

UPPER DESCHUTES WATERSHED COUNCIL

MONITORING REPORT

Whychus Creek Restoration Project at Camp Polk Meadow Preserve

2014 Vegetation Monitoring Report

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Introduction

Wetland and riparian vegetation is an important element of the Whychus Creek Restoration Project at Camp Polk Meadow Preserve. Annual vegetation sampling is conducted as one component of a suite of monitoring activities to evaluate the success of the restoration project (Appendix A). Vegetation monitoring provides information about the riparian community, including abundance of planted riparian and wetland species and other vegetation. Stream water quality as well as the quality of fish and wildlife habitat are directly affected by riparian and wetland vegetation. Vegetation and groundcover also create floodplain roughness, which slows the velocity of floodwaters, contributing to groundwater recharge, reducing erosion, and allowing nutrient-rich sediment to settle out onto the floodplain.

Project Goals and Objectives

The Whychus Creek Restoration Project at Camp Polk Meadow Preserve (UDWC 2007) has several key goals and objectives, with the overall aim of restoring Whychus Creek to its historic channel in order to bring back the functions associated with a healthy stream, including riparian and wetland vegetation, bank stability and floodplain connectivity, and native fish and wildlife habitat.

The data collected during 2014 percent cover vegetation sampling allow us to directly measure the success of Project Goal 3, to restore and enhance high quality riparian wetland habitat along the stream corridor. Although percent cover monitoring only allows us to directly measure the establishment of the riparian community, the development of abundant wetland and riparian communities will contribute to stream and floodplain function and the realization of the following additional project goals:

- Goal 1: Provide 1.7 miles of high quality redband trout, Chinook and steelhead spawning and rearing habitat.

- Goal 2: Restore functioning meadow hydrology, including floodplain connectivity, an increase in the groundwater table and enhanced summer base flow.

- Goal 4: Provide natural channel stability, including dimension, pattern and profile that meet reference conditions.

Background

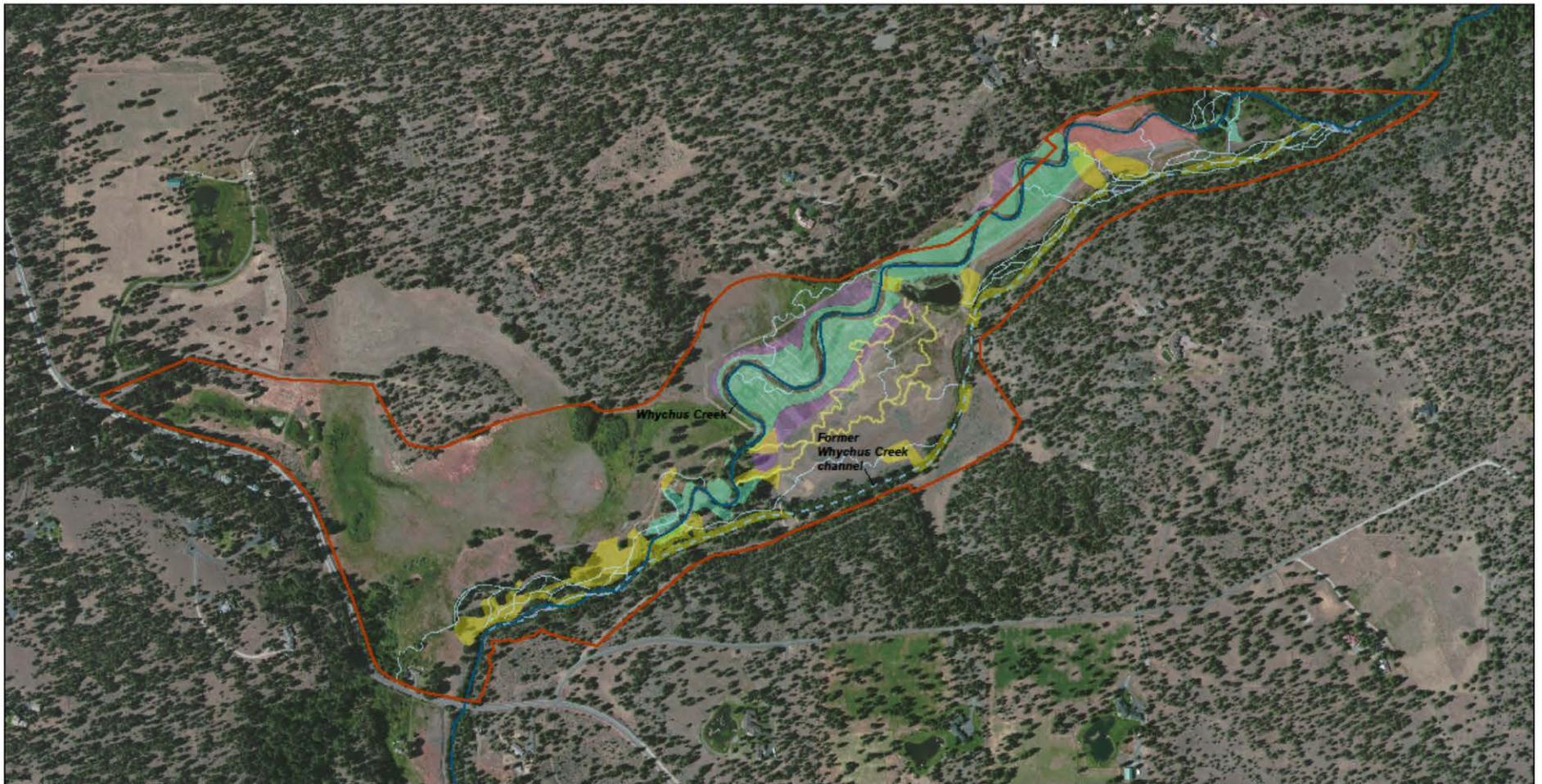
Restoration Design

The revegetation component of the Whychus Creek Restoration Project is a critical element of the restoration design. Revegetation is essential because the restored channel is dependent upon a riparian plant community to provide bank stability. An established riparian and wetland plant community will also provide vegetation, groundcover and coarse woody debris (CWD) that create floodplain roughness.

In addition to the structural components that revegetating Camp Polk Meadow will add, planted native wetland and riparian plants will mimic the native plant species and composition that may have historically occurred in Camp Polk Meadow. An abundant, diverse native plant community will confer the greatest potential to outcompete invasive weed species found in the meadow prior to and since project implementation. Restoring a thriving native wetland and riparian plant community also enhances local wildlife habitat, creates a vital food base for aquatic macroinvertebrates, and provides shade which may contribute to lower stream temperatures.

