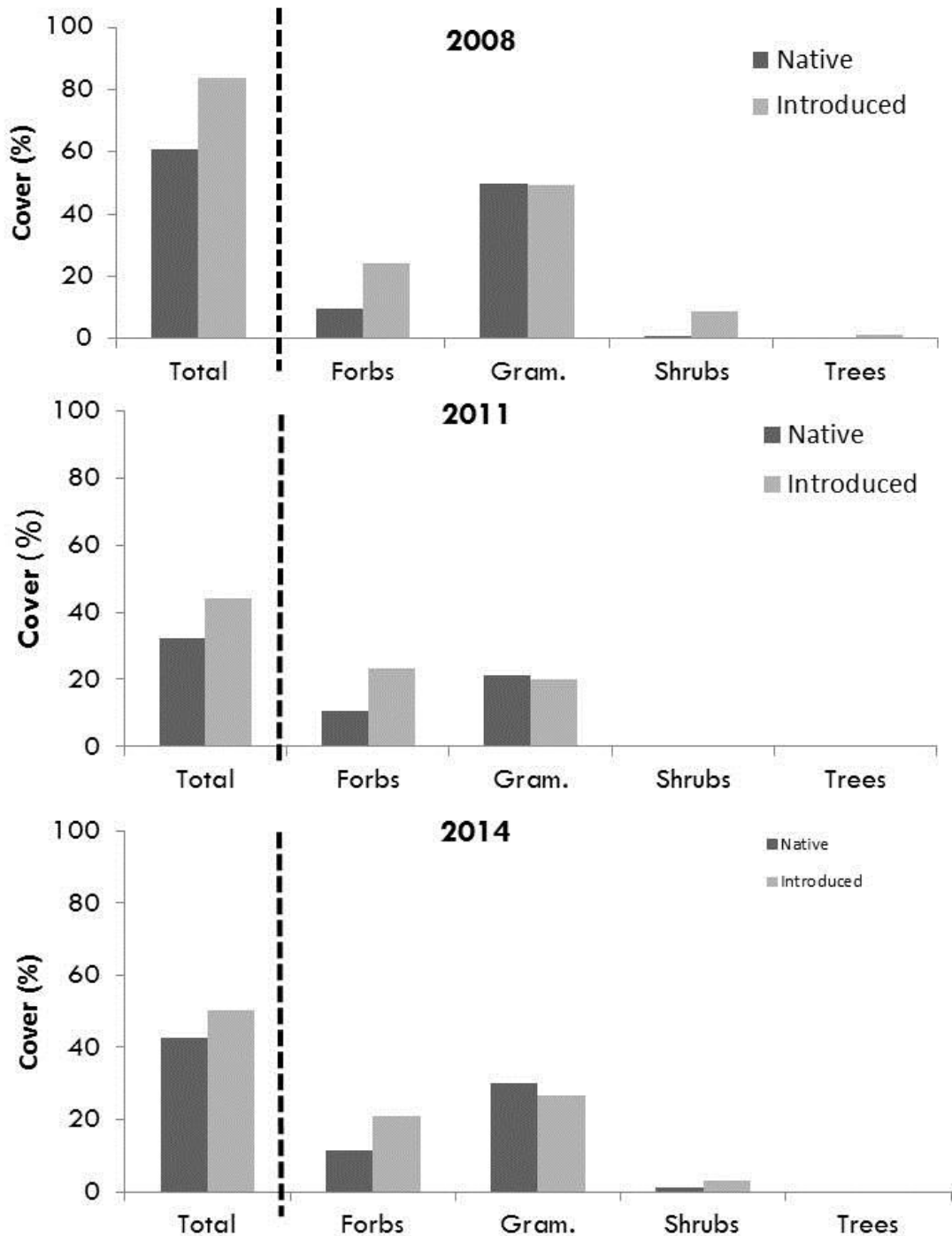


Figure 13. Percent cover of native and introduced species, by growth habit, at Speedway in 2008, 2011, and 2014. Note the y-axis range (0-70).

