Upper Deschutes Watershed Council
Technical Report

2015 Camp Polk Monitoring Summary

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Upper Deschutes Watershed Council
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Introduction

UDWC and restoration partners implemented a suite of monitoring actions at Camp Polk Meadow (CPM) in 2015 per the Whychus Creek Restoration Project at Camp Polk Meadow Preserve Monitoring Summary Table (Appendix A) and in accordance with project funding agreements. Restoration partners modified monitoring activities to respond to emerging conditions, specifically the expansion of reed canarygrass in the meadow. Parameters monitored in 2015 included:

- Groundwater
- Continuous temperature
- Invasive weeds
- Reed canarygrass
- Macroinvertebrates
- Fish populations *(O. mykiss* redds)
- Photopoints; and
- Birds

Riparian vegetation; channel dimension, pattern, and profile; and aerial imagery are parameters included in the monitoring plan but which were not monitored in 2015. UDWC prioritized mapping reed canarygrass, an emerging threat in the meadow, over monitoring riparian vegetation. Riparian vegetation monitoring from 2010 through 2014 showed the seeded and planted riparian community at Camp Polk Meadow to be increasingly well-established and abundant, characterized by a strong native component and minimal cover of invasive weeds; in late 2014, reed canarygrass, a highly invasive species that has altered wetland and stream ecosystems throughout the Pacific Northwest, was observed at increased abundance in the meadow, prompting restoration partners to take action to better understand the problem. This adaptive management approach to changing circumstances in the meadow is allowing restoration partners to gather needed information and formulate an appropriate response that will ensure the best possible ecological outcome at Camp Polk. UDWC and Deschutes Land Trust (DLT) will continue to evaluate vegetation (riparian community and invasive weed) monitoring needs at Camp Polk and tailor monitoring metrics and methods accordingly. Channel dimension, pattern, and profile were surveyed in 2013 and will be surveyed again in 2016. The most recent aerial imagery available for Camp Polk was flown in 2014, accessible online at http://gis.apfo.usda.gov/gisviewer/.

2015 monitoring activities and findings are summarized below.

Groundwater

We sampled groundwater wells monthly from March through October 2014 to evaluate depth to groundwater in relation to the project objective of elevating the water table to within 2.0 ft of the surface. Monitoring was conducted during these months to track groundwater trends during the growing season, when groundwater is thawed, water availability is essential to support riparian vegetation survival, and runoff and snowmelt recharge groundwater. In 2015 we discontinued monitoring at Well 1 after a side channel head-cut back to the well, connecting surface and groundwater at the well site and calling into question the integrity of the well casing and function of the well. We recalculated monthly median values for March through October 2008-2015, the 2008 baseline mean growing season depth to groundwater, and the overall mean for each growing season 2009-2015,

excluding values from Well 1 to allow comparison between years prior and subsequent to the 2015 failure of Well 1.

The six-well mean growing season depth to groundwater in 2015 was 2.67 ft, a 0.49 ft decline from the 2014 six-well mean depth of 2.18 ft. The 2015 mean growing season depth to groundwater remained better than the 2.82 ft 2013 mean growing season depth. 2015 data show a sustained improvement in the overall mean depth to groundwater, compared with 2007-2011 data. The maintenance of an elevated water table from 2012 through 2015 are early indicators of the project's success in restoring the meadow hydrology and floodplain connectivity (Goal 2), increasing the groundwater table and summer base flow (Goal 2), and increasing the average groundwater elevation depth to approach 2 ft below ground during the growing season (Objective 3). The observed increase in the groundwater level also contributes to restoring and enhancing a high quality riparian wetland habitat along the stream corridor (Goal 3), establishing a minimum of 35 acres of wetland and riparian communities (Objective 4), and decreasing stream temperatures to help meet Oregon's state temperature standards[1] (Goal 5). Groundwater levels at Camp Polk Meadow will continue to fluctuate from year to year as a result of inter-annual climatic differences in snowpack, runoff, precipitation, and temperature, and may continue to change with ongoing channel evolution and increasing water demands of more abundant riparian vegetation. Groundwater monitoring results are presented in *Whychus Creek Restoration Project at Camp Polk Meadow Preserve: 2015 Groundwater Monitoring Report* (www.upperdeschuteswatershedcouncil.org).

Continuous Temperature

UDWC monitored continuous temperature at eleven locations along Whychus Creek from March through October 2015, including at sites approximately 250 m upstream and downstream of the restored channel. We analyzed data for 30 days from July 16 to August 15, limiting the analysis to a 30-day period to reduce the effects of intra-annual seasonal variation, and used these dates as representative of the period during which the hottest water day occurred most often between 2005 and 2015. To evaluate stream temperature dynamics in the restored meadow channel compared to the pre-project, straightened channel, we compared July 16-August 15 average temperatures and hottest water day temperatures at upstream (WC 19.50) and downstream (WC 18.25) sites, and average pre- and post-project differences between these metrics, for five years pre-project (2007-2011) to four years post-project (2012-2015).

