

North Pacific / Columbia Basin Fire Ecology Annual Report Calendar Year 2009



Cedar Drake, Lead Fire Effects Monitor
Karen Kopper, Fire Ecologist
North Cascades National Park

Summary

The North Pacific / Columbia Basin (NPCB) Fire Effects Monitoring crew had a busy and varied field season in 2009, revisiting a total of 66 plots within North Cascades National Park (NOCA), John Day Fossil Beds National Monument (JODA), San Juan Island National Historical Park (SAJH), Whitman Mission National Historic Site (WHMI) and Lake Roosevelt National Recreation Area (LARO).

The crew began the field season by installing and reading 10 new FMH grass plots on Young Hill in English camp, and also conducted a grass species assessment project at the base of Young Hill. In both spring and fall the crew assisted in pre and post data collection for an annual Brome treatment experiment on Young Hill and participated in prescribed burning of the research site. Two rapid assessment plots (RAP)s that had been prescribed burned in fall 2008 were also revisited.

During an extended monitoring trip to JODA and WHMI, the crew was able to complete 22 plot visits in a 9-day period. Nine of these plots included 10-year post-fire reads in both Bigleaf Sagebrush and Western Juniper monitoring types. This data will provide the first glimpse of long-term fire effects at JODA.

In addition to revisiting 12 forest plots in the Stehekin valley, the crew was able to install and read 5 new forest plots in the Ranch and the Upper Boulder contour units.

North Cascades National Park had one of its busiest fire seasons on record for the west-side of the park with 28 wildfires. As a result, the crew contributed a combined total of 6 pay-periods to suppression and monitoring efforts within the park. Duties included; participating in initial attack, functioning as helicopter crewmember trainees, acting as lookouts, participating in aerial monitoring and mapping, assisting Public Information Officers in the dissemination of fire ecology information, assisting backcountry rangers in enforcing trail closures, generating GIS maps, and supporting operational logistics. NPCB staff also had the opportunity to install and read 3 backcountry RAP plots along the perimeter of the Brush Creek fire and 2 along the Panther Creek fire. These plots will be reread in 2010.

In October the crew participated as both fire monitors (FEMO)s and fire crew members for six prescribed fire events at SAJH and LARO.

Table 1. Fire Effects Plot Workload 2009

Park	Monitoring Type	Plot Type	Pre-burn	Immed. Post	Postburn (1-20 yrs)	Total Plots
John Day Fossilbeds NM	Western Juniper	FMH forest plot	0	0	9	16
	Big Sagebrush	FMH brush plot	0	0	8	21
Lake Roosevelt NRA	Ponderosa Pine	FMH forest	0	1	6	22
North Cascades NP	Stehekin Valley Forest Fuel Reduction Areas	FMH forest	0	0	12	37
	Stehekin Valley Wall Contours	FMH forest	5	0	0	19
	Brush Creek RAP	Rapid Assessment	3	0	0	3
	Panther Creek RAP	Rapid Assessment	2	0	0	2
Olympic NP	East-side Mixed Conifer	Rapid Assessment	0	0	0	5
San Juan Island NHP	Garry Oak Woodland	FMH forest	0	3	0	10
	Douglas Fir/ Lodgepole	Rapid Assessment	0	0	2	4
	Annual Brome Grasses	FMH grass	10	0	0	10
Whitman Mission NHS	Giant Wild Rye – Meadow Restoration	FMH grass	0	0	5	5
Total			20	4	42	174

Table 2. Fire Ecology Staffing 2009

Ecologist and Monitors	Start Date	End Date	# Pay Period	READ Qualified (Yes or No)	Training & Development
Karen Kopper Fire Ecologist	1/01/09	n/a	26	No	Fire Refresher, UW fire severity and fire history research
Cedar Drake Lead Fire Effects Monitor	4/06/09	12/13/09	19	No	Fire Refresher, “Working with Weeds”, First Aid/ CPR, Defensive Driving, FEMO taskbook initiated and completed, HECM taskbook initiated
Sarah Hoff Fire Effects Monitor	4/29/09	10/21/09	13	No	Fire Refresher, S-271 HECM course, “Working with Weeds”, First Aid/ CPR, HECM taskbook initiated
Evelyn Greiner Fire Effects Monitor	4/29/09	10/22/09	13	No	Fire Refresher, S-240 Field Observer course, RX-310 Introduction to Fire Effects, First Aid/ CPR, FOBS taskbook initiated, FEMO taskbook completed
Ida Cunningham Fire Effects Monitor	4/29/09	10/18/09	13	No	Fire Refresher, “Working with Weeds”, First Aid/ CPR, Defensive Driving, FEMO taskbook initiated

Management Objectives and Monitoring Results 2009

The following reports are the joint effort of Cedar Drake and Karen Kopper. Cedar (mostly) and Karen analyzed the fire effects monitoring data, and Karen wrote the summaries and recommendations.

John Day Fossil Beds National Monument



FJUOC1D06-06:Preburn 1999
Western Juniper Forest



FJUOC1D06-06:10YrPost 2009
Western Juniper Forest



FJUOC1D06-06:Preburn 1999
Western Juniper Forest



FJUOC1D06-06:10YrPost 2009
Western Juniper Forest



BARTR1D02-06:10YrPost 2009
Big Sagebrush Shrubland



BARTR1D02-06:10YrPost 2009
Big Sagebrush Shrubland

JODA: John Day Fossil Beds National Monument

Monitoring Unit	Management Objective (Restoration)	Results for Comparison 5 Years Post-burn	Results Monitoring 10 Years Post-burn	Objective Achieved ?
Western Juniper Forest FJUOC1D06	1) Reduce density of junipers 10 – 40 % by 1 year post-burn 2) Reduce shrub density by 20 – 60 % by 1 year post-burn 3) Reduce or maintain non-native grass cover within 10% of pre-burn cover by 2 nd year post-burn.	1) $x = 18.5\%$ Reduction, 90%CI, $(6.6\% < x < 30.3)$, $n=8$ Pre=46.5, Yr5= 38.0 trees/acre 2) $x=81.5\%$ Reduction, 90%CI, $(38.7 < x < 124.2)$, $n=9$ Pre=190.2, Yr5=35.3 shrub/acre 3) $x=119.3\%$ Increase, 90%CI, $(88.6 < x < 150.0)$, $n=9$ Pre= 14.6, Yr5=32.0 %Cover	1) $x = 32\%$ Reduction, 90%CI $(-29.8 < x < 93.8)$, $n=3$ Pre=33.7 Yr10= 22.9 live stems/acre 2) $x=57.6\%$ Reduction, 90%CI $(-26.0 < x < 141.4)$, $n=3$ Pre=445.16, Yr10= 188.85 shrub/acre 3) $x=192\%$ Increase, 90%CI, $(72.8 < x < 311.3)$, $n=3$ Pre=10.04, Yr10=29.3 % Cover	1) Yes (but not confident) 2) Yes (but not confident) 3) No
Big Sagebrush Shrubland BARTR1D02	1) Reduce shrub density by 20 – 60 % by 1 year post-burn 2) Reduce or maintain non-native grass cover within 10% of pre-burn cover by 2 nd year post-burn.	1) $x=69.4\%$ Reduction, 90%CI, $(51.9 < x < 86.9)$, $n=14$ Pre=427.8, Yr5=131.0 shrub/acre 2) $x=9.6\%$ Increase, 90%CI, $(-5.0 < x < 24.1)$, $n=14$ Pre=54.5, Yr5=59.7 %Cover	1) $x=67.6\%$ Reduction, 90%CI $(46.3 < x < 88.9)$, $n=6$ Pre=472.13, Yr10=152.88 shrub/acre 2) $x=2.3\%$ Reduction, 90%CI $(-17.0 < x < 21.5)$, $n=6$ Pre=74.0, Yr10=72.3 %Cover	1) over-achieved 2) Yes (but not confident)

John Day Fossil Beds National Monument

The primary objectives for prescribed burning in the juniper forest and sagebrush shrubland are to reduce encroachment of juniper into the shrubland, and sagebrush into the grasslands. A secondary goal is to prevent the increase of non-native grass cover. The monitoring results in this report analyze ten year post-burn effects on the Windy Point prescribed fire of 1999. Many of these results are not very robust due to the small number of plots, as their large confidence intervals suggest, however they give use the first glimpse of long-term fire effects. Fifth-year post-burn results from Windy Point, Picture Gorge and Middle Mountain prescribed fires (2007 NPCB YER) are included for comparison.

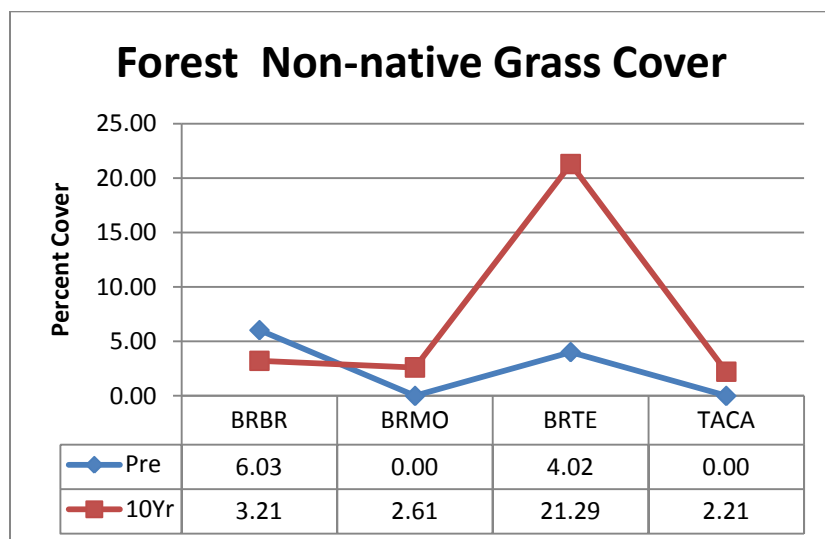
Trees: The objective to reduce juniper encroachment in the forested areas by 10 – 40 percent was maintained in the 10th year post-burn, with a 32% reduction in the number of trees per acre. This result is compatible with the 18.5 percent reduction that occurred in the fifth-year post-burn, in which the larger sample size allows us to be more confident of the results.