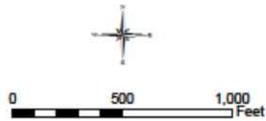
Implementation of the revegetation plan occurred in two phases: Phase I occurred prior to the diversion of Whychus Creek into the new channel, and Phase II occurred after the diversion. Each phase was characterized by different planting timing and plant species (Appendices B & C; Figure 1). Species were selected on the basis of reference site species composition and hydrologic requirements, and planted according to where hydrologic conditions were anticipated to match their respective establishment and growth requirements. Grasses were additionally seeded by hand. Phase I plantings were conducted in Fall 2009, Spring 2010, and Fall 2010, and consisted of trees, shrubs, and herbaceous wetland and riparian species including sedges, rushes, grasses, and forbs (Appendix B). Phase 1 plantings were supplemented with irrigation until the creek was diverted into the new channel in Spring 2012. Phase II plantings were conducted in Spring 2012 in areas recently disturbed by Phase II construction.

Whychus Creek Restoration Project at Camp Polk Meadow Preserve Riparian Plantings 2009-2012



Source:
2011 NAIP aerial imagery

Fig2_zones.mxd
01/16/13



Date planted	Total # of plants
Fall 2009	113,510
Spring 2010	16,480
Fall 2010	48,470
Spring 2012	12,033
190,493 (28.2 ac planted)	

- Camp Polk Meadow Preserve boundary
- ~ Whychus Creek
- ~ Former Whychus Creek channel
- ~ Side channel



Figure 1. Riparian plantings in Camp Polk Meadow by year.

Vegetation Monitoring

In accordance with the project monitoring plan (Appendix A), baseline data collection for the project began in 2007 with the first year of riparian vegetation monitoring occurring in 2010. The Camp Polk Monitoring Plan identifies three types of vegetation monitoring: riparian plant survival, riparian vegetation (percent cover), and vegetation community mapping, discussed below. All three methods were designed to measure the success of Project Goal 3, to restore and enhance high quality riparian wetland habitat along the stream corridor.

Riparian Plant Survival

In 2010 and 2011, riparian plant survival monitoring was conducted to quantify the survivorship and vigor of planted trees, shrubs, and herbaceous species along the banks and floodplain of the new channel. The overall percentage of stressed plants decreased from 30% in 2010 to 8% in 2011, and the overall survivorship of all vegetation increased from 96% in 2010 to 99% in 2011 (Murphy 2011).

During 2011 monitoring, surveyors determined that differentiating between parent plants and “volunteer” plants was becoming impossible as a result of the successful establishment and abundance of planted species, and therefore accurately measuring survivorship of original, planted parent plants was no longer possible. Surveyors also encountered difficulty assessing the number of dead plants due to the inability to identify or locate them. For these reasons, in summer 2012 we replaced riparian plant survival monitoring with percent cover monitoring as the primary method of monitoring riparian vegetation at Camp Polk.

Percent Cover Monitoring

Percent cover monitoring tracks the percentage and composition of vegetation and groundcover on the banks and floodplain of the restored channel to provide a measure of total vegetation cover and planted riparian species richness and abundance. Unlike riparian plant survival sampling, percent cover vegetation monitoring does not require detection of planted or dead individuals. Percent cover monitoring was first implemented in summer 2012 and is scheduled to continue annually through 2016.

Vegetation Community Mapping

Vegetation community mapping throughout the entire meadow will help describe community composition and the acreage dominated by riparian and wetland vegetation. The baseline vegetation community was mapped in 2007; the restored meadow community is scheduled to be mapped again in 2015.

Methods

We sampled fourteen transects in reaches 1-5 between July 30 and July 31, 2014 (Appendix C), using the following protocol:

1. Identify sampling areas according to the following criteria:
 - a) Within riparian corridor planted during Phase I & II (Fall 2009, Spring 2010, Fall 2010, Spring 2012)
 - b) Where plantings extend to at least 100' from channel and can accommodate a 100-foot transect
2. Within sampling areas identified, determine the number of transects per reach according to the proportion of the total project length contained within a given reach.
3. To locate transect within a sampling area, select a random number of paces using a stopwatch or compass dial. Locate transect at the random number of paces from the upstream end of the sampling area.
4. Record the date, surveyor name, reach number, transect orientation, and transect number and length on the data sheet.
5. Mark starting point (point zero) of transect as close to wetted edge of bank as possible.
6. Orient the transect perpendicular to the stream and record transect bearing.
7. Using a 100-foot transect tape, measure and mark a 100-foot transect from point zero.
8. Record transect location using a GPS unit and by hand on aerial map of Camp Polk Meadow.
9. Using a digital camera, take three photos of each transect from point zero: at 45° downstream of transect, down transect line, and at 45° upstream of transect.
10. Record photo numbers from digital camera onto corresponding data sheet.
11. Using a pin flag, sample on the upstream side of the tape at every foot, starting at 1 ft, along the 100 ft transect for a total of 100 points per transect.
12. Record each plant the pin hits on its way to the ground, as follows:
 - Planted trees and shrubs by species;
 - Planted sedges, rushes, and bulrushes by genus;

- Equisetum and planted forbs by species;
- Forb species that were not planted and unknown forbs and all grasses except cheatgrass to functional group (forb or grass);
- Priority weed species to species.
- Record all willows (*Salix* spp.) as shrub species.
- Record all standing cheatgrass (*Bromus tectorum*) including senesced cheatgrass as “cheatgrass”.
- Include all broad-leafed herbaceous plants with forbs.
- Record downed woody plant material greater than the diameter of the pin flag that does not allow the pin flag to come into contact with the ground as coarse woody debris (CWD).
- Record dead organic material lying on the soil surface and touching the pin flag at the point where the pin flag touches the ground as litter.

13. Repeat process for each 12” interval, 1-100.

14. Repeat process for each of 14 transects for a total of 1400 points.

Because 100 points were sampled along each 100-ft transect, each plant or groundcover record represents 1% cover for that transect. For each category or species, we calculated cover as the percentage out of 100 points that a given category or species occupied (x number of records/100 points). We calculated mean cover for total vegetation, total planted species, planted species by strata, total other vegetation, other vegetation by functional group, priority weed species, coarse woody debris, litter, moss, and bare ground. Planted and seeded grasses were recorded to functional group during sampling and accordingly are included in means reported for grasses and for total other vegetation, not with planted species. Total vegetation provides a measure of the mean percentage of the area within 100’ of the wetted channel that was occupied by vegetation, while total planted species describes the abundance of planted species. Percent cover of planted species by strata and other vegetation by functional group describe the composition of the plant community.

Because Reach 1 was planted in the spring of 2012, nearly two years later than the next most recent planting, we expected the riparian community in this reach to be less well-established than in Reaches 2 through 5. For this reason we analyzed Reach 1 data separately from data for Reaches 2 through 5.