On average, 2015 temperatures in Whychus Creek were over 2°C warmer than 2014 temperatures, including at WC 19.50 and WC 18.25, upstream and downstream of Camp Polk, respectively (Table 1). Stream temperature in the restored channel on the hottest water day of 2015 warmed by 2.5°C between the upstream and downstream monitoring sites, 0.4°C more than the 2014 hottest day increase of 2.1°C between the two sites. The average upstream to downstream increase from July 16 to August 15 was 2.4°C in 2015, also 0.4°C more than the 2014 average upstream to downstream increase.

[1] Although the four-year post-project stream temperature dataset for Camp Polk indicates a higher rate of warming in the new, re-meandered meadow channel than in the pre-project, straightened channel, surface water-groundwater exchange indicated by the elevated water table is expected to both increase summer base flow, mitigating the rate of warming, and actively cool warm stream temperatures that occur during late-summer low flows.

The July 16-August 15 average and average hottest water day temperatures downstream of the project both increased pre-project to post project, by 0.5°C and 0.6°C, respectively, while the difference of the July 16-August 15 average and the difference of the average hottest water day temperature increased pre-project to post-project by 0.7 and 0.8°C. As of 2014, comparing three years (2012-2014) of post-project data to the five years of pre-project data, the pre- to post- project increase in the average temperature difference between the upstream and downstream sites resulted from a decrease in the upstream average temperature rather than an increase in the downstream average temperature; average stream temperature at the downstream site (WC 18.25) was actually 0.1°C cooler post-project than pre-project (Table 1). With the addition of 2015 data, the downstream post-project average temperature increased over the pre-project average; the upstream post-project average temperature decreased relative to the pre-project average, but by half a degree less. While the actual difference between the 2012-2014 and the 2012-2015 upstream to downstream average differences changed by only a tenth of a degree, from 2012 to 2015 this difference resulted from downstream warming rather than upstream cooling.

2012-2015 data thus suggest stream temperature is warming more rapidly in the new channel than occurred pre-project. Over the long term, restoration partners expect planted riparian species including alder, willow, and cottonwood to shade and cool the meadow channel at Camp Polk; in the short term, diversion of Whychus Creek from an alder-lined, straight channel into the re-meandered meadow channel has resulted in a net decrease in shade and a net increase in residence time (longer channel length), both shown to increase stream temperatures.

Table 1. July 16-August 15 median average daily flow, average 7DMAX temperatures and average upstream to downstream difference, and 7DMAX temperature and upstream to downstream difference on the hottest water day of each year, at WC 19.50 and WC 18.25, pre- (2007-2011) and post- (2012-2014; 2012-2015) diversion of Whychus Creek into the restored meadow channel.

		July 16 - August 15			Hottest Water Day		
	Median flow (CFS)	18.25 Avg temp (°C)	19.5 Avg temp (°C)	18.25-19.5 Avg Δ (°C)	18.25 7DMAX temp (°C)	19.5 7DMAX temp (°C)	7DMAX Δ 18.25-19.5 (°C)
2007	14	20.4	18.8	1.6	22.2	20.3	1.9
2008	31	17.3	16.4	0.9	19.6	18.3	1.3
2009	16	19.9	18.7	1.2	21.6	20.3	1.3
2010	26	18.6	17.3	1.3	18.9	17.6	1.4
2011	66	15.1	14.5	0.6	17.5	16.5	1.0
Pre-project Average	**30.6**	**18.3**	**17.1**	**1.1**	**20.0**	**18.6**	**1.4**
2012	51	16.5	15.4	1.1	18.9	17.3	1.6
2013	22	19.7	17.8	1.9	21.3	18.9	2.4
2014	37	18.3	16.3	2.0	19.4	17.4	2.1
2015	22	20.6	18.2	2.4	22.7	20.2	2.5
2012-2014							
Post-project Average	**37**	**18**	**16**	**2**	**20**	**18**	**2**
Pre-project-Post-project Difference	**6.1**	**-0.1**	**-0.7**	**0.5**	**-0.1**	**-0.7**	**0.7**
2012-2015							
Post-project Average	**33.0**	**18.8**	**16.9**	**1.9**	**20.6**	**18.4**	**2.1**
Pre-project-Post-project Difference	**2.4**	**0.5**	**-0.2**	**0.7**	**0.6**	**-0.2**	**0.8**

Invasive Weeds

The Deschutes Land Trust has inventoried, mapped, and actively managed invasive plant species at Camp Polk Meadow Preserve since 2000. During the summer of 2006, prior to beginning construction at Camp Polk, weeds were inventoried and distribution maps and infestation levels were updated for priority weed species. The *Camp Polk Meadow Weed Management Plan,* developed in 2002 and revised every year starting in 2009, was updated to respond to these baseline conditions.