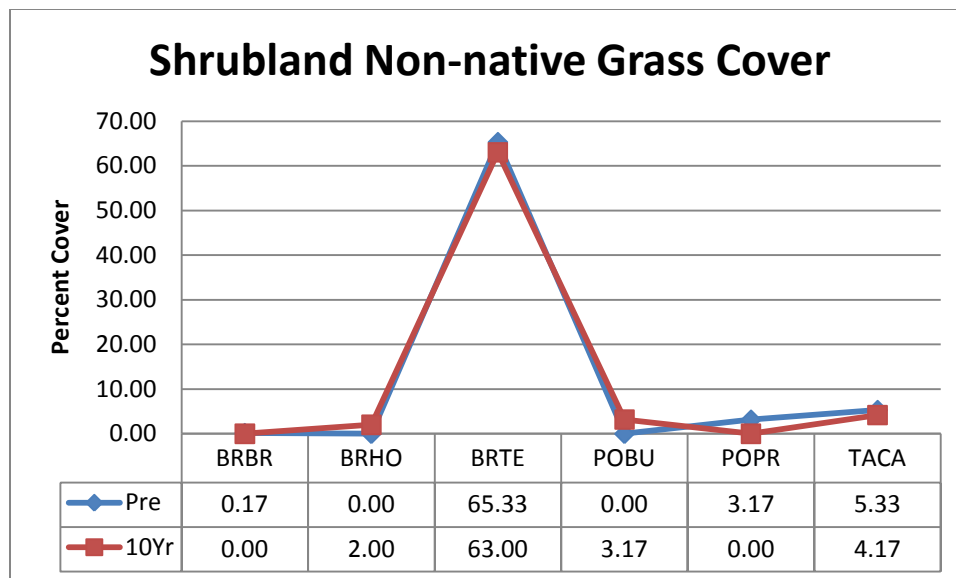
Shrubs: The objective to reduce shrub density was maintained in both the forest and shrub-dominated units through the tenth year post-burn (58 and 68 percent reduction, respectively). We are not confident of this result in the forest due to the small sample size, although the fifth-year post-burn results also suggest a large decrease in shrubs (82% reduction), which may have killed more than the desired number of shrubs per acre. We are more confident of the results in the shrubland, where the shrub reduction was significant by both the fifth and tenth year, and in both cases, killed more of the brush species (predominantly Big Sagebrush (*Artemisia tridentata*) and Rabbitbrush (*Gutierrezia sarothrae*) than intended.

Non-Native Grass Cover: There are some differences between the effects of the prescribed burns on non-native grasses in the juniper forest and sagebrush shrubland. Non-native grass cover before and 10 years following the burns is much lower in the forested areas (10 and 29 percent cover, respectively) than in the shrublands (74 and 72 percent cover, respectively). However, the non-native grass cover has increased by 192 percent in the forest by the tenth year post-burn, whereas, it appears to have declined by 2.3 percent on the brush plots.

Despite these differences, Cheatgrass (BRTE, *Bromus tectorum*) is the predominant non-native grass species in both areas, as shown in the two graphs below. Rattlesnake brome (BRBR, *B. briziformis*), Soft brome (BRMO, *B. mollis* or BRHO, *B. hordeaceus*) and Medusa-head grass (TACA, *Taniatherum caput-medusae*) are also common in the juniper forest. Bulbous bluegrass (POBU, *Poa bulbosa*) and Kentucky bluegrass (POPR, *Poa pratensis*) are found in addition to these species in the shrubland.

A complete list of understory species encountered in the plots is included as Appendix 1 of this report.





Recommendations:

The tenth year post-burn results are preliminary, given the small sample size. However, these results suggest that prescribed burning in the juniper forest and sagebrush shrubland has had long-lasting effects and impacts on these ecosystems. Although objectives to reduce sagebrush and juniper have been successful, the reduction of sagebrush in the shrubland has been greater than desired, and thus, does not warrant re-entry until the shrub layer has recovered. The burn prescription should be revised to protect more of the sagebrush before any additional shrubland units are burned.

The increase in cheatgrass cover in the forested areas, where it had initially been sparse, is a concerning impact. Fire management goals must be weighed alongside other resource priorities before additional burning in the juniper forest would be advisable. These recommendations will be reevaluated as more plots reach their tenth-year post-burn.

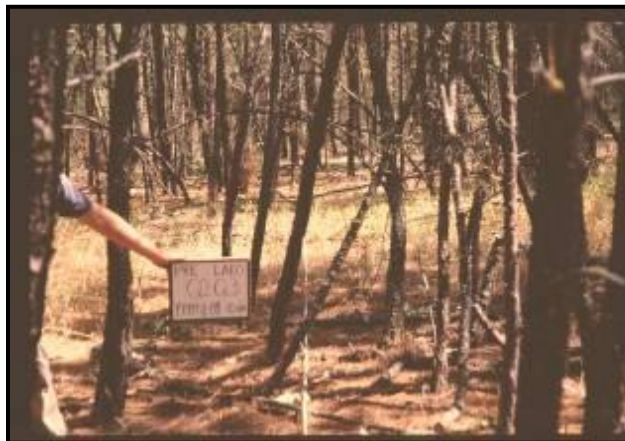
Lake Roosevelt National Recreation Area



FPIPO1D010-04: Preburn 2001
Ponderosa Pine- Snowberry forest



FPIPO1D010-04: 5yrs Post-thin/burn 2009
Ponderosa Pine- Snowberry forest



FPIPO1D010-09: Preburn 2001
Ponderosa Pine- Snowberry forest



FPIPO1D010-09: 5yrs Post-thin/burn 2009
Ponderosa Pine- Snowberry forest

LARO: Lake Roosevelt National Recreation Area				
Monitoring Unit	Management Objective (Restoration)	Results for Comparison (2 Yr post thin & burn)	Monitoring Results (5 Yrs post thin & burn)	Objective Achieved?
Ponderosa Pine - Snowberry Forest (FPIPO1D10)	1) Reduce mean basal area to 40 - 60 Ft ² / acre as measured 2 years after treatment.	1) x=79.5% Reduction, 90%CI (46.8<x<112.1), n=6 Pre=115.8 Yr02=23.8 Ft ² /acre	1) x=84.7%Reduc, 90%CI (53.2<x<116.2), n=6 Pre=115.8, Yr5= 17.7 Ft ² /acre	1) No: Overachieved
	2) Maintain an average woody fuel load of 2–6 tons/acre 2 years after treatment.	2) n=6 Pre = 4.23 tons/acre, SD 4.01 Yr02=6.62 tons/acre, SD 6.00	2) n=6 Pre= 7.6 tons/acre, SD 5.6, Yr05= 18.1 tons/ acre, SD 9.91	2)No
	3) Reduce litter and duff fuel loading by 40-95% 2 years after treatment	3) 69.0% Reduction, n=6 Pre=28.55 tons/acre, SD 3.22 Yr02=8.84 tons/acre, SD 2.12	3) 73.4% Reduction, n=6 Pre=28.55 tons/acre, SD 3.22 Yr05= 7.60 tons/acre, SD 3.00	3)Yes
	4) Maintain a minimum of 30 percent cover of native understory vegetation (graminoids, grass-like, forbs, ferns, vines, shrubs, subshrubs) 2 years after the initial treatment.	4)148=% Increase, 90%CI (87.3<x<208.7), n=6 Pre=34.6, Yr02= 85.2 %Cover	4) x=79.9% Increase, 90%CI (50.12<x<109.7) , n=6 Pre=34.6, Yr05= 62.2 %Cover	4)Yes
	5) Accept <20% increase of non-native understory vegetation from the pre-treatment condition by 2 years following treatment.	5) x=465.9% Increase, 90% CI, (277.1<x<654.6), n=6 Pre=3.4, Yr02=18.4 %Cover	5) x=413.4% Increase, 90% CI, (15.8<x<821.2), n=6 Pre=3.4, Yr05= 17.9 %Cover	5)No

Lake Roosevelt National Recreation Area

These are the results of an analysis of fire effects on six plots for five years following burning and thinning. Three plots are from the Cloverleaf/Gifford burn unit, and three are from the North Evans unit. Second-year post-burn results of these same plots (NPCB 2006 YER) are included for comparison.