Results

Total Cover

In 2014, vegetation was present at 73% (1,022 points) of the 1,400 points sampled at Camp Polk Meadow (Figure 2). In 2013, total vegetative cover was calculated to be 84%, which translates to an 11% decrease from 2013 to 2014 (Hammer 2013) (Figure3). This difference, however, may be attributed to sampling error resulting from a small sample size rather than an actual loss of vegetative cover. Reaches 2 through 5 were characterized by an average of 75% vegetative cover, and comparatively Reach 1 contained 61% vegetative cover. Coarse woody debris represented 3.9% cover, litter accounted for 68% cover, and bare ground was found at 37% of points sampled. In 2012 and 2013, coarse woody debris was calculated to account for 2.0% and 4.1% cover, respectively; litter accounted for 59% and 87%; and moss represented 1.1% and 1.9% cover (Monday 2012) (Hammer 2013). Bare ground was present at 11% of points sampled in 2012 and 6.6% of points in 2013, both less than half of that calculated in 2014 (Monday 2012) (Hammer 2013). Differences in the amount of litter and bare ground were substantial between Reach 1 and Reaches 2 through 5. Reach 1 showed 25% litter cover and 70% bare ground, whereas data from Reaches 2 through 5 indicated 75% litter cover and only 31% bare ground. Average cover of coarse woody debris and moss was much more consistent across reaches.

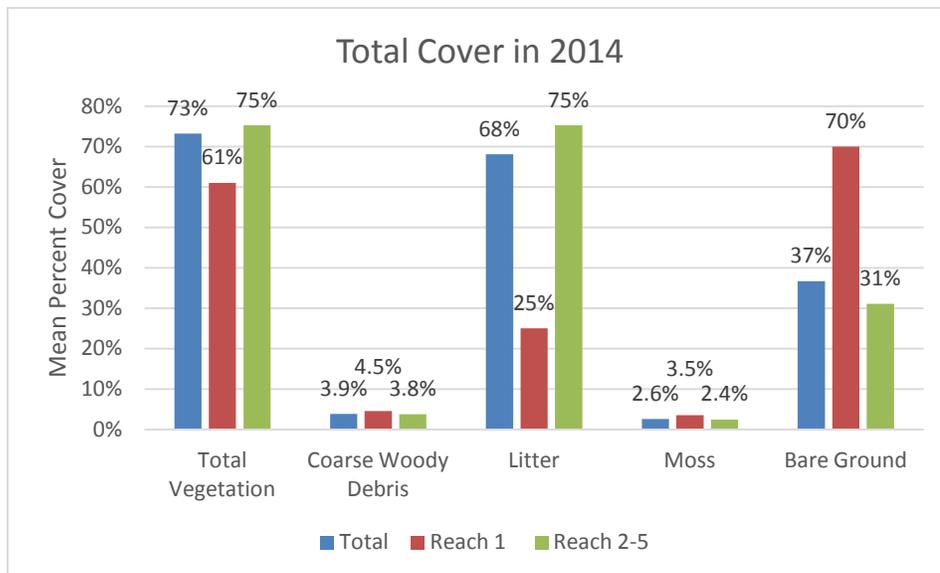


Figure 2. Total cover at Camp Polk Meadow by cover category and reach.

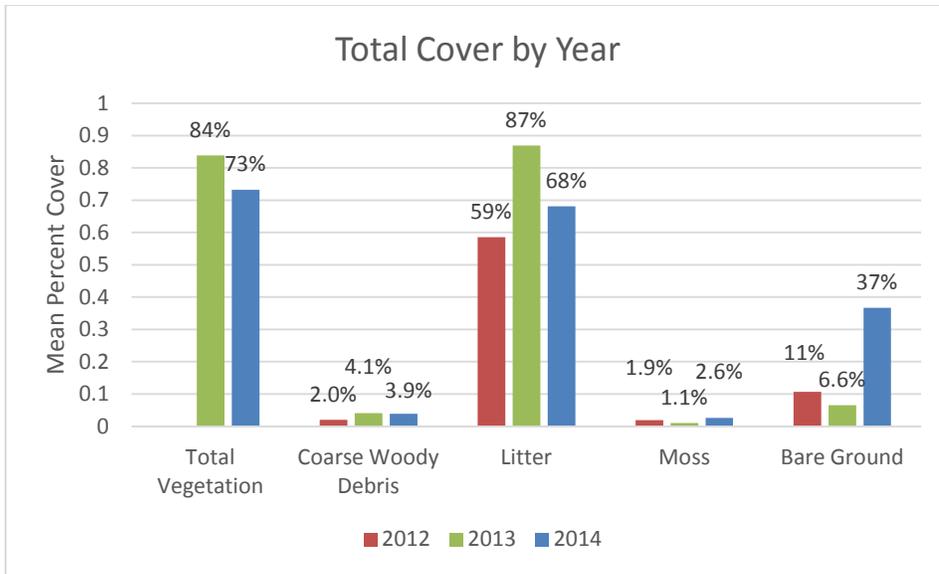


Figure 3. Total cover at Camp Polk Meadow in 2012, 2013 and 2014.

Planted Species

Planted vegetation accounted for 29% of total vegetative cover sampled in 2014, a slight increase from previous years (Figure 4) (Figure 5). Planted vegetation represented 27% cover in 2012, and remained at 27% in 2013 (Monday 2012) (Hammer 2013). Within planted vegetation, 6.1% cover was represented by trees, 13% cover by shrubs, and 13% cover by herbaceous plants. Alder and cottonwood accounted for the majority of tree cover, with 3.4% and 2.2% cover, respectively; chokecherry accounted for 0.3%, birch for 0.2%, and aspen for 0.1% cover. Mean tree cover has increased by a total of 4.1%, from 2.0% in 2012 and 2.7% in 2013 (Monday 2012) (Hammer 2013). Among shrubs, willow represented 9.2% cover and spirea represented 3.4% cover. Shrubs have also increased in abundance since 2012. Starting at 10% in 2012, shrub cover increased to 13% in 2013 and remained at 13% in 2014 (Monday 2012) (Hammer 2013). Of the herbaceous plants, sedges represented 6.7% cover, rushes showed 6.0% cover, planted forbs accounted for 0.4% cover, and bulrushes had 0.1% cover. Percent cover of herbaceous species has declined slightly. Herbaceous cover was calculated at 16% in 2012, and has since represented 13% cover in 2013 and 2014 (Monday 2012) (Hammer 2013). Abundance of planted vegetation also varied between Reach 1 and Reaches 2 through 5, especially within tree and shrub categories. In Reach 1, planted vegetation represented 14% cover with 1.5% tree cover, 1.0% shrub cover, and 12% herbaceous cover. Conversely, Reaches 2 through 5 showed 31% planted vegetative cover with 6.8% tree cover, 15% shrub cover, and 13% herbaceous cover.