The spread of non-native, invasive plants in disturbed areas was anticipated to occur in the first few years following restoration construction. Pre- and post- construction weed treatments (chemical application and manual control) and weed population monitoring were planned according to the *Camp Polk Meadow Weed Management Plan* to maximize successful establishment of native plants. DLT has monitored priority weed species and implemented treatments annually between April and October since 2009. Changes in species density and distribution are recorded and mapped. Monitoring data are used in an adaptive management approach to plan monitoring and treatments for the following year.

By 2013 weed populations had been controlled to the extent that 2014 weed monitoring was reduced to once a month during June, July, and August. 2014 surveys detected spotted knapweed, common mullein, and bull and scotch thistle at lower abundances than in previous years; mustard, nightshade, and fiddleneck (a weedy native) populations were also much reduced. The expansion of reed canarygrass observed within and along the main channel in reach 2 in 2014 prompted an intensive reed canarygrass mapping effort in 2015, summarized in the Reed Canarygrass section of this report.

In addition to reed canarygrass mapping, weeds were surveyed and mapped in 2015 over four visits to the meadow, once per month from May through August (Appendix B). Species that continue to present a management concern include spotted knapweed, bull and Canada thistle, common mullein, and reed canarygrass. Spotted knapweed and bull thistle were found in sandbars, flood deposits, and dry side channels, suggesting that flood flows are likely introducing seeds of these species into the meadow. Common mullein also remained abundant throughout the restoration area. Volunteer crews hand-pulled (mullein) or clipped (knapweed and thistle) these species throughout the summer. Canada thistle continued to expand in the meadow despite sustained efforts to control it through clipping. In September, 2015, DLT staff treated all major Canada thistle and co-occurring common teasel populations that could be safely treated with the herbicide Opensight (aminopyralid and metsulfuron); additional treatments are anticipated to be needed in 2016 to control Canada thistle and teasel to the point where they can be controlled without the use of herbicides.

Management actions in 2016 will include hand pulling and clipping of spotted knapweed, mullein, and bull thistle, and treating Canada thistle and common teasel with the herbicide Opensight.

Reed Canarygrass

In fall 2014, UDWC staff noticed a marked increase in Reed canarygrass (RCG), a rhizomatous grass that has invaded wetlands throughout the continental US, in Camp Polk Meadow. RCG was known to occur in the meadow and was actively controlled through manual and herbicide treatments and closely monitored from 2009 through 2012. By 2012, abundance of RCG in established populations had decreased, populations detected in the new meadow channel in 2011 were absent following diversion of Whychus Creek into the channel, and no new populations had been observed subsequent to 2011 treatments. Riparian vegetation monitoring and field observations showed native species to be increasing in abundance and successfully competing with weeds. Weed populations responded so

positively to 2012 and 2013 control measures that in 2014 weed monitoring was reduced to once per month. The most recent weed map for Camp Polk Meadow was from 2013.

To evaluate the scope and severity of RCG expansion and identify management alternatives for controlling RCG, in 2015 UDWC and DLT staff mapped reed canarygrass in the meadow, reviewed available literature on reed canarygrass ecology and management, and developed a preliminary plan for controlling reed canarygrass at Camp Polk. Sampling efforts were focused in the upstream reaches of the project (Reaches 1 & 2) and along the main channel and side channels (Appendix C). RCG was found throughout areas sampled at relatively low abundance (<25% cover). It was consistently found in riparian areas and side channels where the stream accesses the floodplain during high flow events, leaving soil moisture high, and in stream channels where sediment and woody material collect. We did not find reed canarygrass in drier areas above elevations typically flooded by high flows.

Treatment priorities and methods identified for Camp Polk respond to the flooding regime and plant community that characterize the meadow. Frequent flooding promotes RCG establishment by depositing sediment, RCG rhizomes and seeds onto the floodplain, particularly in Reaches 1 & 2; the planted native riparian community is well-established, diverse and abundant; invasive weeds other than RCG represent a small proportion of the community. Treatment recommendations are summarized as follows:

- Prioritize upstream reaches, the mainstem channel, dense monocultures, and new shoots ("starts") for treatment. Beginning treatment in the upper reaches of a focal area, addressing vectors, and eliminating small source populations are approaches that have been shown to significantly control RCG in wetland settings.
- Hand pull starts and in-stream mats and dig up all roots.
- Backpack spray logjams and well-established, high-density areas with glyphosate herbicide during late summer low flows. A USFS study on the Metolius River found backpack spraying to more effectively control ribbongrass, another *Phalaris* species, than wand application. RCG was consistently found at relatively higher abundances on logjams in the main and side channels at CPM.
- Experimentally solarize dense monocultures above high water. Although solarization has been shown to be effective in controlling dense stands of RCG, restoration partners are wary of floodwaters degrading plastic and introducing plastic fragments into the stream environment.
- Monitor but defer treatment of RCG sparsely interspersed with native riparian vegetation.