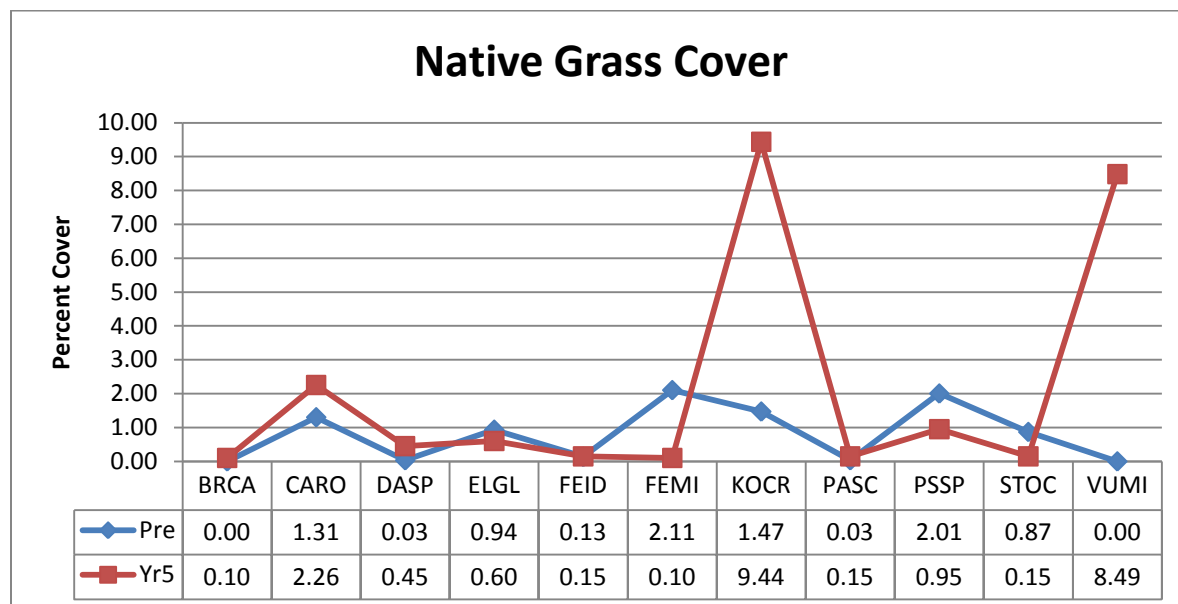
Trees: Basal area continued to decline in the fifth year following the burns. The pre-burn basal area (115.8 ft²/acre) was reduced by 79.5 percent (to 23.8 ft²/acre) by the second year post-burn, and by 84.7 percent (to 17.7 ft²/acre) by the fifth year post-burn. These results exceeded the desired basal area reduction of 40-60 ft²/acre. These units were predominantly comprised of dense small diameter trees that were thinned in order to allow the few remaining trees to release. Although there was an increase of 4.2 ft²/acre between the first and second years post-burn (NPCB 2006 YER), delayed mortality by the fifth year post-burn resulted in a 25% reduction of basal area in the remaining trees between the second and fifth years post-burn.

Woody Fuels: Although the woody fuel loading was close to the desired range of 2 to 6 tons per acre after the second year post-burn (6.62 tons/acre), it had greatly exceeded this range by the fifth year post-burn (18.1 tons per acre). Seventy-five percent of the downed fuel in these units are 1000-hour fuels (>3 inches in diameter). This increase in large woody debris was expected due to the large number of snags in the Evans unit, many of which fell during a wind event a few years ago.

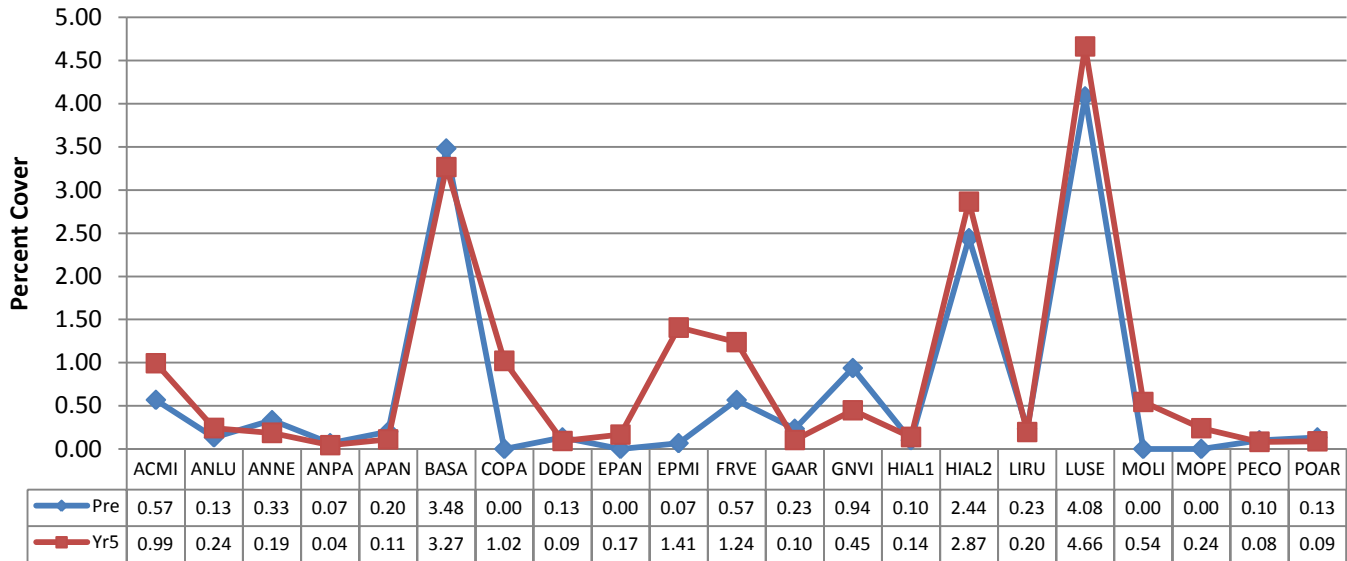
Litter and Duff: Unlike the woody fuels, the objective to reduce the organic layer (litter and duff) by 40 to 95% was maintained in the fifth year post-treatment (7.6 tons/acre, a 73% reduction from pre-treatment). On the fifth year post-burn the litter load was 1.7 tons/acre and the duff load was 5.9 tons/acre. Duff was the predominant component of the organic layer before the treatments (92% of the organic), although more of it was consumed by the treatment, and less of it recovered than the litter, thus reducing the relative percentage of duff to 77% by the fifth year post-treatment.

Native Cover: The objective to maintain a minimum of 30 percent cover of the native understory vegetation, including shrubs, was successfully maintained after the fifth year post-treatment. The native cover jumped to 148 percent in the second year post-burn, but dropped back to an 80 percent increase (62.2 percent cover) in the fifth year. This is still very impressive. Most of the overall increase in native cover is due to two native grasses (crested hairgrass (KOCR, *Koeleria cristata*) and small fescue (VUMI, *Vulpia microstachys*)), as shown in the first graph below.

Please note that the native forb cover chart does not include species that have less than 0.1% cover, except for the Nuttall's pussytoes (ANPA, *Antennaria parvifolia*), which is state-listed as sensitive. The species names that correspond to the four-letter codes are included in Appendix 2.

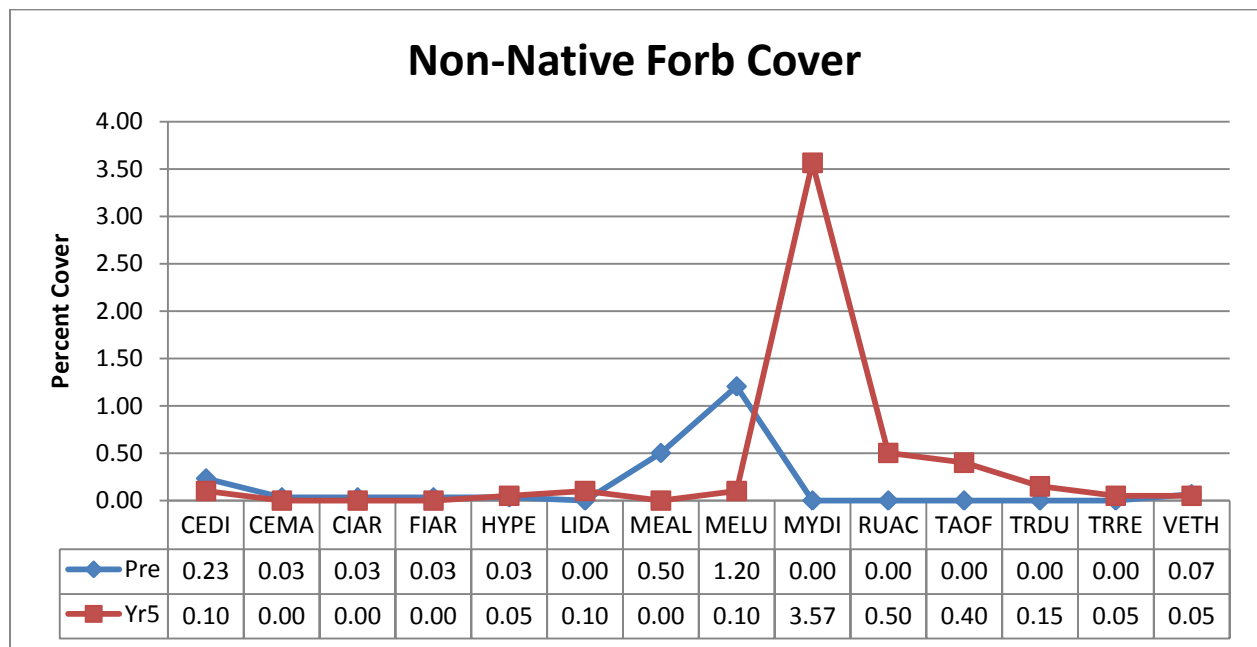
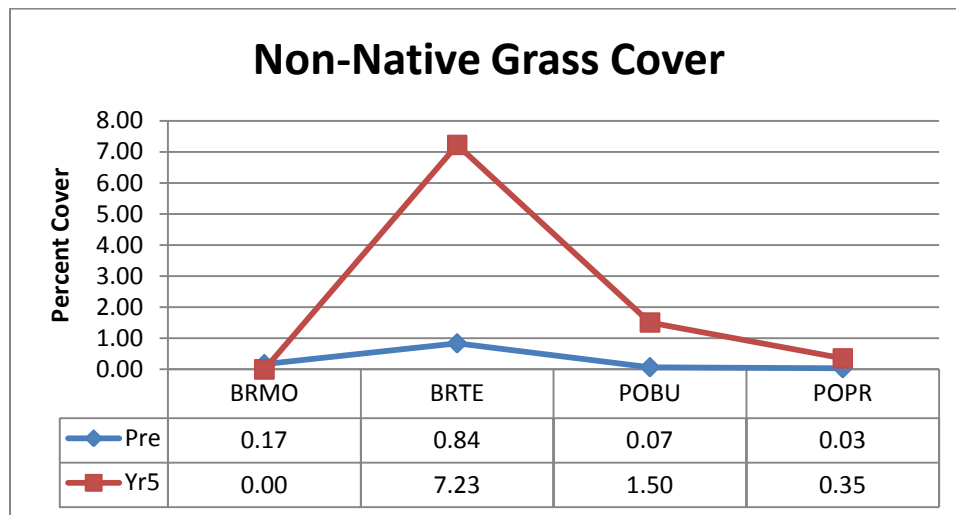


Native Forb Cover



Non-native Cover: Unfortunately, non-native cover has increase even more substantially than native cover in the post-burn plots, and consequently the objective to accept no more than a 20% increase in non-native cover by the second year post-treatment is far from being achieved. The pre-treatment cover of 3.4% increased by 766% in the first year (NPCB 2006 YER), subsided to a 466% increase by the second year (18.4 % cover) and to a 413% increase by the fifth year. The initial response of the non-natives may continue to decline over time; however this should be monitored closely.