## Vinci

Vinci 1 experienced a net increase in total cover from 2010 to 2014 (Figure 14), with equal amounts of native and introduced species cover in 2014. There were 19 introduced species and 13 native species when monitoring in 2013, which was similar to numbers in 2013. Native cover was dominated by graminoids, with 6.9% cover by *D. cespitosa* and 14.8% *D. californica*, this was a decrease of *D. cespitosa* by almost half between 2013 and 2014. Among native forbs, *Allium amplexans* had the highest cover (16.7%), followed by *Microseris laciniata* (7.9%) and *Cammisia quamash* var. *maxima* (3%). The fire which occurred between 2013 and 2014 seemed to impact vegetation composition at the site. Post-fire, total native cover increased by 14%, with a 40% change in native forb cover and a 9% decrease in native grasses (Table 4); despite this, total cover of native grasses still tended to be greater than that of introduced grasses (Figure 14). Total cover of introduced species also increased slightly post-fire (4% change), however this increase was mostly in introduced grasses (14% change) and cover of introduced shrubs. In 2014, the introduced species with the greatest cover was *Mentha pulegium* (17.7%) which increased greatly from that in 2013 (6.2%). Other common introduced species included *Vicia tetrasperma* (9.4%), *Hypochaeris radicata* (4.9%), and followed by *Leucanthemum vulgare* (3.9%). Among introduced graminoids, *Anthoxanthum odoratum* had the highest cover (7.9%), which was a slight decrease from 2013 (10.6%). *Holcus lanatus* increased slightly from 4% to 4.9%. We noted very slight cover of *Rubus armeniacus* (1.5%), which was not found in 2013. One of the most obvious impacts of the fire was a decrease in litter from 96.5% in 2013 to 47.8% in 2014 (Table 3). Bare ground was quite abundant, given the fire, at 90.6%.

Table 4. Percent change in functional group cover at Vinci 1 from 2013 (pre-fire) to 2014 (post-fire).