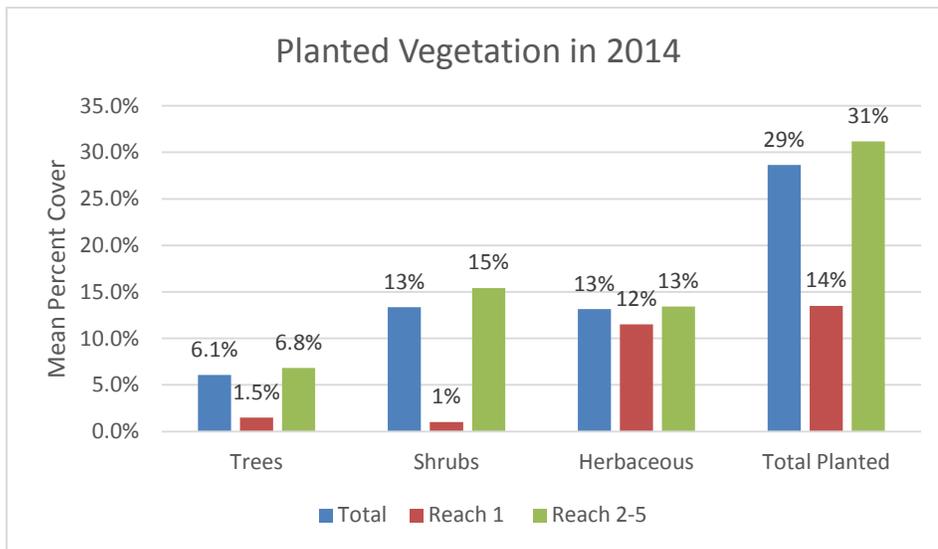


Figure 4. Percent cover of planted vegetation at Camp Polk Meadow, in 2014, by strata and reach break.

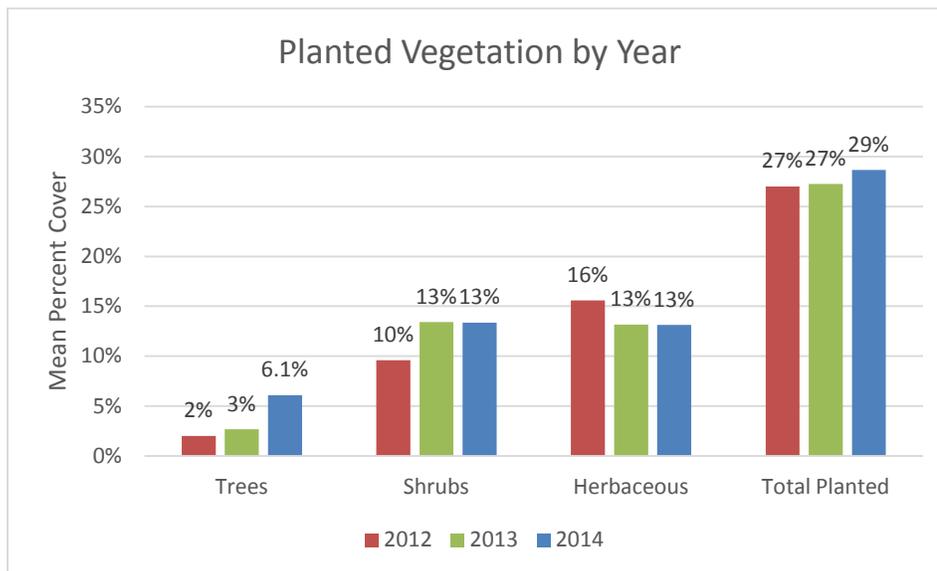


Figure 5. Planted vegetation by strata for years 2012, 2013, and 2014.

Other Vegetation

Other vegetation included all species and groups not included with the trees, shrubs, and herbaceous vegetation planted during Phases I and II (Appendix B), as well as planted and seeded grasses. In 2014, total other vegetation accounted for 60% mean cover (Figure 6) Equisetum represented 2.6% cover, grass represented 48% cover, and forbs represented 16%

cover. Weeds accounted for a small percentage of total cover at 1.8%, of which cheatgrass comprised 1.5%, in addition to 0.1% common mullein (*Verbascum thapsis*), and 0.1% thistle (*Cirsium* spp.). Percent cover of other vegetation has declined by 26% since 2012, but again may be attributed to an artifact of sampling error rather than an actual loss of vegetative cover. Data from 2012 and 2013 shows other vegetation totaling 86% and 76% cover, respectively, with equisetum accounting for 0.8% and 1.7%, grass for 51% and 57%, and forbs for 27% and 36% cover (Monday 2012) (Hammer 2013) (Figure7). Reach 1 showed other vegetation to be present at a lower mean cover than in Reaches 2 through 5, at 49% as compared to 62% in Reaches 2 through 5. Reach 1 had 6.5% equisetum cover, 32% grass cover, and 15% forb cover. Reaches 2 through 5 had 1.9% equisetum cover, 50% grass cover, and 17% forb cover.

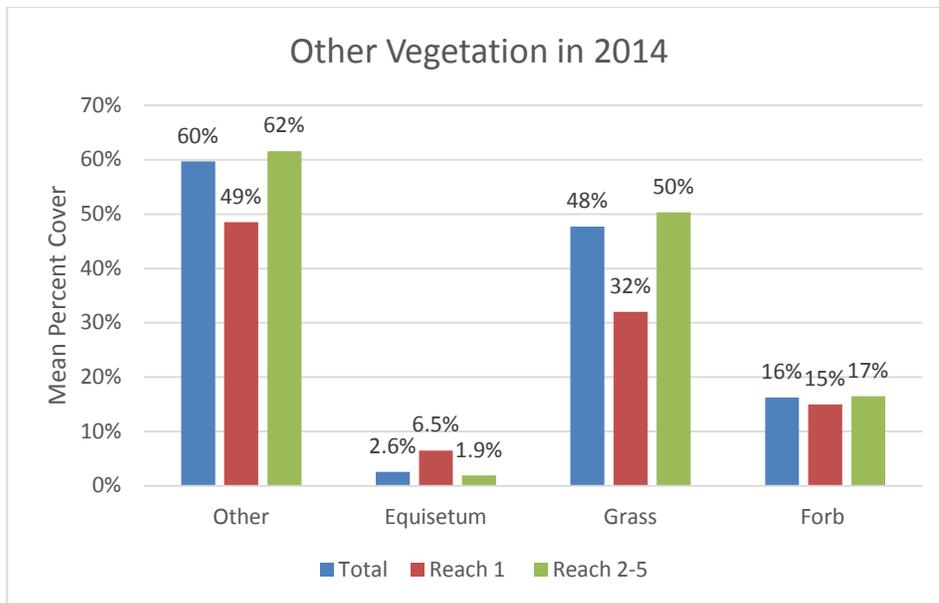


Figure 6. Percent cover of other vegetation at Camp Polk Meadow, in 2014, by functional category and reach break.