The two graphs below clearly show that cheatgrass (BRTE, *Bromus tectorum*) and forget-me-not (MYDI, *Myosotis discolor*) are the culprits for the dramatic increases in non-native grasses and forbs, respectively. The cheatgrass cover increased to 7.2 percent, and a 3.6 percent cover of forget-me-nots emerged post-burn. Although these percentages are still relatively small, and are less than those of the more prolific native plants, they do highlight a potential problem with invasives. Mitigation techniques, such as treating non-native populations with herbicide, should be considered before the situation worsens.



Recommendations:

The prescribed burn program at LARO is making progress towards reducing hazard fuels in the wildland-urban interface despite exceeding basal area reduction goals in a few of the first units. Subsequent understory or pile burns will be needed to continue to reduce woody fuels, whereas litter and duff loading and understory cover are at appropriate levels. Finally, controlling Cheatgrass in areas that have been burned, or that will burn in the future needs to be discussed and prioritized.

North Cascades National Park



FPSME5D09-08: Open Canopy Douglas Fir/Ponderosa Pine Forest monitoring type



FPSME5-D09-18: Open Canopy Douglas Fir/Ponderosa Pine Forest monitoring type



FPSME4D10-08: Closed Canopy Douglas Fir/Ponderosa Pine Forest monitoring type



FPSME4D10-16: Closed Canopy Douglas Fir/Ponderosa Pine Forest monitoring type

North Cascades National Park			
Monitoring Types	Monitoring Variables	Closed Canopy Monitoring Type (FPSME4D10)	Open Canopy Monitoring Type (FPSME5D09)
Douglas fir / Ponderosa Pine Forest	1) Pole density	1) $x = 55.31$ trees/acre , SE=14.45, 90%CI, n=9	1) $x = 29.13$ trees/acre , SE=9.24, 90%CI, n=10
	2) Overstory tree density	2) $x = 145.69$ trees/acre , SE=13.87, 90%CI, n=9	2) $x = 48.16$ trees/acre , SE=7.81, 90%CI, n=10
	3) Total basal area	3) $x = 228.14$ Ft ² /acre, SE=17.35, 90%CI, n=9	3) $x = 105.92$ Ft ² /acre, SE=18.22, 90%CI, n=10
	4) % Cover of individual non-native species	4) $x = 0$ % Cover, SE=0 90%CI, n=9	4) $x = 0.60$ % Cover BRTE, SE=0.41, 90%CI, n=10 $x = 0.03$ % Cover POBU, SE=0.41, 90%CI, n=10
	5) Non-native herbaceous ground cover (ferns, graminoids, grass-like, forbs, vines)	5) $x = 0.0\%$ Non-native Cover, SE=0, 90%CI, n=9	5) $x = 0.63\%$ Cover, SE=0.45, 90%CI, n=10
	6) Native herbaceous ground cover (ferns, graminoids, grass-like, forbs, vines)	6) $x = 16.2$ % Native Cover, SE=5.81, 90%CI, n=9	6) $x = 50.1$ % Native Cover, SE=7.40, 90%CI, n=10
	7) Total fuel load	7) Total Fuel loading =41.70 tons/acre, SE=3.10, n=9	7) Total Fuel loading =35.72 tons/acre, SE=4.79, n=10
	a) 1-hour fuels	a) 1-hour Fuel loading =0.94 tons/acre, SE=0.10, n=9	a) 1-hour Fuel loading =0.23 tons/acre, SE=0.04, n=10
	b) 10-hour fuels	b) 10-hour Fuel loading =2.56 tons/acre, SE=0.49, n=9	b) 10-hour Fuel loading =1.07 tons/acre, SE=0.17, n=10
	c) 100-hour	c) 100-hr Fuel loading =3.06 tons/acre, SE=0.63, n=9	c) 100-hr Fuel loading =1.09 tons/acre, SE=0.33, n=10
	d) 1,000-hour fuels	d) 1000-hr Fuel loading = 7.03 tons/acre, SE=1.63, n=9	d) 1000-hr Fuel loading =8.08 tons/acre, SE=1.98, n=10
	e) litter and duff	e) Litter and Duff Fuel loading =28.11 tons/acre, SE=1.49, n=9	e) Litter and Duff Fuel loading =25.25 tons/acre, SE=4.65 n=10

North Cascades National Park

Two new monitoring types have been developed for the Contour prescribed fire units in the wilderness surrounding the valley of Stehekin. The monitoring types represent the open (11-40% canopy cover) and closed (>40 % canopy cover) stands within the Douglas fir / Ponderosa pine forest. The objectives for these monitoring types are described in the tables below. This report compares the pre-burn conditions found in the first 9 plots in the closed canopy type and 10 plots in the open canopy type, all of which are randomly located within the Ranch, Rainbow, Boulder and Bueller Contour Units.

Closed Canopy Objectives

Variable	Desired Future Condition	Time frame
Trees	10- 50% reduction in trees/acre	5 years
	Increase relative number of large trees by $\geq 5\%$	5 years
Ground Fuels	50-95% reduction in 1 and 10 hr fuels	2 year
	10-80% reduction in 100 hr. fuels	2 year
	$\geq 10\%$ reduction in 1000 hr. fuels	2 year
	20-90% reduction in Litter & Duff	2 year
Understory Vegetation	Maintain, or increase native understory cover	2 years
	Accept less than 20% increase in existing non-native cover, Alert resource staff to presence of new non-natives.	1 year

Open Canopy Objectives

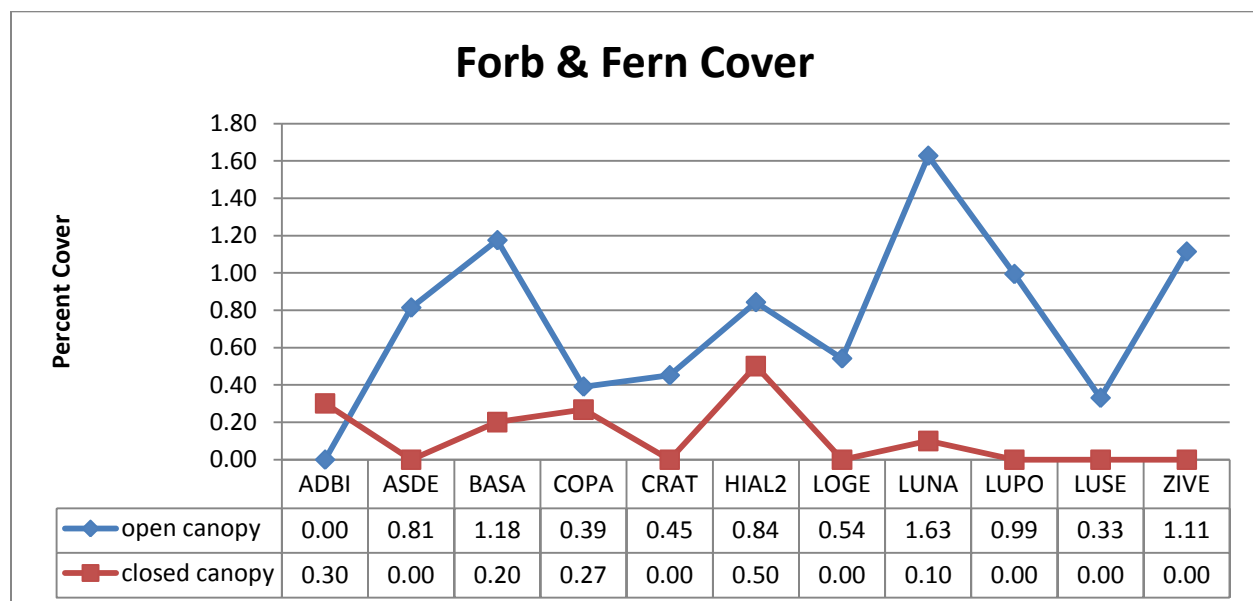
Variable	Desired Future Condition	Time frame
Trees	Maintain or reduce trees per acre by $\leq 10\%$,	5 years
	Maintain $\geq 50\%$ relative percentage of large trees per acre.	5 years
Ground Fuels	50-95% reduction in 1 and 10 hr fuels	2 years
	10-80% reduction in 100 hr. fuels	2 years
	$\geq 20\%$ reduction in 1000hr fuels	2 years
	20-90% reduction in Litter & Duff	2 years
Understory Vegetation	Maintain, or increase native understory cover	2 years
	Accept less than 20% increase in existing non-native cover, Alert resource staff to presence of new non-natives.	1 year