Deschutes Land Trust incorporated these recommendations to identify a RCG treatment plan for 2016 that includes application of an aquatic glyphosate herbicide in priority treatment areas to prevent reed canarygrass from forming monocultures, choking side channels, and out-competing natives. Ultimately DLT aims to reduce the RCG population to the extent that it can be controlled in the future exclusively through hand pulling. Active prevention of RCG establishment at future projects will be facilitated by intensifying RCG management efforts at the time when the stream is reconnected to the floodplain, and by strategically developing funding and allocation of resources for RCG control. Reed canarygrass mapping and literature review findings are presented in *Reed Canarygrass at Camp Polk Meadow Preserve: 2015 Monitoring Report* (www.upperdeschuteswatershedcouncil.org).

Macroinvertebrates

Macroinvertebrates were sampled at Camp Polk in 2005, 2009, and 2011-2015. Samples were collected at the temperature monitoring locations upstream and downstream of Camp Polk in all seven years. Two sites sampled in 2005, 2009, and 2011 in the old, straightened channel were re-located to the new channel following diversion of the stream in 2012, and sampled in the new channel from 2012-2015.

ODEQ (Oregon Department of Environmental Quality) and Grande Ronde IBI (Index of Biological Integrity) ratings for the four Camp Polk monitoring sites, calculated from ten community metrics such as the total number of species and the number of sensitive species, indicated relatively good biological conditions in 2015, with little change over seven years of data. Slightly (ODEQ) and minimally (Grande Ronde) disturbed 2015 ratings for the three upstream sites are consistent with previous years or show improvement over 2011 (upper and lower channel) and 2013 (lower channel) moderately disturbed ratings. In 2015, ratings for the downstream site, WC 18.25, deteriorated for the first time, from consistently slightly/minimally disturbed to moderately disturbed.

Scores from the PREDATOR model, which evaluates stream condition according to the proportion of macroinvertebrate taxa expected at a site versus the proportion observed, increased significantly at all sites along Whychus Creek in 2015, including at the four Camp Polk sites. Ratings increased from nearly consistently poor for the four sites since 2011, to fair ratings for three sites and a good rating for the upper new channel site (WC 19.00) in 2015. These ratings mark a return to the good (three sites) and fair (lower channel, WC 18.50) ratings received in 2009 and 2005.

Several macroinvertebrate metrics suggested a community response to warmer stream temperatures and a higher fine suspended sediment load in the Camp Polk reach in 2015. Although the 2015 temperature preference (weighted mean temperature optima) of taxa comprising the macroinvertebrate community at Camp Polk remained significantly lower than the 2009 temperature preference, temperature preferences of taxa characterizing the Camp Polk community increased in 2014 and again in 2015. The 2015 fine sediment preference of the Camp Polk macroinvertebrate community increased significantly in 2015 over 2012 and 2014, returning to a pre-2012, higher fine sediment preference. Taxa tolerant of high levels of disturbance and pollution (tolerant taxa) and sediment-tolerant taxa both increased, tolerant taxa significantly so, in the Camp Polk reach in 2015; these taxa also increased significantly in downstream (both tolerant and sediment tolerant) and in upstream (tolerant only) reaches, indicating a tolerant and sediment-tolerant taxa response throughout Whychus Creek.

PREDATOR ratings for Whychus Creek have historically indicated very poor conditions, in contrast to IBI ratings, bringing into question how well the parameters of this model describe the Whychus system. Similarly, although the high 2015 PREDATOR scores are generally in keeping with the 2015 trend in IBI scores, they do not align with the simpler tolerance and sediment and temperature optima metrics that indicate higher stream temperatures and increased fine suspended sediments in 2015. While we will continue to use the PREDATOR model, we place greater confidence in the simpler metrics that directly reflect a biological response to stream conditions.

Despite metrics indicating some decline in stream conditions and in particular in the Camp Polk reach in 2015, metrics characterizing the macroinvertebrate community in Whychus over time suggest the community has become increasingly composed of a greater abundance of sensitive taxa, taxa associated with flowing (rather than standing) water, and taxa that will only inhabit cooler and clearer streams. Species new to Whychus have been added in every year we've sampled, mostly in the sensitive EPT

group. It is worth noting that the assemblage of macroinvertebrate species in the new channel is entirely a product of colonization following diversion of the stream, thus conditions in the new channel are at a minimum favorable to support a robust macroinvertebrate community. The 2015 macroinvertebrate report, *Effectiveness Monitoring in Whychus Creek; Benthic Macroinvertebrate Communities in 2005, 2009, and 2011-2015*, is available on the UDWC website at www.upperdeschuteswatershedcouncil.org.