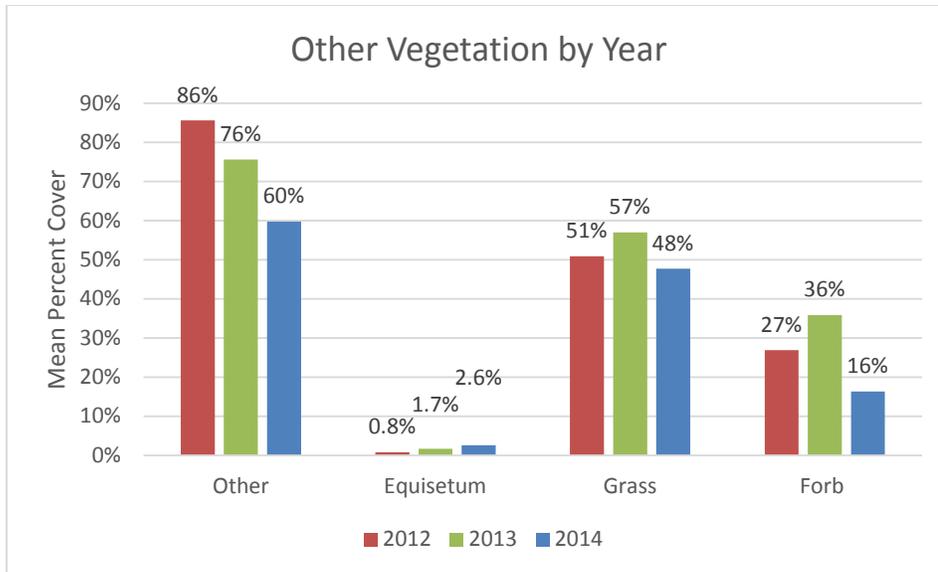


Figure 7. Percent cover of other vegetation at Camp Polk Meadow, in 2012, 2013, and 2014.

Discussion

Our 2014 results show that vegetation in the riparian corridor at Camp Polk Meadow remains well established and abundant, with a strong native riparian species component. Although we observed a decrease in mean total vegetation from 2013 to 2014, from 84% in 2013 to 73% in 2014, we suspect the mean lower abundance reported for 2014 is an artifact of sampling error associated with low sample size and the patchiness of the plant community, rather than reflective of a real reduction in vegetation.

Planted species represent a substantial component of total vegetation, indicating hydrologic conditions within 100 feet of the stream channel are suitable to support riparian vegetation. Planted vegetation now exists at an abundance of over one-third of total vegetative cover (29% planted vegetative cover/73% total vegetative cover); in Reaches 2-5, where riparian vegetation has had four to five growing seasons to become established, this proportion is even higher, at over 40% of total vegetative cover. This demonstrates progress toward Goal 3, to restore and enhance high quality riparian wetland habitat along the stream corridor, and Objective 4, to establish a minimum of 35 acres of wetland and riparian plant communities. The level of establishment of riparian vegetation also contributes to Goal 2, to restore functioning meadow hydrology, including floodplain connectivity.

Other vegetative cover was present at 82% of the total vegetative cover (60% other vegetation/73% total vegetation). Although some of the species contributing to cover of

grasses and forbs may be non-native, they contribute to the success of Project Goals 2 and 3 by helping to retain soil moisture, stabilize soil, create roughness, and prevent erosion as well as reduce the velocity of floodwaters.

Priority weed species detected on transects remained low, accounting for less than 2% of total vegetation. These species have been closely managed by the Deschutes Land Trust, and their relatively low presence within 100' of the creek channel reflects effective management. However, they may be persisting at higher percentages at greater distances from the wetted channel, in drier areas of the restored meadow.

Groundcover at the soil surface in the form of coarse woody debris, litter and moss was abundant and there was comparably little bare ground. In 2014 we revised the definition of litter to only include organic material lying on the soil surface. Along with vegetation, groundcover serves the important functions of creating roughness, reducing erosion, and slowing floodwaters. Although bare soil, unprotected by litter or vegetation, can indicate susceptibility to erosion, bare soil resulting from alluvial sediment deposits demonstrates a well-functioning stream connected to and spilling onto the floodplain during bankfull events. The sampling protocol we used in 2012, 2013 and 2014 did not differentiate between sediment deposited as a result of a functioning, connected floodplain and bare soil resulting from erosion or the failed establishment of vegetation. We anecdotally observed that much of the bare soil in Reach 1 in particular appeared to be alluvial sediment deposits. Although the quantity of bare soil recorded in 2014 does not raise concern at this time, it may prove useful to distinguish between sediment deposits and other bare soil in future sampling.

Since riparian vegetation sampling began in 2010, the vegetation community and our ability to measure it has changed to the extent that we've needed to change our sampling methodology twice. This experience suggests that vegetation monitoring protocols for stream channel, floodplain and riparian restoration may best be designed for the vegetation community found at reference sites, so that as the restored riparian community matures and develops a structure similar to that of reference communities, the sampling protocol will already have accounted for these changes. This will also improve the accuracy and correspondence of comparison of data between years. As a case in point, in 2014, many planted trees and shrubs were too tall to look down at and quite a bit taller than the pins we used for sampling, likely compromising to some degree the accuracy of cover estimates. Use of a canopy cover sampling method in 2015 where vegetation is overhead, in addition to use of the point intercept method, may generate better information about the abundance of planted vegetation by strata at Camp Polk.

Consistent with our predictions, analysis of Reach 1 data indicated a less-established community compared to Reaches 2 through 5. Reach 1 showed lower total and planted

vegetative cover, as well as less litter, and more bare ground than Reaches 2 through 5, which have had three additional growing seasons to become established. Although cover of trees and shrubs was much lower in Reach 1 than in Reaches 2 through 5, cover of herbaceous plants was nearly equal between reaches, with Reach 1 showing only 1% less herbaceous cover than Reaches 2 through 5. This finding offers some insight into the order and rate of establishment of various vegetation types and strata following restoration plantings. Based on initial findings, it appears that herbaceous species reestablish the quickest after planting. As tree and shrub species become established and gain height, the cover of herbaceous species seem to stabilize. This potential trend can also be seen when comparing percent cover of various strata between years 2012 through 2014.

Conclusion

Percent cover data from 2014 show that the riparian community along the restored stream channel at Camp Polk Meadow is continuing to become established to an extent consistent with the project goals of restoring functioning meadow hydrology and floodplain connectivity (Goal 2), restoring and enhancing high quality riparian wetland habitat along the stream corridor (Goal 3), and establishing a minimum of 35 acres of wetland and riparian plant communities (Objective 4). Vegetation and groundcover remain abundant, while weed species within 100 feet of the wetted channel continue to exist only in low numbers. Planted vegetation now accounts for over one third of total vegetative cover. We anticipate that planted trees and shrubs will become increasingly dominant, with cover and composition becoming more characteristic and representative of the desired reference conditions.

References

Hammer, Daniel. Whychus Creek Restoration Project at Camp Polk Meadow: 2013 Vegetation Monitoring Report. 2013. 29 p.