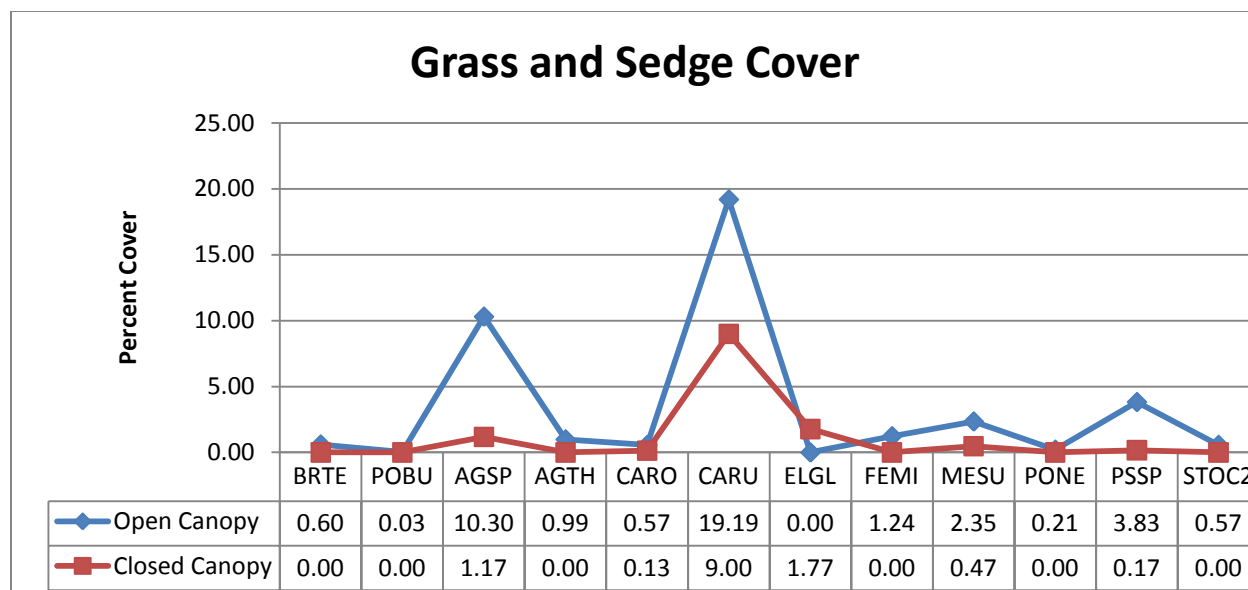
Trees: The number of overstory (≥ 15 cm dbh) and pole (2.5 to < 15 cm dbh) trees per acre are analyzed separately. There are almost twice as many pole trees in the closed canopy plots (55 trees/acre) as in the open canopy plots (29 trees/acre), and roughly three times as many overstory trees in the closed canopy plots (146 trees/acre) as in the open canopy plots (48 trees/acre). The open canopy plots contain a greater percentage of larger diameter overstory trees than the closed canopy plots, given that despite having only one-third the number of overstory trees, the basal area is almost half that of the closed canopy plots (106 Ft²/acre and 228 Ft²/acre, respectively).

Understory: Detecting the presence of non-native species along the vegetation transects is a high priority monitoring objective. Although none were encountered in the closed canopy transects, there is a 0.63 percent cover in the open canopy (0.60% Cheatgrass (BRTE, *Bromus tectorum*), and 0.03% Bulbous bluegrass (POBU, *Poa bulbosa*)). The presence of non-natives within the plots that are not found along the vegetation transects has not been analyzed for this report, but will be examined once entry of this information has been completed.

As expected, the total native herbaceous ground cover is more than twice as great in the open canopy plots as in the closed canopy plots, with 50 and 16 percent cover, respectively. The graphs below show the cover of all species with a 0.3 percent cover or greater. A complete list of species is included as Appendix 3.

The open canopy plots contained a predominance of Silvercrown (LUNA, *Luina nardosmia*) and Arrowleaf Balsamroot (BASA, *Balsamorhiza sagittata*), whereas Hawkweed (HIAL2, *Hieracium albertinum*), and Pathfinder (ADBI, *Adenocaulon bicolor*) had the greatest forb and fern cover in the closed canopy. Pinegrass (CARU, *Calamagrostis rubescens*) had the most plentiful cover in both open and closed canopy plots, followed by Bluebunch wheatgrass (AGSP, *Agropyron spicatum*) and Blue wildrye (ELGL, *Elymus glaucus*) in the open and closed canopy plots, respectively.





Fuels: The fuel loading and distribution amongst the time-lag fuel classes were similar in the open and closed canopy monitoring types. The total fuel load (woody + litter and duff) was 41.7 tons/acre in the closed canopy and 35.7 tons/acre in the open canopy. The litter and duff constituted the majority of the tonnage, with closed and open canopy plots having 28.1 and 25.3 tons/acre, respectively. The 1000-hour (>3 inch diameter) time-lag fuel loadings were largest among the woody fuels in each monitoring type (closed = 7.0 tons/acre, open = 8.1 tons/acre).

Recommendations: The desired future conditions for these monitoring types are still in a draft form. Fire and resource staff should review these conditions and make suggestions. There are additional data collected that can be queried from this dataset, including insect and disease ratings, seedling density, shrub cover and canopy heights. Suggestions for additional analyses are welcome.

San Juan Island National Historical Park



GBRTE1D01-10 Annual Brome monitoring type



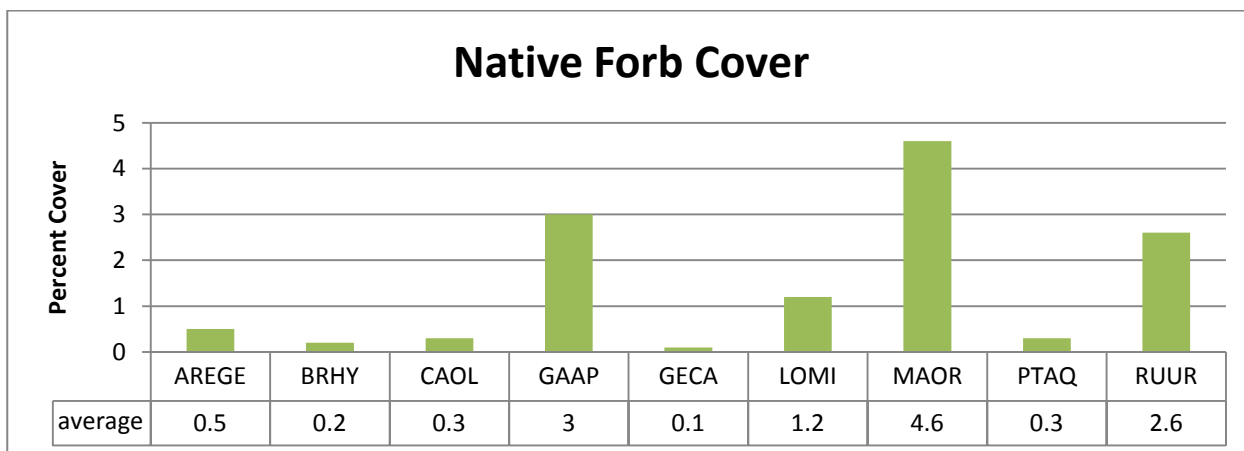
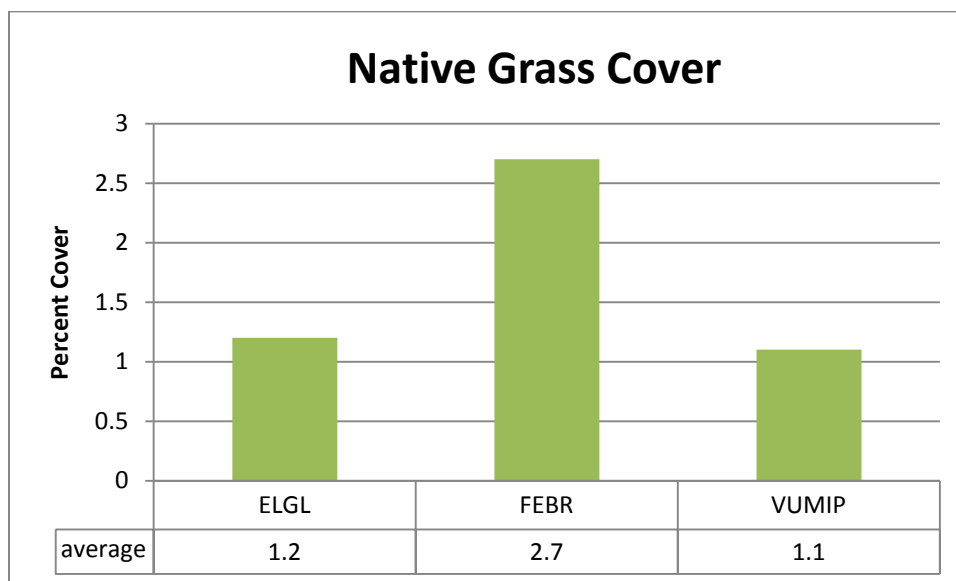
GBRTE1D01-08 Annual Brome monitoring type

San Juan Island National Historical Park		
Monitoring Type	Monitoring Objectives	Pre-burn Conditions
GBRTE1D01 Annual Brome	1) Increase or maintain the relative cover of native grasses and forbs within 10% of pre-burn by 2nd year post-burn a) grass b) forbs 2) Reduce or maintain the relative cover of non-native grasses and forbs within 10% of pre-burn cover by 2nd year post-burn a) grass b) forbs	Total Vegetation = 187.9% Cover 1) % Relative Cover: native vegetation a) Grass/Total = 2.7% Relative Cover, Pre =5.0% grass cover, SE=3.4, 90% CI, n=10 b) Forbs/Total= 6.8% Relative Cover, Pre =12.8 % forb cover, SE=4.0, 90%CI, n=10 2) % Relative Cover: non-native vegetation a) Grass/Total= 66.3% Relative Cover, Pre=124.5 % grass cover, SE=6.4, 90%CI, n=10 b) Forbs/Total=24.3% Relative Cover, Pre =45.6 % forb cover, SE=6.0, 90%CI, n=10