Fish Populations

PGE discontinued juvenile density surveys at Camp Polk following diversion of Whychus Creek into the new channel in 2012; no other entity conducted fish population surveys at Camp Polk in 2015. PGE did survey O. mykiss redds in one Camp Polk reach in 2015, in the restored meadow channel (PGE Reach 5). Surveyors found only two redds at Camp Polk during the course of five surveys between March 19 and June 12. The low number of redds detected at Camp Polk was consistent with low numbers (0-1) of redds found at six additional sites surveyed along Whychus Creek in 2015; only the sites below and above Alder Springs, the site of critical cold water spring inputs, supported higher numbers of O. mykiss redds, 7 and 21, respectively. The low numbers of redds at six of eight sites surveyed in 2015 suggest low numbers of redds at Camp Polk do not reflect poor habitat conditions in the restored meadow channel at Camp Polk specifically, but rather poor stream conditions along the length of Whychus Creek in 2015, likely related to insufficient stream flow and resulting high stream temperatures.

Photopoints

Photographic monitoring was conducted in 2015 at photopoints throughout Camp Polk Meadow. A select portfolio from photo monitoring comparing photopoints from 2008/2009, 2014, and 2015 is presented as Appendix D. We included 2008, pre-construction photopoints where available; where 2008 photos were not available we used 2009 photos for the pre-project comparison.

Bird Surveys

Since 2006, volunteers from Deschutes Land Trust, Central Oregon Birder's Association, and the East Cascades Audubon Society have conducted presence/absence bird surveys year-round throughout Camp Polk Meadow. The survey protocol was designed to support analysis of changes in the number, composition, and frequency of species detected over time, and specifically before and after the diversion of Whychus Creek to the new channel in 2012. 2016 will mark the final year of surveys under this protocol; analysis will be completed following 2016 surveys. Raw data are available upon request .

APPENDIX A. Whychus Creek Restoration Project at Camp Polk Meadow Preserve Monitoring Summary Table

Whychus Creek Restoration Project at Camp Polk
Monitoring Plan Summary
January-16