	Total	Forbs	Gram.	Shrubs
Native	14	40	-9	-100
Introduced	4	-3	14	67

# Vinci 1

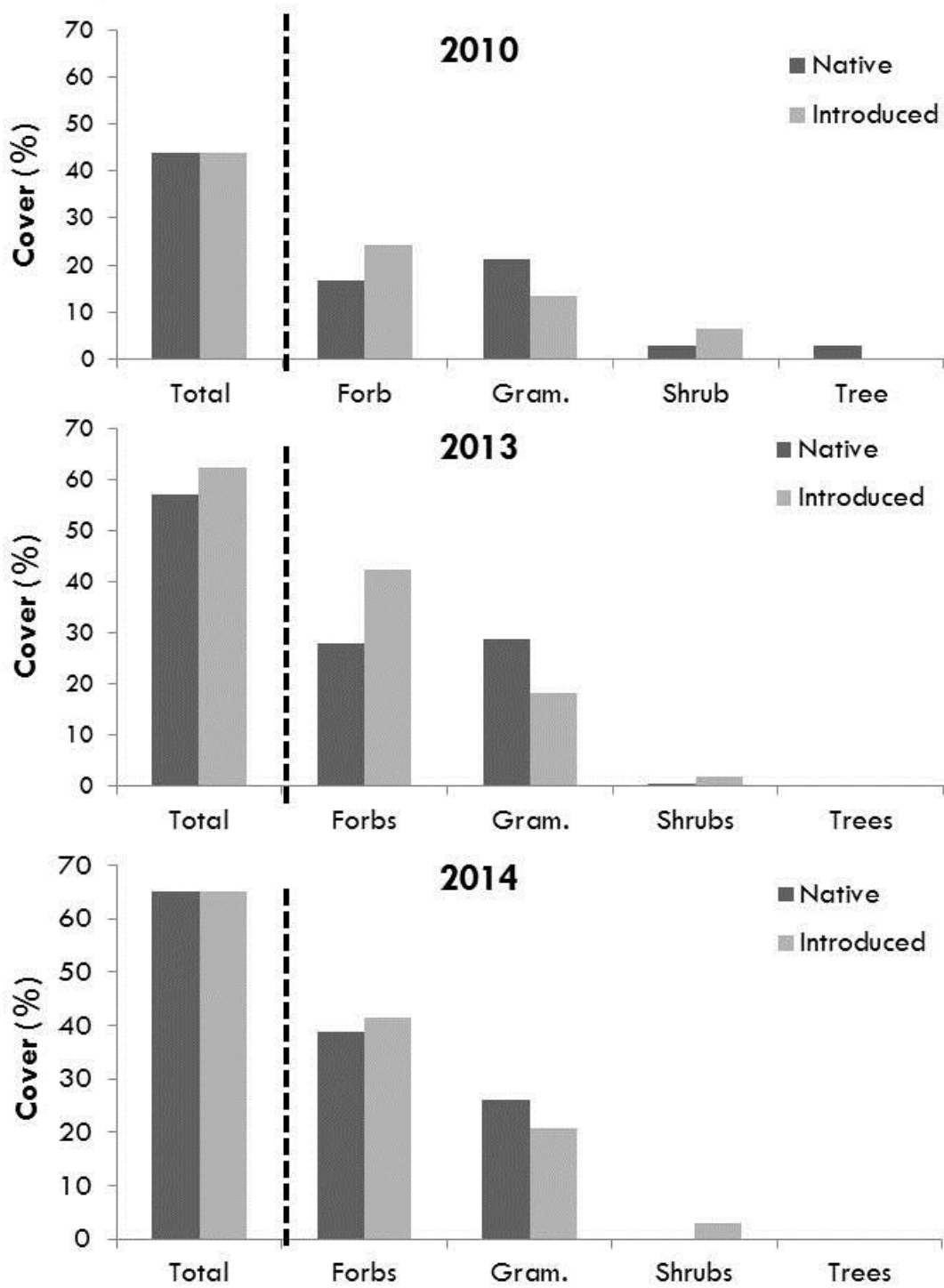


Figure 14. Percent cover of native and introduced species, by growth habit, at Vinci 1 in 2010, 2013, and 2014. Note the y-axis range (0-70).

The plant community at Vinci 2 consisted of 15 native species and 17 introduced species in 2014. Cover by native species was greater than that of introduced species (Figure 15). Similar to Vinci 1, Vinci 2 experienced a fire between 2013 and 2013; cover by native forbs increased the most during this time with a 31% change. Native grasses declined by 12% between 2013 and 2014. Total cover of introduced species increased by 8%, with the greatest increase occurring in the graminoids (41% change) between 2013 and 2014. The native graminoids *Danthonia californica* and *Deschampsia cespitosa* had the highest cover of any species (14.9 and 14.1%, respectively), this was a slight decrease for both species from 2013. Native forbs included *Allium amplexans* sp. (14.5%) and *Microseris laciniata* (5.2%). Among nonnative forbs, *Mentha pulegium* had the highest cover (18.2%) which was an increase from the 5.1% seen in 2013. *Hypochaeris radicata*, which was dominant in 2013 decreased from 16% to 6.7% in 2014. All other native forbs had cover of less than 2%. While *Anthoxanthum odoratum* was the most abundant non-native grass in 2013, its cover declined greatly between 2013 and 2014 (5.3 and 1.5%, respectively). *Festuca arundinacea* had the highest cover in 2014 at 8.2%, followed by *Holcus lanatus* and *Briza minor* (both with 6.7%). While there were no introduced shrubs in 2013, we found traces of *Rubus armeniacus* and *Rosa eglanteria* in 2014. Litter at Vinci 2, similar to Vinci 1, responded notably to the fire in 2013 as it decreased from 95.3 to 60.2% (Table 3). Bare ground at Vinci 2 was slightly lower than at Vinci 1 with 88.5%. Though this data was collected in the same macroplot as in previous years, there were parts of it that had been covered by shade cloth for a planting of *Erigeron decumbens*; this slight difference in monitoring techniques could have impacted some of the cover estimates recorded.