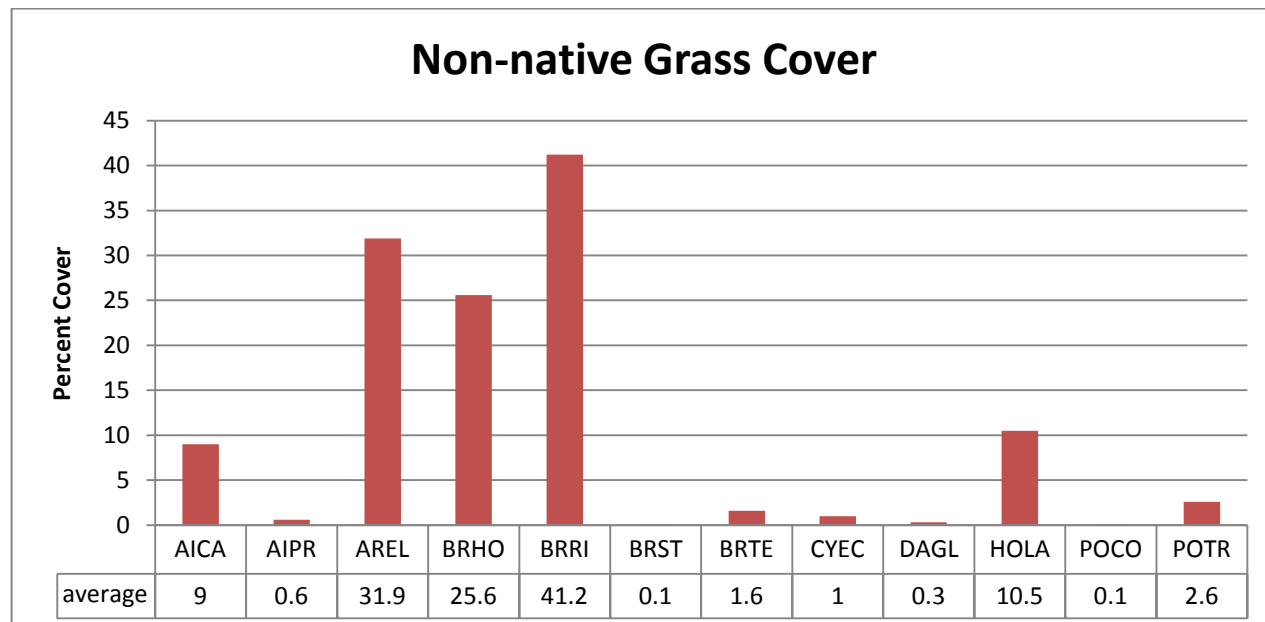
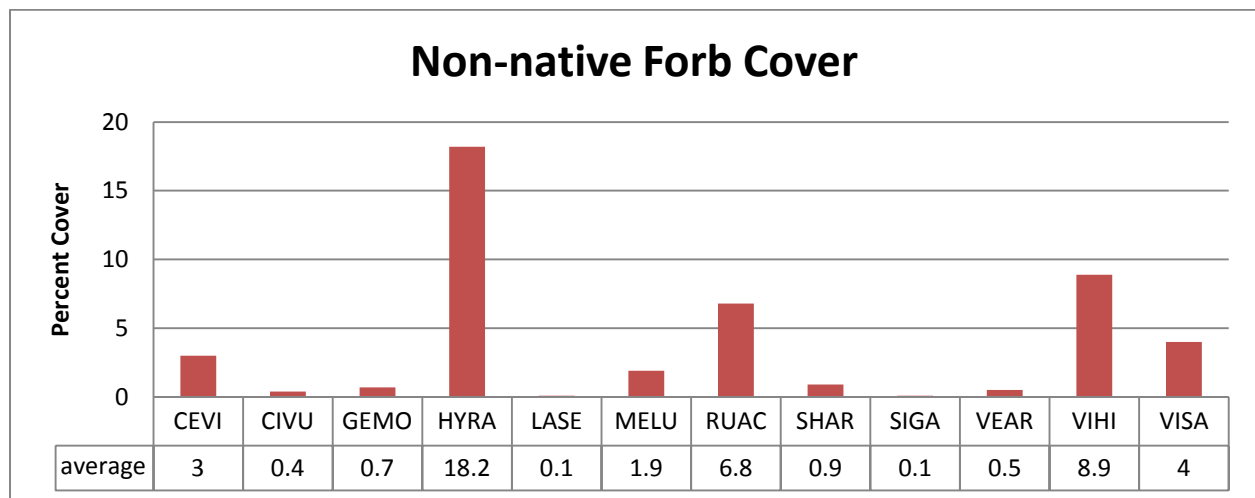
San Juan Island National Historical Park

A new annual brome monitoring type was developed to monitor the grasses in the interior of the Young Hill Prescribed burn area. This new monitoring type, consisting of grass transects, supplements the Garry Oak woodland plots that are located along the perimeters of Young Hill. This new monitoring type was developed to track the effects of the prescribed burns on cheatgrass and other non-native annual grasses that were not captured by the Garry Oak monitoring type. This is a report of the conditions found along the 10 new grass transects.

Native Vegetation: One of the primary objectives of this monitoring type is to increase or maintain the relative cover of native vegetation. Currently, the relative cover of native vegetation is 9.5 percent (18% native cover of 188% total cover). Forbs constitute 7 percent of the relative cover (13% cover), compared to grasses with only 3 percent relative cover (5% cover). The first graph below shows that Alpine fescue (FEBR, *Festuca brachypylla*) makes up over half the native grass cover. Two vines, Coastal manroot (MAOR, *Marah oreganus*) and California blackberry (RUUR, *Rubus ursinus*), and one forb, Bedstraw (GAAP, *Galium aparine*), dominate the native understory, where they comprise 10 percent of the total forb cover. A complete list of the species (and their corresponding four-letter codes) that are encountered on the grass transects is in Appendix 4.



Non-native Vegetation: Maintaining, if not reducing the relative cover of non-natives to within 10% of the pre-burn condition is another important objective of this monitoring type. Non-native species have a hold on this monitoring type, with 91 percent relative cover (170% cover), most of which is grass (66% relative cover, 125% cover) rather than forbs (24% relative cover, 46% cover). Hairy cat's ear (HYRA, *Hypochaeris radicata*) is the most common non-native forb (18% cover), and Ripgut brome (BRRI, *Bromus rigidus*), Soft brome (BRHO, *Bromus hordeaceus*) and Tall oatgrass (AREL, *Arrhenatherum elatius*) are the predominant grasses, with 41, 26 and 32 percent cover, respectively.



Recommendations: The monitoring objectives listed for this new monitoring type are in a draft form. They should be discussed at the spring fire management meeting to determine whether they are acceptable.

Whitman Mission National Historic Site



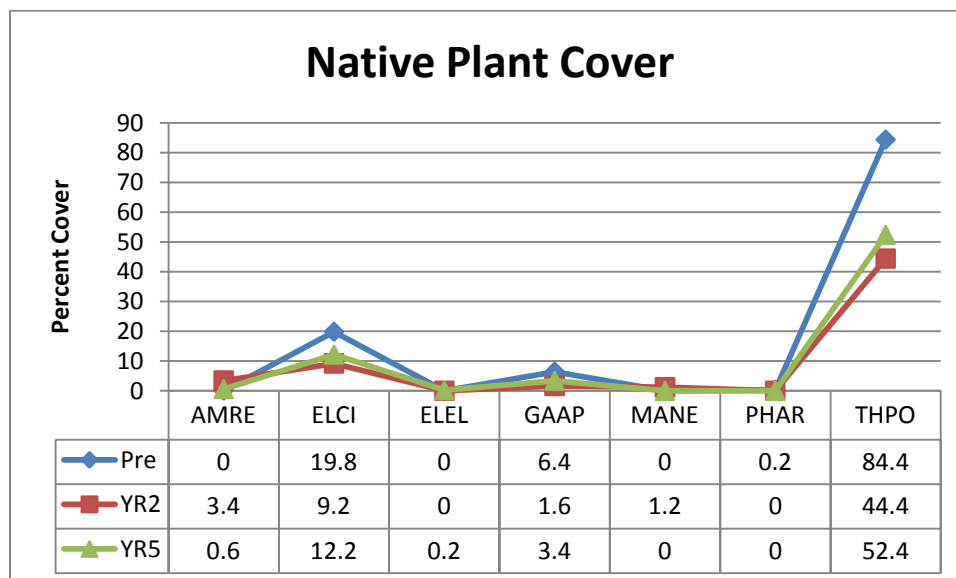
NPCB Fire Effects staff in Giant Wild Rye Meadow Restoration monitoring type