Monday, Angie. Whychus Creek Restoration Project at Camp Polk Meadow: 2012 Vegetation Monitoring Report. 2012. 30 p.

Murphy, Shanti. Whychus Creek Restoration Project at Camp Polk Meadow: Vegetation Monitoring Report. 2011. 15 p.

Upper Deschutes Watershed Council (UDWC). Whychus Creek Restoration Project at Camp Polk Meadow Preserve. 2007. 88 p.

Appendix: A
Title: Whychus Creek Restoration Project at Camp Polk Meadow
Monitoring Plan Summary
Prepared By: Lauren Mork
Date: September 2012

**Whychus Creek Restoration Project at Camp Polk
Monitoring Plan Summary
September-12**

Monitoring Parameter	Goals ¹	Protocol/Citation	Reporting	Location	Season	Frequency	Duration	Lead	Annual Budget	Baseline	Notes
Priority 1²											
I. Hydrology											
Groundwater	2, 3, 5	Groundwater well measurements. S:\UDWC\Projects\Metolius & Whychus\Camp Polk\Monitoring\Groundwater\Data\Monitoring Well Protocol	Annual groundwater monitoring report written by UDWC intern	2 x-sections of 5 and 2 wells	Thaw and growing season, March - October	Monthly March - October	2007 - 2017. Installed in 2007.	UDWC	Installation (2007), maintenance, data management	2008	Assistance from UDWC intern, UDWC or DLT volunteer.
Temperature Heterogeneity	1,5	2010 Temperature Heterogeneity at Rimrock Ranch and Camp Polk Meadow; Benawah Creek Model Watershed Effectiveness Monitoring 2009	UDWC Intern or Monitoring Coordinator	Pools and downstream riffles within existing channel reach (pre project) and new channel (post project)	July (hottest days of the year)	Once, post phase II construction.	2013	UDWC	Labor for field work and write up.	2010	Baseline study conducted at Rimrock Ranch and Camp Polk by an OSU student.
II. Water Quality											
Continuous Temperature	1, 2, 5	Data collected with Vemco temperature dataloggers. UDWC QAPP 2008, SOP 2008.	Excerpted from annual Whychus Creek Monitoring Technical Report by Monitoring Coordinator.	Above new channel (RM 19.50); Below new channel (RM 18.25).	April - October	Annually	2007 - 2017. Begun in 2007.	UDWC	Deployment, audits, maintenance, data management	Upstream data from 1998, 2000-2012; Downstream data 2001, 2003-2012 (UDWC)	Camp Polk sites are a subset of the Whychus Creek Model Watershed Monitoring
III. Geomorphology											
Channel dimension, pattern and profile	3,4, 5	Full Channel survey / total station survey with cross-sections and 2009 Lidar data	Paul Powers, Fisheries Biologist, and Cari Press, Hydrologist, Deschutes National Forest	16 cross sections; entire project reach	Summer or fall	2009: Reaches 2-5; 2013: As-built for Reaches 1-6, cross sections for Reach 1 and 6.	Evaluate need for additional surveys after 2013 pending further changes to system	UDWC	Labor for field work and write-up	Lidar data was collected in 2009 post Phase I construction	Add years as needed and if funding allows. As built survey will be done in 2013.

#1: Project Goals:

1. Provide 1.7 miles of high quality redband trout, chinook and steelhead spawning and rearing habitat.
2. Restore functioning meadow hydrology, including floodplain connectivity, an increase in the groundwater table and enhanced summer base flow.
3. Restore and enhance high quality riparian wetland habitat along the stream corridor.
4. Provide natural channel stability, including dimension, pattern and profile that meets reference conditions.
5. Decrease stream temperatures to help meet Oregon's State Temperature Standards.

#2: Monitoring Priorities. Priority 1 monitoring is that which helps define project success and for which funding will be prioritized. Priority 2 monitoring is above and beyond that suggested to evaluate the success of the project, but which would provide valuable data if resources are available.

Monitoring Parameter	Goals ¹	Protocol/Citation	Reporting	Location	Season	Frequency	Duration	Lead	Annual Budget	Baseline	Notes
IV. Biological Parameters											
Riparian Vegetation - Transects	1, 2, 3, 4	Percent cover monitoring. 2012 Camp Polk Vegetation Monitoring Report	Annual vegetation monitoring report written by UDWC intern	Twelve stratified randomly located transects in riparian beltwidth	First week of August	Annually	2012 - 2017	UDWC	Labor for field work and write-up (Monitoring Coordinator, Intern). Consulting contract with Karen Allen.	2012	UDWC intern, Monitoring Coordinator
Riparian Vegetation - Grids	1, 2, 3, 4	Percent cover monitoring. 2010 UofO CPM Vegetation Monitoring Report.	U of O Field Course Reports	Five transects and grids along monitoring well cross sections	Summer	Annually 2007-2010; evaluate frequency in 2013.	Resume in 2013 or later depending on vegetation conditions.	Karen Allen, UofO.	Consulting contract with Karen Allen; In-kind from UofO students.	2007 (Grid #1), 2008 (Grids #2,3), 2009 (Grids #4,5), 2010 (Grids #1,2,3)	
Riparian Plant Survival	1, 2, 3, 4	Belt transects perpendicular to channel. 2010 Camp Polk Vegetation Monitoring Report.	2010 and 2011 Camp Polk Vegetation Monitoring Reports written by UDWC intern	Twelve stratified randomly located transects in riparian beltwidth	Summer	Annually	2010 - 2011	UDWC	Labor for field work and write-up; Contract with Karen Allen (2010 and 2011)	2010	Discontinued in 2012 due to inability to distinguish planted individuals and detect dead plants.
Invasive Weeds - Revisit December 2012	3	Direct observation focusing on targeted species. 2006 Weed Monitoring and Evaluation	Annual DLT report summarizing Weed Management Plan, Weekly Weed Monitoring Reports and Monthly Accomplishments	Restoration project area delineated by implementation boundary on implementation schematics (2009)	Spring, Summer, Fall	Annually	Funding through 2013. Should continue as long as possible	DLT	Labor for weed removal including manual and herbicide applications, materials and reporting.	DLT 2006	Annual Weed Management Plans
Macroinvertebrate sampling	1, 5	Level 2 Benthic Macroinvertebrate survey. 2009 Whychus Creek Monitoring Technical Report.	Excerpted from annual Whychus Creek Monitoring Technical Report by Monitoring Coordinator.	Two original sites (UDWC 2009); two sites in new channel established in 2011 (UDWC 2011)	Third week of August	2005, 2009, 2011, 2012; Annually depending on status and trends	2011-2017	UDWC	Labor for write-up and/or in-kind.	UDWC 2005	Camp Polk sites are a subset of the Whychus Creek Model Watershed Monitoring
Fish Habitat	1	Refer to Camp Polk Restoration Plan Appendix B and E	Excerpted from annual Whychus Creek Monitoring Technical Report by Monitoring Coordinator.	Within project reach, as determined by PGE, ODFW and UDWC	Summer	1997; 2008-2009; 2013	Evaluate need for additional surveys after 2013 pending further changes to system	PGE, ODFW, UDWC	Labor for field work and write-up	ODFW 2008-2009	Camp Polk sites are a subset of the Whychus Creek Model Watershed Monitoring
Fish Populations	1	Refer to Camp Polk Restoration Plan Appendix B and E	Excerpted from annual Whychus Creek Monitoring Technical Report by Monitoring Coordinator.	Within project reach, as determined by PGE, ODFW and UDWC	Spring, Summer	Annually as part of PGE reintroduction monitoring; 2013 ODFW sampling	Continue through 2017	PGE, ODFW, UDWC	Labor for field work and write-up	PGE 2007	Camp Polk sites are a subset of the Whychus Creek Model Watershed Monitoring