Table 5. Percent change in functional group cover at Vinci 2 from 2013 (pre-fire) to 2014 (post-fire).

	Total	Forbs	Gram.	Shrubs
Native	3	31	-12	-100
Introduced	8	-9	41	0

## Vinci 2

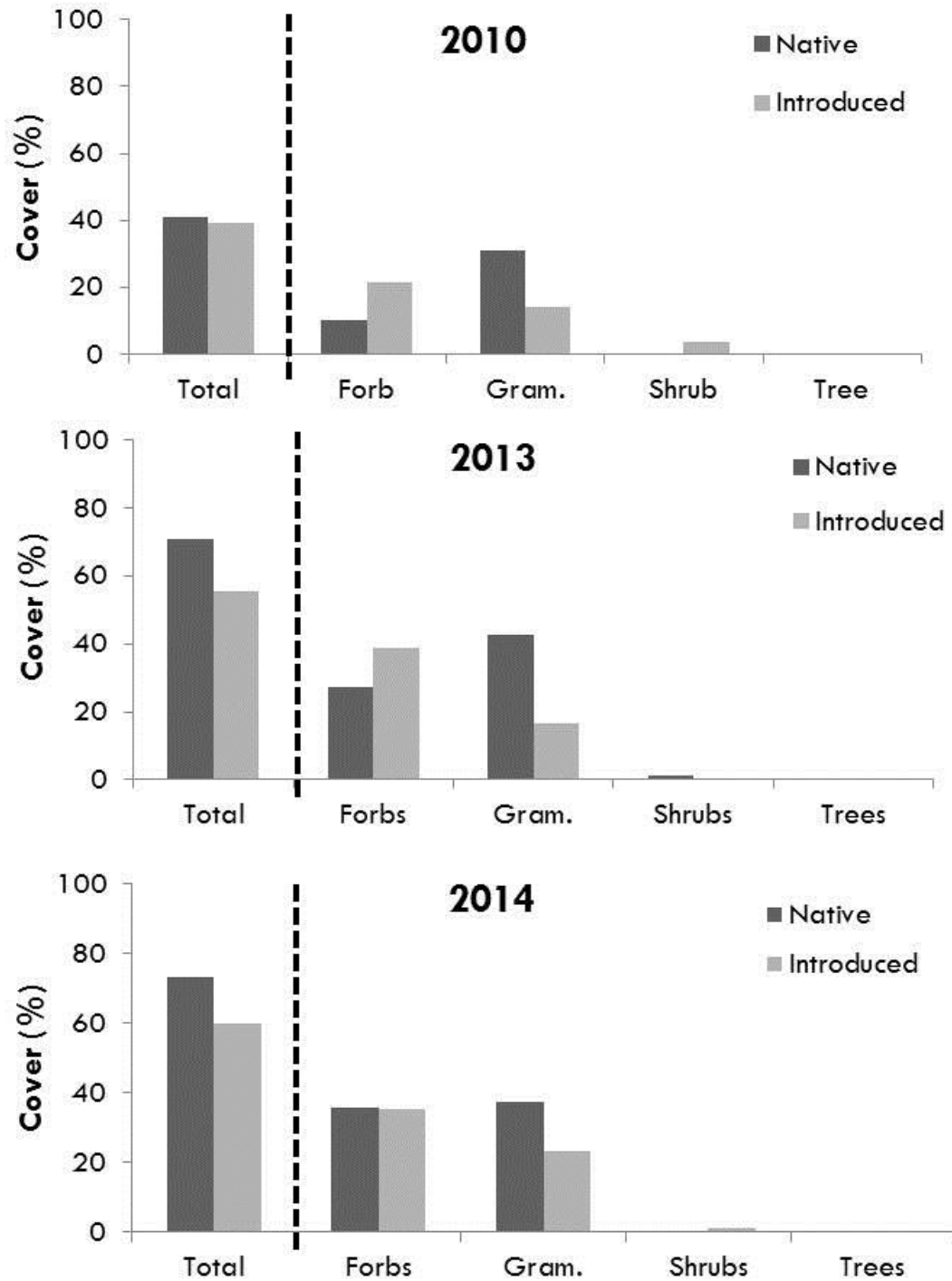


Figure 15. Percent cover of native and introduced species, by growth habit, at Vinci 2 in 2010, 2013, and 2014.

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Both Vinci 1 and Vinci 2 experienced increases in native species post-fire, with the majority of percent change occurring in native forbs. Fire at Vinci also tended to increase introduced graminoids; percent change in introduced graminoid cover was high at Vinci 2, with a 41% change between 2013 and 2014. These data give a glimpse of the ephemeral benefits of fire, along with knowledge of potential negative impacts such as the documented increase in introduced grasses.

Across all sites we noticed changes in total plant cover which are likely due in part to the difference in timing of the monitoring efforts, for many of the sites previous visits were conducted in July rather than in May (Table 1). Increases in native species found in 2013 and 2014 could be due to detection earlier in the season. Conducting monitoring at different times of the year gives a better representation of the species diversity and composition for the sites as a whole, however repeated sampling during the same time of the year enables more concrete comparisons regarding changes that are occurring in plant community composition. This type of monitoring enabled us to see the effects of fire on the plant communities at Vinci 1 & 2 between 2013 and 2014.

### **Fender's blue butterfly stepping stone habitat**

All of the sites monitored in 2014 show potential to serve as habitat for Fender's blue butterfly (*I. icarioides fenderi*). Appropriate habitat for this species includes high quality prairie or oak savannah habitat, the presence of larval host-plants (*L. oreganus*), adult nectar sources, and stepping-stone habitat (undeveloped areas with the physical characteristics appropriate for supporting the short-stature prairie oak savannah plant community within 1.2 miles of natal lupine patches) (USFWS 2010).