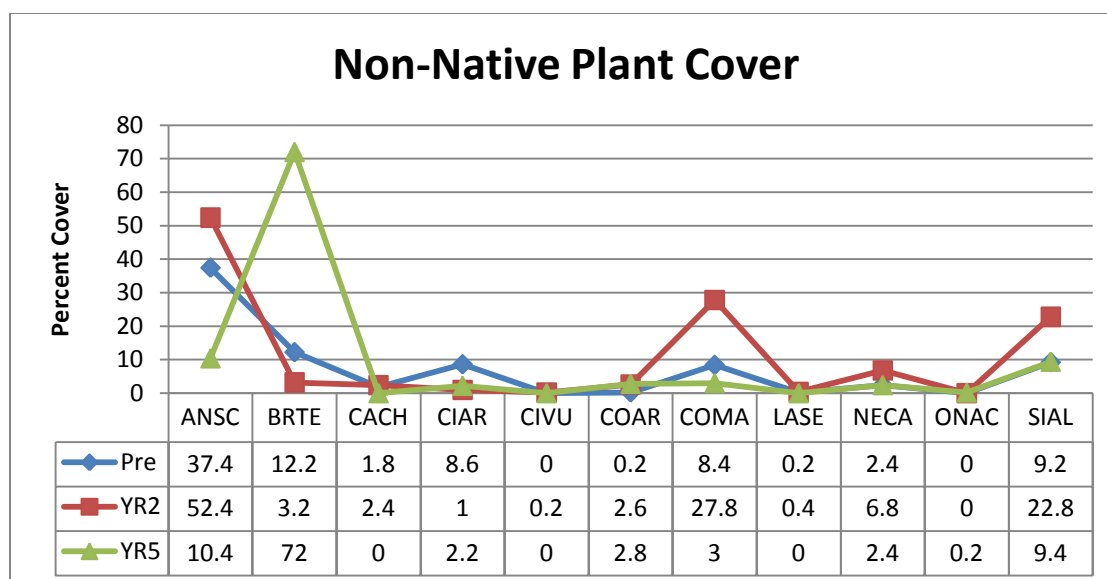
WHMI: Whitman Mission National Historic Site					
Monitoring Unit	Management Objective (Restoration)	Results for Comparison 2nd Year Post-burn	Monitoring Results 5th Year Post-burn	Objective Achieved?	
Giant Wild Rye – Meadow Restoration (GTHPO1D01)	1)Relative cover of planted restoration grassland species is $\geq 40\%$ of all species by the 2 nd year postburn.	Total Vegetation = 179.4% Cover 1)planted/total = 29.9% Relative Cover, Yr02=53.6 % Cover, SD=23.4, n=5 (Pre=104.4/191.2 %)	Total Vegetation = 171.2% Cover 1)planted/total = 37.7% Relative Cover, Yr05=64.6% Cover, SD=27.4, n=5	1) Not Quite	
	2)Relative cover of noxious weed species $\leq 40\%$ of all species by the 2 nd year postburn.	2) noxious/total = 47.1% Relative Cover, Yr02=84.4% Cover, SD=24.2, n=5 (Pre=66.6/191.2 %)	2) noxious/total = 51.2% Relative Cover, Yr05=87.6 % Cover, SD=33.6, n=5	2) No	

The primary goal of the prescribed burn in the giant wild rye dominated meadow at Whitman Mission in 2004 was to reduce thatch from the planted grass species within this restored grassland. The monitoring is focused on the cover of the planted species relative to weedy species. The restoration grasses include Tall wheatgrass (THPO, *Thinopyrum ponticum*), Basin wildrye (ELCI, *Elymus cinereus*) and Reed canarygrass (PHAR, *Phalaris arundinaceae*). The noxious weed species are Cheatgrass (BRTE, *Bromus tectorum*), Chervil (ANSC, *Anthriscus scandicina*), Poison hemlock (COMA, *Conium maculatum*) and Canadian thistle (CIAR, *Cirsium arvensis*).

The relative cover of planted restoration species is on the rebound. It had declined from a pre-burn level of 55 percent relative cover to 30 percent relative cover in the second year post-burn, however, it recovered 8 percent of its relative cover by the fifth year post-burn (38% relative cover, 65 % cover). Unfortunately, the relative cover of noxious weeds also continued to increase in the fifth year post-burn. The relative cover was 35 percent before the burn, 47 percent two years post-burn, and 51 percent (87.6 % cover) by the fifth year post-burn.

The two graphs below display the percent cover of all species encountered along the transects. Appendix 5 lists the species names that correspond to the four-letter codes in these charts. It is evident that the majority of the total native plant cover is comprised of tall wheatgrass (THPO), which maintains a 52.4 percent cover in the fifth year post-burn. Unfortunately, the graph of non-native plant cover indicates that Cheatgrass (BRTE) has increased substantially, to 72 percent cover, in the fifth year post-burn. This response indicates a serious problem that warrants proactive measures.





Recommendations: It is reassuring to see that the restoration grasses are on the rebound, however, the staggering increase in Cheatgrass must be addressed before subsequent burns would be advisable. Cheatgrass alters fire regimes by increasing the amount of dry fine fuel available, and it invades newly burned areas before restoration species can recover.

Table 4. Fire Ecologist Accomplishments/Focus Areas

Category	Percent Time	Accomplishments and/or areas of activities
Planning	1%	FMP planning for SAJH, NOCA
Presentations	2%	NW Science Conference presentation, UW Science presentation
NPS Meetings/task groups	1%	NOCA Wilderness Committee, NOCA Housing Committee
Interagency work	2%	Fire data for LANDFIRE
Fire Assignments	2%	FEMO at NOCA
Research	30%	Doctoral Research at UW
Data entry	1%	Fire data
Data Collection	30%	Stehekin Fire History, SAJH Annual Brome, OLYM fuels
Data analysis	10%	2009 Year End Report, FMH data requests, Research summaries
Supervision/Admin	20%	Hiring, supervision, travel, payroll, etc.
Training	1%	Fire Refresher, Defensive Driving
Miscellaneous		Things that don't fit in other categories – BAER, BAR plans, etc.

Table 5. Fire Effects Crew Accomplishments/Focus Areas

Category	Percent Time	Notes
FMH plots	45%	The NPCB crew visited 59 FMH plots at 5 different sites in 2009.
WUI plots		None
CBI plots		None
other plots	7%	Installation and pre-reads of 5 wildfire plots, 2 rereads of 2008 RX burn plots, helped install and read 10 SAJH Annual Brome treatment plots, monitored SAJH native grass on Young Hill.
Fire Assignments	10%	HECM, FEMO, initial attack, lookout, RX fire crew, and public relations duties.
Fuels Project work		None
Data entry	15%	Combined with “downtime” during fire assignments at NOCA. Completed all data entry for 2009 and remaining data entry from 2008
Data analysis	2%	Data analysis for SAJH Grass assessment and 2009 Year End Report.
Supervision/Admin	6%	Travel, payroll, credit card statements, logistics planning, vehicle maintenance, purchasing, hiring, performance evaluations,
Training	5%	S-271 HECM, S-240 FOBS, RX-310 Fire Effects, NOCA Fire Refresher, Working with Weeds, First Aid/CPR, Defensive Driving
Miscellaneous	6%	GIS assistance to Fire Management team, Fire FX presentations to NOCA and OLYM staff, RX fire monitoring reports, photo database organization, RX Fire History project per FMH site, writing FFI data entry protocols
Plant identification / Herbarium maintenance	4%	Keying out and mounting voucher specimens, inventorying herbarium and field voucher collections

Annual Report Supplement Additional Information

1. Identify types of fire effects monitoring databases or spreadsheets being used (e.g., FFI, Access, Excel).
 1. NOCA Voucher collection: Excel
 2. Park Species lists: Excel
 3. RAPs: Access
 4. Fire FX plot data: FFI
 5. Fire FX plot history/workload: Excel
 6. GPS point catalog: Excel
2. Annual Meetings – The fire ecologist presented the fire effects monitoring results to the Olympic NP Fire Management Staff and the SAJH Superintendant and Resource Manager. Monitoring results for NOCA and LARO were discussed informally with resource and fire management staff. There were no monitoring results to discuss with WHMI or JODA in 2009, but the results of this report will be discussed with resource staff at these parks in the spring of 2010.

Appendix 1.

JODA List of Understory Species Encountered in the Plots

Code	Species Name	Lifeform	Nativity	brush plot	forest plot
ACMI	<i>Achillea millefolium</i>	forb	Native	absent	present
AMLY	<i>Amsinckia lycopsoides</i>	forb	Native	present	absent
AMTE	<i>Amsinckia tessellata</i>	forb	Native	present	absent
ARTR	<i>Artemisia tridentata</i>	shrub	Native	present	present
ASFI	<i>Astragalus filipes</i>	forb	Native	present	present
BRBR	<i>Bromus briziformis</i>	grass	Non-native	absent	present
BRHO	<i>Bromus hordeaceus</i>	grass	Non-native	present	absent
BRMO	<i>Bromus mollis</i>	grass	Non-native	absent	present
BRTE	<i>Bromus tectorum</i>	grass	Non-native	present	present
CHSE	<i>Chamaesyce serpyllifolia</i>	forb	Native	present	absent
COGR	<i>Collomia grandiflora</i>	forb	Native	absent	present
CROC	<i>Crepis occidentalis</i>	forb	Native	present	absent
DERI	<i>Descurainia richardsonii</i>	forb	Non-native	absent	present
DRVE	<i>Draba verna</i>	forb	Non-native	present	present
ELEL	<i>Elymus elymoides</i>	grass	Native	absent	present
EPMI	<i>Epilobium minutum</i>	forb	Native	absent	present
ERCI	<i>Erodium cicutarium</i>	forb	Non-native	present	absent
ERNA	<i>Ericameria nauseosa</i>	shrub	Native	absent	present
ERST	<i>Eriogonum strictum</i>	forb	Native	present	absent
ERV1	<i>Eriogonum vimineum</i>	forb	Native	present	absent
FEID	<i>Festuca idahoensis</i>	grass	Native	absent	present
GUSA	<i>Gutierrezia sarothrae</i>	shrub	Native	present	present
HECU	<i>Helianthus cusickii</i>	forb	Native	absent	present
HOUM	<i>Holosteum umbellatum</i>	forb	Non-native	present	present
LEPE	<i>Lepidium perfoliatum</i>	forb	Non-native	present	present
LIDA	<i>Linaria dalmatica</i>	forb	Non-native	present	absent
LOMA	<i>Lomatium macrocarpum</i>	forb	Native	absent	present
MIGR	<i>Microsteris gracilis</i>	forb	Native	absent	present
PLMA	<i>Plectritis macrocera</i>	forb	Native	absent	present
POBU	<i>Poa bulbosa</i>	grass	Non-native	present	absent
POSE	<i>Poa secunda</i>	grass	Native	present	present
PSSP	<i>Pseudoroegneria spicata</i>	grass	Native	present	present
SAVE	<i>Sarcobatus vermiculatus</i>	shrub	Native	absent	present
SIAL	<i>Sisymbrium altissimum</i>	forb	Non-native	present	absent
SPCR	<i>Sporobolus cryptandrus</i>	grass	Native	present	absent
SPMU	<i>Sphaeralcea munroana</i>	forb	Native	present	absent
TACA	<i>Taeniatherum caput-medusae</i>	grass	Non-native	present	present
VUMI	<i>Vulpia microstachys</i>	grass	Native	absent	present

Appendix 2.