#1: Project Goals:

1. Provide 1.7 miles of high quality redband trout, chinook and steelhead spawning and rearing habitat.
2. Restore functioning meadow hydrology, including floodplain connectivity, an increase in the groundwater table and enhanced summer base flow.
3. Restore and enhance high quality riparian wetland habitat along the stream corridor.
4. Provide natural channel stability, including dimension, pattern and profile that meets reference conditions.
5. Decrease stream temperatures to help meet Oregon's State Temperature Standards.

#2: Monitoring Priorities. Priority 1 monitoring is that which helps define project success and for which funding will be prioritized. Priority 2 monitoring is above and beyond that suggested to evaluate the success of the project, but which would provide valuable data if resources are available.

Monitoring Parameter	Goals ¹	Protocol/Citation	Reporting	Location	Season	Frequency	Duration	Lead	Annual Budget	Baseline	Notes
V. Photographic Monitoring											
Photopoints	1, 2, 3, 4	Established photopoints using DLT protocol.	Annual photo management by DLT; Photopoint binders (2008 pre-implementation photos, 2009 and 2010 Phase I implementation photos)	Various points throughout Camp Polk Meadow Preserve that are good vantage points of the restoration project area.	Summer	Set up in 2008 (year 1); repeated in 2009 immediately following construction (Year 2); 2010-2015 (Years 3-8)	Continue through 2017	DLT	Labor for field work and write-up	2008 and/or 2009	Photo points were established in 2008 and modified after phase 1 construction. After phase II, we will reassess if all photopoints should be monitored in the future.
Aerial photos	1, 2, 3, 4	Check with Deb Quinlan annually regarding availability from stock (Bend Mapping and Blueprint) or low elevation from USFS	Retain in UDWC GIS library	Whole site	Summer	Annually as available	Continue as long as possible	UDWC		2008 NAIP	
										2004?	
Priority 2²											
VI. Supplemental Monitoring											
Bird surveys – presence and breeding data	3	Spring/fall migration counts, Christmas Bird counts, Breeding bird atlas surveys	DLT, intern, or volunteer	Throughout meadow and existing & new riparian corridor	Spring, summer, fall, winter	2000 (pre-implementation); Annually 2008-2017	2008-2017	DLT	In-Kind	DLT 2000	
Vegetation Community Mapping	2, 3	USACE Wetland Delineation or GPS mapping of wetland areas and communities.	Whychus Creek Restoration Project: Vegetation Monitoring Report 2010	Throughout meadow, as in 2007	Spring, early summer	Once, post phase II construction.	Evaluate - 2017?	UDWC	Labor for field work and write-up. Contract with Karen Allen.	Wetland Delineation (2007)	Complete mapping as long as possible after Phase II construction.

#1: Project Goals:

1. Provide 1.7 miles of high quality redband trout, chinook and steelhead spawning and rearing habitat.
2. Restore functioning meadow hydrology, including floodplain connectivity, an increase in the groundwater table and enhanced summer base flow.
3. Restore and enhance high quality riparian wetland habitat along the stream corridor.
4. Provide natural channel stability, including dimension, pattern and profile that meets reference conditions.
5. Decrease stream temperatures to help meet Oregon's State Temperature Standards.

#2: Monitoring Priorities. Priority 1 monitoring is that which helps define project success and for which funding will be prioritized. Priority 2 monitoring is above and beyond that suggested to evaluate the success of the project, but which would provide valuable data if resources are available.

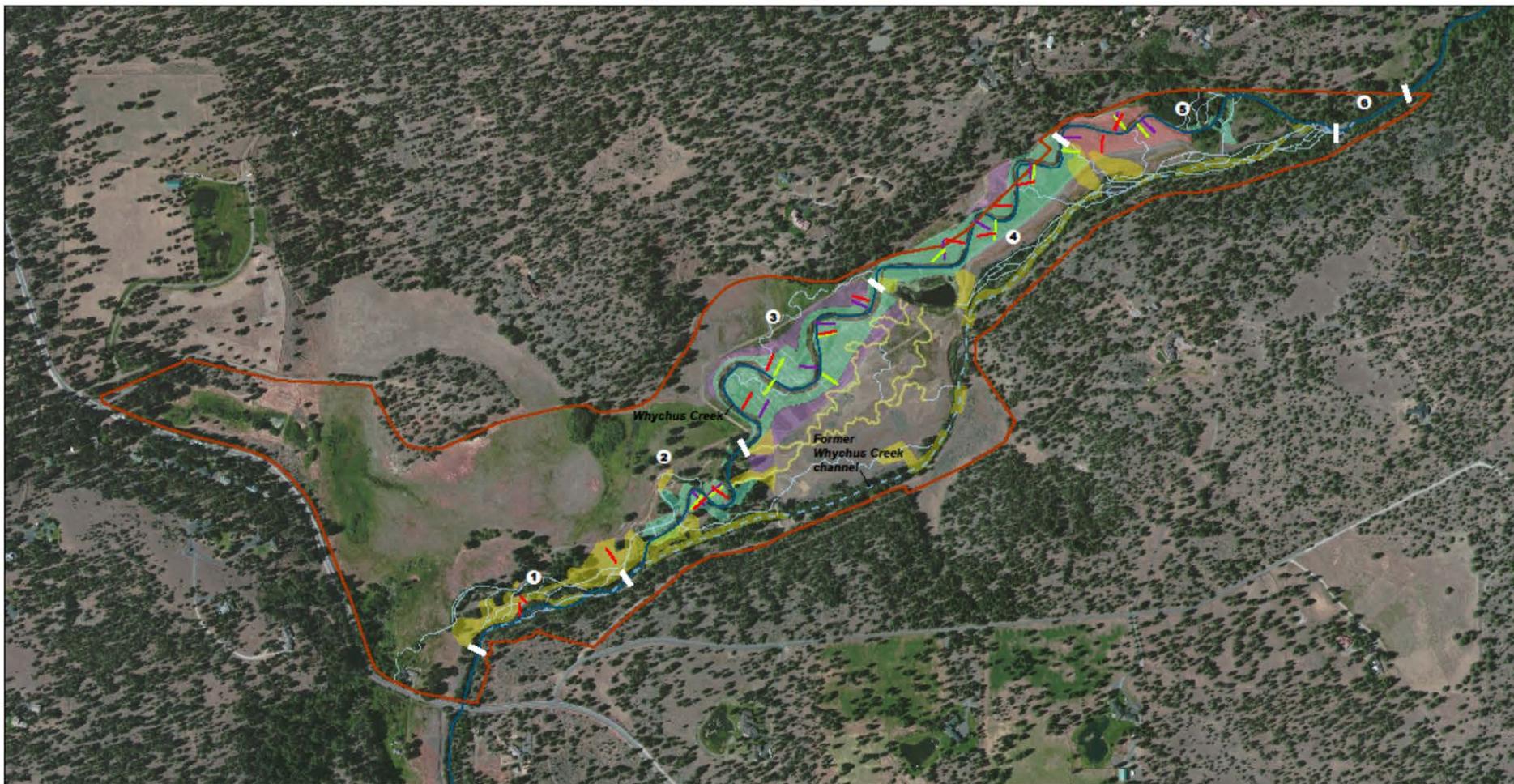
Appendix: B
Title: Phase I & II Plants: Whychus Creek Restoration at Camp Polk
Meadow Preserve
Prepared By: Karen Allen
Date: Spring 2012