In 2010, all of the sites included in this study were surveyed to meet at least one of the criteria for critical habitat for Fender's blue butterfly and were determined to be suitable stepping stone habitat (Thorpe 2010).

In 2014 monitoring, *Lupinus oreganus* was the most dominant forb in our plots at Oxbow West (13% cover), but was not present in the plots at the other sites (Appendix A). We identified many nectar species for Fender's blue butterfly including *Vicia* spp. at Long Tom and Oxbow West. *Camassia quamash* was present at all sites in 2014. *Brodiaea* sp. was present at Long Tom, Speedway, and Vinci 2 in 2014. Another common nectar forb, *Eriophyllum lanatum*, was present at Long Tom, Vinci 1 and Vinci 2. Though these species were present at the sites, they constitute a low percentage of total cover and we recommend efforts to increase both the diversity and cover of nectar species at these sites.

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## SUMMARY

The Recovery objectives from the Western Oregon and Southwestern Oregon Prairie Species Recovery Plan (USFWS 2010) specify that within habitat for *Lupinus oreganus*, *Erigeron decumbens*, and *Lomatium bradshawii*, there is to be  $\geq 50\%$  relative cover of non-woody natives at 70% of local populations,  $\leq 15\%$  cover of woody species, and no single non-native species with  $> 50\%$  cover. Furthermore, the monitoring indicators and corresponding thresholds for management actions from the Environmental Assessment (further outlined in USDI BLM 2005, Alternative D, pages 58-61) are:

<b>Habitat indicator</b>	<b>Threshold for management</b>
Woody vegetation	When canopy cover exceeds the level appropriate for the local habitat (5-10% for wet-prairie/vernal pool and upland prairie habitats)
Invasive species	When combined encroachment reaches 10%-35% or greater of the habitat block and/or a weed population covers $> 50\%$ of a 1 m <sup>2</sup> area, depending on site conditions and species present.
Thatch	When the litter layer exceeds 10-20% cover and litter layer is detrimentally impacting native forb plant diversity or rare plant habitat.
Native Species	When there is a loss of 5%-10% of a site's existing cover and number of native plant species.