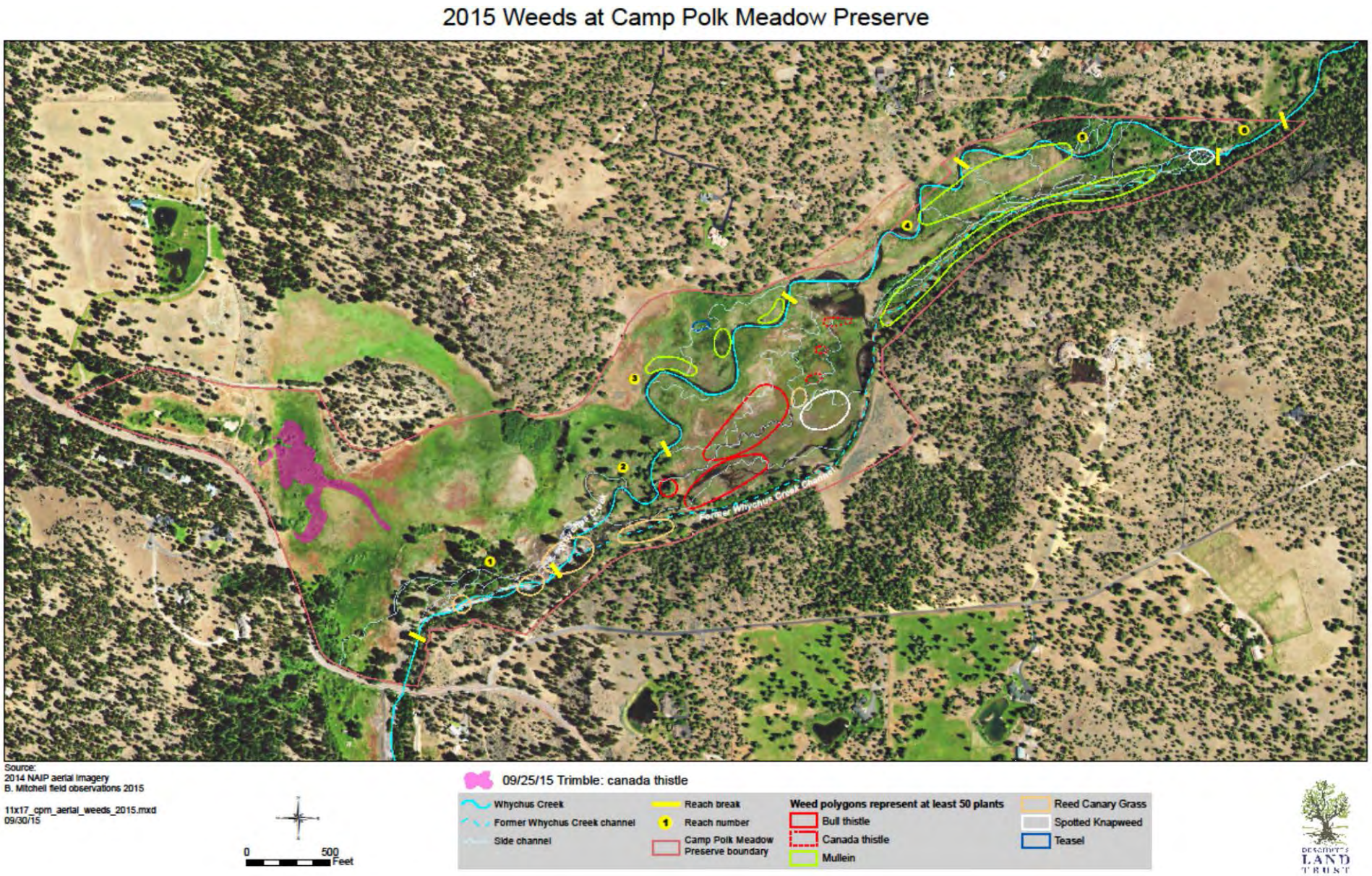
Monitoring Parameter	Goals[1]	Protocol/Citation	Reporting	Location	Season	Frequency	Duration	Years													Lead	Annual Budget	Baseline	Notes
							Years -->	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017				
								B = Baseline; I = Implementation; PP = Post Project; TBD = To Be Determined																
Priority 1[2]																								
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.			B	B	I	I	I	PP	PP	PP	PP	PP	PP	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; Benewah 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. Additional monitoring will depend on results from 2013.						B			PP		DISCONTINUED			UDWC	Labor for field work and write up.	2010	Discontinued post-2013 monitoring. Summary of 2013 findings included in 2013 Pelton Camp Polk Monitoring Report. 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.	Written evaluation of temperature at monitoring sites upstream and downstream of Camp Polk by Monitoring Coordinator	Above new channel (RM 19.50); Below new channel (RM 18.25).	April - October	Annually	2007 - 2017. Begun in 2007.	B	B	B	B	B	B	B	PP	PP	PP	PP	TBD		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					B				PP			PP		UDWC w/ field work conducted by USFS	Labor for field work and write-up	Lidar data was collected in 2009 post Phase I construction	Given the ongoing dynamic evolution of the channel, a second total station survey will be conducted in 2016
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								B	PP	PP	PP	TBD		UDWC	Labor for field work and write-up (Monitoring Coordinator, Intern). Consulting contract with Karen Allen.	2012	Replaces Riparian Plant Survival. UDWC Intern, Monitoring Coordinator
Riparian Vegetation - Grids	1, 2, 3, 4	Percent cover monitoring. 2010 U of O CPM Vegetation Monitoring Report.	OSU Field Course Reports (Formerly U of O)	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.			B	B	PP	PP			PP	PP	DISCONTINUED			Karen Allen, Matt Orr (OSU).	In-kind from UofO field ecology course.	2007 (Grid #1), 2008 (Grids #2,3), 2009 (Grids #4,5), 2010 (Grids #1,2,3)	Discontinued after 2014 due to change of U of O faculty priorities. Independent UofO work not coordinated by UDWC or DLT.
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						B	PP	REPLACED WITH RIPARIAN VEGETATION - TRANSECTS						UDWC	Labor for field work and write-up; Contract with Karen Allen (2010 and 2011)	2010	Discontinued in 2012 due to abundance of vegetation and inability to distinguish planted individuals and detect dead plants.
Invasive Weeds	3	Direct observation focusing on targeted species. 2006 Weed Monitoring and Evaluation	Annual DLT report summarizing Weed Management Plan, Weekly Weed Monitoring Reports and Monthy 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		B			I	I	I	PP	PP	PP	PP	PP	PP	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 2012 (UDWC 2012)	Third week of August	2005, 2009, 2011 - present; Annually depending on status, trends and funding	2011-2017	B				B		B	PP	PP	PP	PP	PP	PP	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 Whychus Creek Monitoring Technical Report by Monitoring Coordinator.	Within project reach, as determined by PGE, ODFW and UDWC	Summer	1997; 2008-2009; TBD	Assess ongoing changes to system and collaborate with PGE to determine post-2011 survey				B	B							PP		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	Results of Camp Polk fish surveys reported by PGE, USFS or ODFW	Within project reach, as determined by PGE, ODFW, USFS, and UDWC	Spring, Summer	Annually as part of PGE reintroduction monitoring or by ODFW/USFS	Continue through 2017			B							PP	PP	TBD		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
V. Photographic Monitoring																								

Monitoring Parameter	Goals[1]	Protocol/Citation	Reporting	Location	Season	Frequency	Duration	Years													Lead	Annual Budget	Baseline	Notes
							Years -->	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017				
								B = Baseline; I = Implementation; PP = Post Project; TBD = To Be Determined																
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				B	I	I	I	PP	PP	PP	PP	PP	PP	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	Aerial imagery is accessed online from USDA Imagery: http://gis.apfo.usda.gov/gisviewer/.	Trackand report most recent year for which imagery is available.	Whole site	Summer	Annually as available	Continue as long as possible				B	I	I	I	PP	PP	PP		PP	PP	UDWC	Labor - Deb, Lauren - NAIP transfer, management	2008 NAIP	
Priority 2 [2]																							2004?	
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				I	I	I	I	PP	PP	PP	PP	PP		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?			B							EVALUATE				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.