Phase I & II Plants: Whychus Creek Restoration at Camp Polk Meadow Preserve						
		Phase I		Phase II	Totals	
		Zone 1	Zone 2	Zones 1-4		
Scientific Name	Common Name	Fall 2009 (#)	Spr 2010 (#)	Fall 2010 (#)	Spr 2012 (#)	
Trees						
<i>Alnus incana</i>	Alder	5,300		340	550	
<i>Betula occidentalis</i>	Birch	1,400		340	175	
<i>Populus trichocarpa</i>	Cottonwood	2,000		1,030	575	
<i>Prunus virginiana</i>	Chokecherry	280		350	125	
<i>Salix sp.</i>	Willow (tree)	4,000		170	350	
<i>Populus tremuloides</i>	Aspen			1,030	75	
<i>Pinus ponderosa</i>	Ponderosa pine				150	
Trees Subtotal		12,980	0	3,260	2,000	18,240
Shrubs						
<i>Cornus sericea</i>	Redosier dogwood	800		1,000	350	
<i>Rosa woodsii</i>	Rose	1,600		770	525	
<i>Salix sp. (S. geyeriana)</i>	Willow (shrub)	18,700		2,740	775	
<i>Sambucus cerulea</i>	Blue elderberry	0		60		
<i>Spiraea douglasii</i>	Spirea	9,800		1,980	850	
<i>Amelanchier alnifolia</i>	Serviceberry			600	50	
<i>Ribes cereum</i>	Wax currant			210	280	
<i>Symphoricarpus albus</i>	Snowberry			380	191	
<i>Lonicera involucrata</i>	Twinberry				20	
<i>Purshia tridentata</i>	Bitterbrush				255	
<i>Sambucus cerulea</i>	Blue elderberry				100	
Shrubs Subtotal		30,900	0	7,740	3,396	42,036
Herbaceous Wetland						
<i>Carex vesicaris / utriculata</i>	Inflated sedge / southern beaked sedge	4,704	98			
<i>Carex lasiocarpa</i>	Wool fruit sedge	1,960	196			
<i>Carex nebracensis</i>	Nebraska sedge	10,094	2,156		392	
<i>Scirpus microcarpus</i>	Small-fruited bulrush	13,307	3,822		392	
<i>Scirpus validus</i>	Soft stem bulrush	882	174			
<i>Carex simulata</i>	Short-beak sedge	3,683	1,149			
<i>Carex stipata</i>	Saw beaked sedge	1,764	1,372			
<i>Eleocharis palustris</i>	Common spikerush	1,274	163			

<i>Carex aquatilis</i>	Water sedge	4,704	784			
<i>Carex amplifolia</i>	Bigleaf sedge	4,508	784			
<i>Juncus balticus</i>	Baltic rush	7,070	1,470	13,380	1,274	
<i>Carex athrostachya</i>	Slender beaked sedge	0	0		392	
<i>Juncus effusus</i>	Dagger leaved rush	2,254	686	6,680	980	
<i>Juncus ensifolius</i>	Swordleaf rush	2,849	882		490	
<i>Carex microptera</i>	Small-wing sedge	10,577	2,744	13,380	2,717	
Herbs Subtotal		69,630	16,480	33,440	6,637	126,187
Upland Grasses						
<i>Elymus elymoides</i>	Squirreltail			830		
<i>Poa secunda</i>	Sandberg's bluegrass			830		
<i>Pseudoroegneria spicata</i>	Bluebunch wheatgrass			830		
<i>Koeleria macrantha</i>	Prairie junegrass			280		
Grasses Subtotal				2,770		2,770
Forbs						
<i>Aquilegia formosa</i>	Western columbine			100		
<i>Geum macrophyllum</i>	Largeleaf avens			130		
<i>Iris missouriensis</i>	Rocky Mountain Iris			100		
<i>Lupinus polyphyllus</i>	Bigleaf lupine			150		
<i>Mimulus guttatus</i>	Common monkeyflower			100		
<i>Mimulus lewisii</i>	Yellow monkeyflower			100		
<i>Penstemon rydbergii</i>	Rydberg's beardtongue			130		
<i>Polemonium occidentale</i>	Western polemonium			150		
<i>Sidalcea oregana</i>	Oregon checkerbloom			150		
<i>Sisyrinchium idahoense</i>	Idaho blue-eyed grass			150		
Forbs Subtotal				1,260		1,260
Total Plants		113,510	16,480	48,470	12,033	190,493
Total Phase I Plants				178,460		
Total Phase II Plants					12,033	

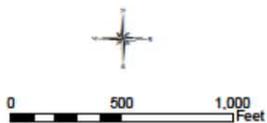
Appendix: C
Title: 2012-2014 Vegetation Monitoring Transects
Prepared By: Lauren Mork
Date: September 2014

Whychus Creek Restoration Project at Camp Polk Meadow Preserve Riparian Planting Zones



Source:
2011 NAIP aerial imagery

Fig2_zones.mxd
01/16/13



Date planted	Total # of plants
Fall 2009	113,510
Spring 2010	16,480
Fall 2010	48,470
Spring 2012	12,033
190,493 (28.2 ac planted)	

- 2014 Transects
- 2013 Transects
- 2012 Transects
- Camp Polk Meadow Preserve boundary
- ~ Whychus Creek
- ~ Former Whychus Creek channel
- Reach break
- 1 Reach number