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In our surveys, we found that the thresholds for management were exceeded for the following indicators in 2014:

Table 6. Habitat indicators and levels at each site in 2014. Each of these indicators exceeded the thresholds in the 2005 Environmental Assessment.

Habitat indicator	Site	Indicator level
<b>Invasive species</b>	Long Tom	60% introduced species cover
	Oxbow West (upland)	88% introduced species cover
	Speedway	50% introduced species cover
	Vinci 1	65% introduced species cover
	Vinci 2	59% introduced species cover
<b>Thatch</b>	Long Tom	93% litter cover
	Oxbow West (upland)	98% litter cover
	Speedway	95% litter cover
	Vinci 1	48% litter cover
	Vinci 2	60% litter cover
<b>Woody vegetation</b>	Long Tom	35% woody cover

Despite management efforts, the cover of invasive species and litter layer exceeded the threshold values for management at every site (Table 6). The threshold for woody vegetation cover was exceeded at Long Tom only. Litter cover was greater than 90% at all sites; litter at these sites often causes a dense layer of thatch that can be inhibitory for germination of species, both native and introduced. Any management activities to remove litter should be followed by extensive weed control and seeding of native species. While a fire recently occurred at Vinci and while we noted decline from values in 2013, litter was still present and abundant at these sites. High graminoid cover contributes greatly to the build-up of thatch.

Introduced species had greater than 50% cover at all sites (Table 6). Introduced species were particularly abundant at Oxbow West where cover was 88%. Despite this, the area supported a very healthy population of Kincaid's lupine that has nearly doubled in cover since it was last monitored in 2009. Both Long Tom and Vinci 2 had greater cover of native species than introduced species (Figure 11, Figure 15). Continued habitat management to reduce invasive species and decrease litter cover would push these sites closer to a condition with the potential to support more native species.

This report describes changes in plant community composition that have occurred both over time and across seasons. At all sites, monitoring from 2009-2010 occurred in July, while more recent monitoring in 2013 and 2014 occurred in May. This provides valuable information that may be used for future management activities including information on species dynamics over time and the variability between seasons. We noted a net decrease in total plant cover at Speedway, Oxbow West, and Long Tom, while cover increased from earlier years for Vinci 1 and Vinci 2. These decreases could be associated with seasonal phenology of the species and also management activities that have occurred over the years. Likewise, plant community composition could also be greatly affected by management activities including



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prescribed fires and herbicide use. Continued monitoring of these populations will be essential to document changes in the plant community and how these might impact the rare plant populations present.

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## APPENDIX A. PERCENT COVER OF EACH SPECIES IN PLOTS MONITORED, 2014