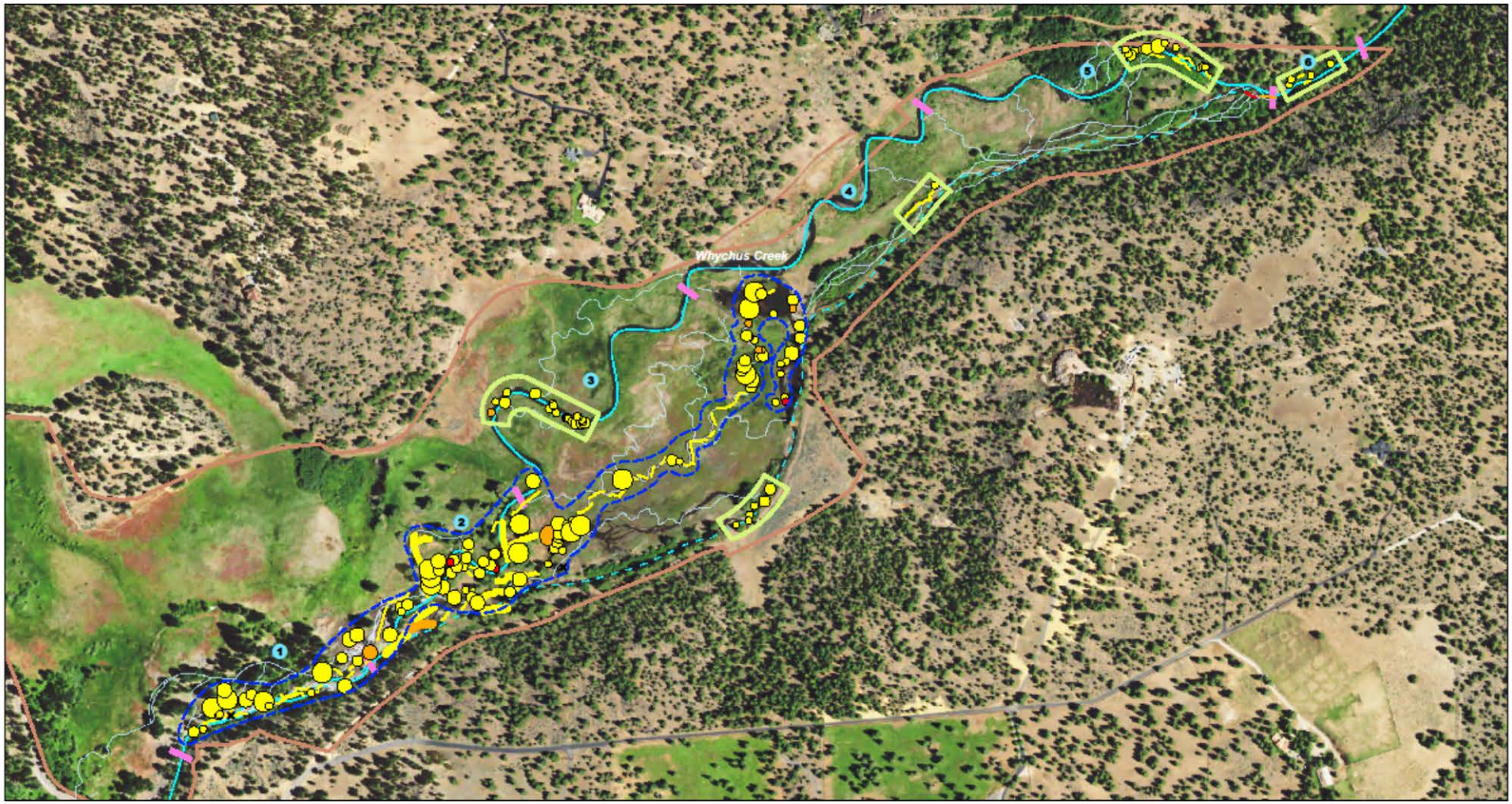
#2: Monitoring Priorities. Priority 1 monitoring is that which helps define project success and for which funding will be prioritized. Priority 2 monitoring is above and beyond that suggested to evaluate the success of the project, but which would provide valuable data if resources are available .

APPENDIX B. 2015 distribution of priority weed species of concern at Camp Polk Meadow.