Nativity	Functional Group	Species	Long Tom	Oxbow West	Speedway	Vinci1	Vinci2
Exotic	Forb	<i>Cirsium vulgare</i>	0.4	0.0	0.0	0.0	0.0
Exotic	Forb	<i>Daucus carota</i>	0.0	5.1	0.6	0.5	1.5
Exotic	Forb	<i>Galium aparine</i>	0.4	0.0	0.0	0.0	0.0
Exotic	Forb	<i>Geranium dissectum</i>	0.0	0.5	0.0	1.0	0.0
Exotic	Forb	<i>Hypericum perforatum</i>	0.8	0.0	0.0	0.0	0.4
Exotic	Forb	<i>Hypochaeris radicata</i>	0.8	0.9	15.6	4.9	6.7
Exotic	Forb	<i>Leucanthemum vulgare</i>	0.0	14.4	1.7	3.9	2.2
Exotic	Forb	<i>Linum bienne</i>	0.0	0.0	0.6	0.0	0.0
Exotic	Forb	<i>Mentha pulegium</i>	0.0	0.0	0.0	17.7	18.2
Exotic	Forb	<i>Moenchia erecta</i>	0.0	0.0	0.0	0.0	1.9
Exotic	Forb	<i>Myosotis discolor</i>	1.6	2.8	0.0	1.5	0.7
Exotic	Forb	<i>Parentucellia viscosa</i>	0.8	0.0	0.0	0.5	0.4
Exotic	Forb	<i>Plantago lanceolata</i>	0.4	0.5	1.7	0.0	0.0
Exotic	Forb	<i>Rumex acetosella</i>	0.4	0.5	0.0	0.5	0.0
Exotic	Forb	<i>Senecio jacobaea</i>	0.8	0.0	0.0	0.0	0.0
Exotic	Forb	<i>Sherardia arvensis</i>	5.7	2.8	0.6	0.5	0.0
Exotic	Forb	<i>Trifolium dubium</i>	4.9	0.0	0.0	1.0	0.0
Exotic	Forb	<i>Trifolium subterraneum</i>	0.4	0.0	0.0	0.0	0.0
Exotic	Forb	<i>Vicia hirsuta</i>	0.0	1.4	0.0	0.0	0.0
Exotic	Forb	<i>Vicia sativa</i>	4.5	1.9	0.0	0.0	0.7
Exotic	Forb	<i>Vicia tetrasperma</i>	0.0	0.0	0.0	9.4	2.6
Exotic	Graminoid	<i>Agrostis stolonifera</i>	0.4	0.0	0.0	1.0	0.4
Exotic	Graminoid	<i>Aira caryophyllea</i>	0.8	0.0	0.0	0.0	0.0
Exotic	Graminoid	<i>Anthoxanthum odoratum</i>	6.1	0.0	23.7	7.9	1.5
Exotic	Graminoid	<i>Briza minor</i>	2.0	0.0	1.2	3.0	6.7
Exotic	Graminoid	<i>Bromus rigidus</i>	0.4	0.0	0.0	0.0	0.0

Nativity	Functional Group	Species	Long Tom	Oxbow West	Speedway	Vinci1	Vinci2
Exotic	Graminoid	<i>Festuca arundinacea</i>	11.8	43.5	0.0	3.9	8.2
Exotic	Graminoid	<i>Holcus lanatus</i>	1.6	1.4	1.7	4.9	6.7
Exotic	Graminoid	<i>Poa compressa</i>	0.4	4.2	0.0	0.0	0.0
Exotic	Shrub	<i>Rosa eglanteria</i>	4.1	7.4	0.6	1.0	0.4
Exotic	Shrub	<i>Rubus armeniacus</i>	10.2	1.4	2.3	1.5	0.7
Exotic	Shrub	<i>Rubus laciniatus</i>	0.0	0.0	0.0	0.5	0.0
Native	Forb	<i>Allium amplexans</i>	8.2	2.8	2.3	16.7	14.5
Native	Forb	<i>Aster</i> sp.	0.8	0.0	0.0	0.0	0.0
Native	Forb	<i>Camassia quamash</i>	4.1	1.9	1.2	3.0	4.1
Native	Forb	<i>Claytonia</i> sp.	0.4	0.0	0.0	0.0	0.0
Native	Forb	<i>Epilobium</i> sp.	0.4	0.0	0.0	0.0	0.0
Native	Forb	<i>Eriophyllum lanatum</i>	3.7	0.0	0.0	1.0	1.1
Native	Forb	<i>Grindelia integrifolia</i>	0.0	0.0	1.2	0.5	0.0
Native	Forb	<i>Heracleum lanatum</i>	0.0	3.2	0.0	0.0	0.0
Native	Forb	<i>Iris tenax</i>	0.4	0.0	0.0	0.0	1.5
Native	Forb	<i>Lathyrus</i> sp.	0.4	0.0	0.0	0.0	0.0
Native	Forb	<i>Lotus formosissimus</i>	0.8	0.0	0.6	0.0	2.2
Native	Forb	<i>Lupinus oregonus</i>	0.0	13.0	0.0	0.0	0.0
Native	Forb	<i>Microseris laciniata</i>	8.6	1.9	2.3	7.9	5.2
Native	Forb	<i>Perideridia oregana</i>	2.0	0.9	0.0	0.0	0.0
Native	Forb	<i>Plagiobothrys</i> sp.	0.4	0.0	0.0	0.0	0.7
Native	Forb	<i>Plectritis congesta</i>	0.8	0.0	0.0	0.0	0.4
Native	Forb	<i>Potentilla gracilis</i>	0.8	6.5	0.0	0.0	0.0
Native	Forb	<i>Prunella vulgaris</i>	2.0	0.0	0.6	2.5	0.0
Native	Forb	<i>Ranunculus orthorhyncus</i>	2.0	0.0	0.0	0.0	0.7
Native	Forb	<i>Saxifraga oregana</i>	0.0	0.0	0.0	2.5	0.0
Native	Forb	<i>Sidalcea</i> sp.	0.0	3.2	0.0	0.0	0.0
Native	Graminoid	<i>Carex aperta</i>	1.2	0.0	0.0	0.0	0.0

Nativity	Functional Group	Species	Long Tom	Oxbow West	Speedway	Vinci1	Vinci2
Native	Graminoid	<i>Carex densa</i>	0.0	0.0	0.0	1.0	0.0
Native	Graminoid	<i>Carex feta</i>	0.0	0.0	0.0	0.5	0.0
Native	Graminoid	<i>Carex leporina</i>	0.4	0.0	0.0	0.0	0.0
Native	Graminoid	<i>Carex pachystaca</i>	0.0	0.5	0.0	0.0	0.0
Native	Graminoid	<i>Carex sp.</i>	2.9	0.0	0.0	0.0	0.0
Native	Graminoid	<i>Carex stichensis</i>	1.6	0.0	0.0	0.0	0.0
Native	Graminoid	<i>Danthonia californica</i>	11.8	10.2	20.2	14.8	14.9
Native	Graminoid	<i>Deschampsia cespitosa</i>	7.8	2.8	6.4	6.9	14.1
Native	Graminoid	<i>Juncus bufonius</i>	0.0	0.0	0.0	0.0	1.5
Native	Graminoid	<i>Juncus tenuis</i>	1.2	0.0	2.9	3.0	7.1
Native	Graminoid	<i>Luzula comosa</i>	0.0	0.0	0.6	0.0	0.0
Native	Shrub	<i>Crataegus sp.</i>	0.0	0.0	0.6	0.0	0.0
Native	Shrub	<i>Fraxinus latifolia</i>	6.5	0.0	0.6	0.0	0.0
Native	Shrub	<i>Spiraea Douglasii</i>	7.8	0.0	0.0	0.0	0.0
Native	Shrub	<i>Symphoricarpos albus</i>	0.4	0.0	0.0	0.0	0.0
Native	Shrub	<i>Toxicodendron diversilobum</i>	0.8	0.0	0.0	0.0	0.0
Native	Tree	<i>Quercus garryanna</i>	3.7	0.0	0.0	0.0	0.0
Native	Forb	<i>Aster hallii</i>	4.9	0.0	2.9	4.9	3.7
Native	Forb	<i>Brodiaea sp.</i>	0.4	0.0	0.6	0.0	1.5
Native	Shrub	<i>Amelanchier alnifolia</i>	1.6	0.0	0.0	0.0	0.0
	Graminoid	<i>Bromus sp. 1</i>	11.4	0.0	0.0	0.0	0.0
		Rock	0.0	0.0	0.6	0.0	0.0
		Bareground	80.8	1.9	76.3	90.6	88.5
		Moss	10.6	78.7	17.9	8.4	1.5
		Litter	93.5	97.7	95.4	47.8	60.2