APPENDIX C. 2015 distribution of reed canarygrass at Camp Polk Meadow

2015 Reed Canarygrass at Camp Polk Meadow Preserve



Source:
2014 NAIP aerial imagery

11x17_cpm_aerial_RCGweeds_2015.mxd
11/12/15

0 500 Feet

Camp Polk Meadow Preserve boundary
Whychus Creek
Former Whychus Creek channel
Side channel
Reach break
1 Reach number

RCG point features
Diameter (meters)
0-2
3-5
6-10
11-30

RCG line features
Diameter (meters)
0-6
7-10
11-30

RCG point & line features
Percent cover
0-24 %
25-49 %
50-75 %

Area of intensive RCG survey, 2015
RCG reference surveys

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APPENDIX D. Selected 2008/2009, 2014, and 2015 photopoint photos from Camp Polk Meadow


2008


2015


2008


2015


2008


2015


2014


2015


2008


2015


2014


2015


2008


2015


2014


2015


2008

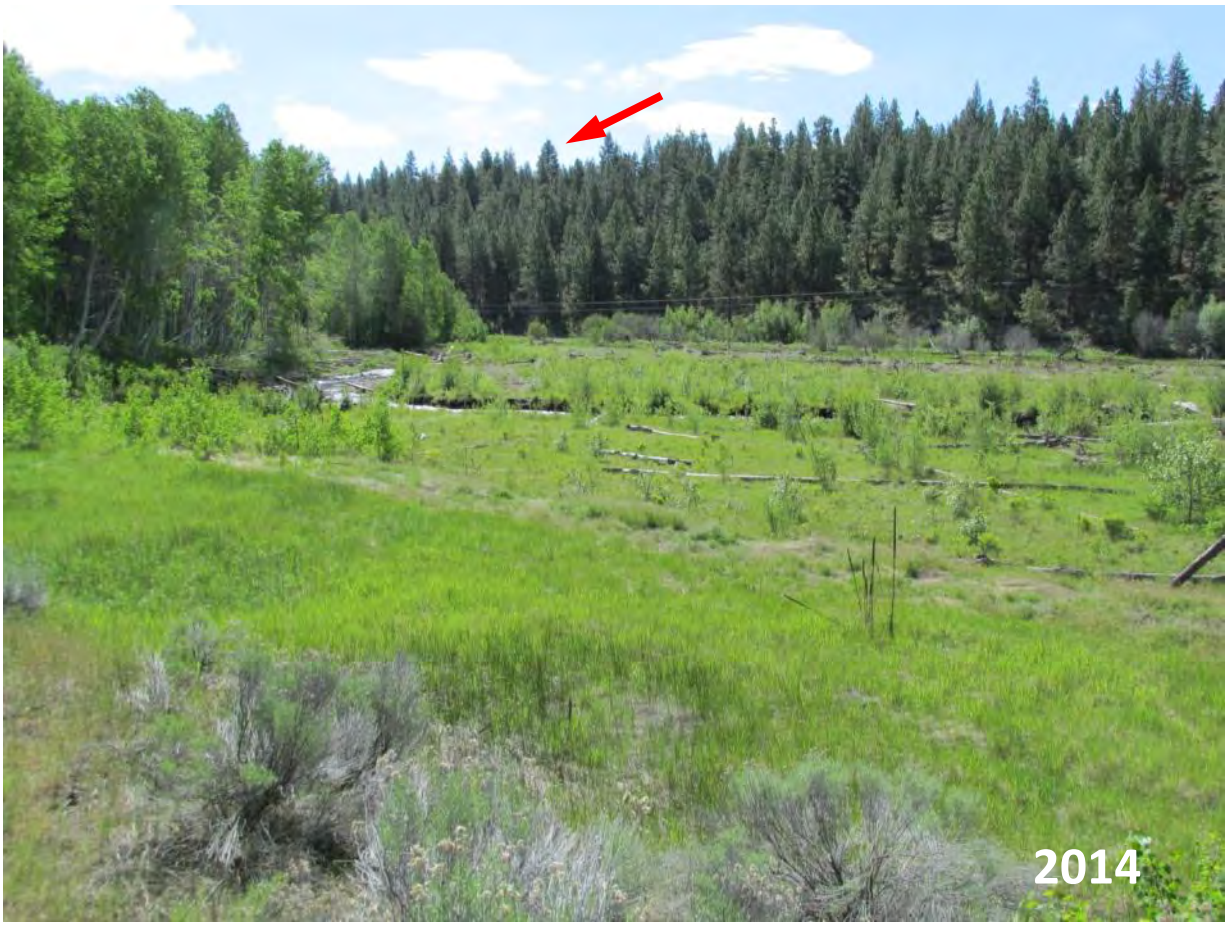

2015


2014


2015


2009


2015


2014


2015


2009


2015


2014


2015


2009


2015


2014


2015


2009


2015


2014


2015