LARO List of Understory Species Encountered in the Plots

Code	Species Name	Lifeform	Nativity
ACMI	Achillea millefolium	forb	Native
AGRE	Agoseris retrorsa	forb	Native
ANLU	Antennaria luzuloides	forb	Native
ANNE	Antennaria neglecta	forb	Native
ANPA	Antennaria parvifolia	forb	Native
ANRO	Antennaria rosea	forb	Native
APAN	Apocynum androsaemifolium	forb	Native
BASA	Balsamorhiza sagittata	forb	Native
BRCA	Bromus carinatus	grass	Native
BRMO	Bromus mollis	grass	Non-native
BRTE	Bromus tectorum	grass	Non-native
CARO	Carex rossii	grass	Native
CEDI	Centaurea diffusa	forb	Non-native
CEMA	Centaurea maculosa	forb	Non-native
CIAR	Cirsium arvense	forb	Non-native
CLLA	Claytonia lanceolata	forb	Native
COCA	Collinsia parviflora	forb	Native
COGR	Collomia grandiflora	forb	Native
COPA	Conyza canadensis	forb	Native
DASP	Danthonia spicata	grass	Native
DENU	Delphinium nuttallianum v. linepetalum	forb	Native
DODE	Dodecatheon dentatum	forb	Native
DOPU	Dodecatheon pulchellum	forb	Native
ELGL	Elymus glaucus	grass	Native
EPAN	Epilobium angustifolium	forb	Native
EPMI	Epilobium minutum	forb	Native
FEID	Festuca idahoensis	grass	Native
FEMI	Festuca microstachys	grass	Native
FIAR	Filago arvensis	forb	Non-native
FRVE	Fragaria vesca	forb	Native
GAAR	Gaillardia aristata	forb	Native
GNVI	Gnaphalium viscosum	forb	Native
HIAL1	Hieracium albertinum	forb	Native
HIAL2	Hieracium albiflorum	forb	Native
HISC	Hieracium scouleri	forb	Native
HYPE	Hypericum perforatum	forb	Non-native

Code	Species Name	Lifeform	Nativity
KOCR	Koeleria cristata	grass	Native
LIDA	Linaria dalmatica	forb	Non-native
LIRU	Lithospermum ruderales	forb	Native
LUSE	Lupinus sericeus	forb	Native
MEAL	Medicago alba	forb	Non-native
MELU	Melilotus lupulina	forb	Non-native
MOLI	Montia linearis	forb	Native
MOPE	Montia perfoliata	forb	Native
MYDI	Myosotis Discolor	forb	Non-native
PASC	Panicum scribnerianum	grass	Native
PECO	Penstemon confertus	forb	Native
POAR	Potentilla arguta	forb	Native
POBU	Poa bulbosa	grass	Non-native
POGL	Potentilla glandulosa	forb	Native
POGR	Potentilla gracilis	forb	Native
POPR	Poa pratensis	grass	Non-native
PSSP	Pseudoroegneria spicata	grass	Native
RUAC1	Rumex acetosella	forb	Non-native
SEIN	Senecio integerrimus	forb	Native
STOC	Stipa occidentalis	grass	Native
TAOF	Taraxacum officinale	forb	Non-native
TRDU	Tragopogon dubius	forb	Non-native
TRRE	Trifolium repens	forb	Non-native
VETH	Verbascum thapsus	forb	Non-native
VUMI	Vulpia microstachys	grass	Native
ZIVE	Zigadenus venenosus	forb	Native

Appendix 3.

NOCA List of Species Encountered on Herbaceous Transects

Code	Species Name	Lifeform	Nativity
ADBI	Adenocaulon bicolor	forb	Native
AGSP	Agropyron spicatum	grass	Native
AGTH	Agrostis thurberiana	grass	Native
AMAL	Amaranthus albus	forb	Native
AMAL	Amelanchier alnifolia	shrub	Native
APAN	Apocynum androsaemifolium	shrub	Native
ARNE	Arctostaphylos nevadensis	subshrub	Native
ARCO	Arnica cordifolia	forb	Native
ARMA	Arenaria macrophylla	forb	Native

ASDE	<i>Aspidotis densa</i>	fern	Native
ASLE	<i>Aster ledophyllus</i> var. <i>ledophyllus</i>	forb	Native
BASA	<i>Balsamorhiza sagittata</i>	forb	Native
BEAQ	<i>Berberis aquifolium</i>	shrub	Native
BRIN	<i>Bromus inermis</i>	grass	Native
BRTE	<i>Bromus tectorum</i>	grass	Non-native
CARU	<i>Calamagrostis rubescens</i>	grass	Native
CAMA5	<i>Calochortus macrocarpus</i>	forb	Native
CARO	<i>Carex rossii</i>	sedge	Native
CEVE	<i>Ceanothus velutinus</i>	shrub	Native
CHGR	<i>Cheilanthes gracillima</i>	fern	Native
CHUM	<i>Chimaphila umbellata</i>	forb	Native
COGR	<i>Collomia grandiflora</i>	forb	Native
COPA	<i>Collinsia parviflora</i>	forb	Native
CRAT	<i>Crepis atribarba</i> ssp. <i>originalis</i>	forb	Native
CRIN	<i>Crepis intermedia</i>	forb	Native
CRCR	<i>Cryptogramma acrostichoides</i>	fern	Native
DIHO	<i>Disporum hookeri</i> var. <i>oreganum</i>	forb	Native
ELGL	<i>Elymus glaucus</i>	grass	Native
ERFI	<i>Erigeron filifolius</i> var. <i>filifolius</i>	forb	Native
FEMI	<i>Festuca microstachys</i>	grass	Native
FEOC	<i>Festuca occidentalis</i>	grass	Native
GAAP	<i>Galium aparine</i>	forb	Native
HIAL2	<i>Hieracium albertinum</i>	forb	Native
HISC	<i>Hieracium scouleri</i>	forb	Native
HODI	<i>Holodiscus discolor</i>	shrub	Native
KEGA	<i>Kelloggia galioides</i>	forb	Native
LOGE	<i>Lomatium geyseri</i>	forb	Native
LONU	<i>Lomatium nudicaule</i>	forb	Native
LUNA	<i>Luina nardosmia</i> var. <i>glabrata</i>	forb	Native
LUPO	<i>Lupinus polyphyllus</i> var. <i>burkei</i>	forb	Native
LUSE	<i>Lupinus sericeus</i> ssp. <i>sericeus</i>	forb	Native
MESU	<i>Melica subulata</i> var. <i>subulata</i>	grass	Native
MIGR	<i>Microsteris gracilis</i>	forb	Native
OREX	<i>Oryzopsis exigua</i>	grass	Native
OSCH	<i>Osmorhiza chilensis</i>	forb	Native
OSDE	<i>Osmorhiza depauperata</i>	forb	Native
PAMY	<i>Paxistima myrsinites</i>	subshrub	Native
PEFR	<i>Penstemon fruticosus</i>	forb	Native
PEPR	<i>Penstemon pruinosis</i>	forb	Native
PESP	<i>Penstemon speciosus</i>	forb	Native
PHLE	<i>Philadelphus lewisii</i>	shrub	Native
POBU	<i>Poa bulbosa</i>	grass	Non-native

PONE	<i>Poa nervosa</i> var. <i>wheeleri</i>	grass	Native
POAR	<i>Potentilla arguta</i>	forb	Native
PODO	<i>Polygonum douglasii</i>	forb	Native
POMU	<i>Polystichum munitum</i> ssp. <i>imbricans</i>	fern	Native
POMI	<i>Polemonium micranthum</i>	forb	Native
PREM	<i>Prunus emarginata</i>	shrub	Native
PSSP	<i>Pseudoroegneria spicata</i>	grass	Native
PTAQ	<i>Pteridium aquilinum</i>	fern	Native
ROGY	<i>Rosa gymnocarpa</i>	shrub	Native
RUPA	<i>Rubus parviflorus</i>	subshrub	Native
SASC	<i>Salix scouleriana</i>	shrub	Native
SAGR	<i>Sanicula graveolens</i>	forb	Native
SPBE	<i>Spiraea betulifolia</i>	shrub	Native
STOC2	<i>Stipa occidentalis</i> var. <i>occidentalis</i>	grass	Native
SYAL	<i>Symphoricarpos albus</i>	shrub	Native
ZIPA	<i>Zigadenus paniculatus</i>	forb	Native
ZIVE	<i>Zigadenus venenosus</i>	forb	Native

Appendix 4.

SAJH List of Understory Species Encountered in the Grass Plots

Code	Species Name	Lifeform	Nativity
AICA	<i>Aira caryophyllea</i>	grass	Non-native
AIPR	<i>Aira praecox</i>	forb	Non-native
AREL	<i>Arrhenatherum elatius</i>	grass	Non-native
AREG	<i>Argentina egedii</i> ssp. <i>egedii</i>	grass	Non-native
BRHO	<i>Bromus hordeaceus</i> ssp. <i>hordeaceus</i>	grass	Non-native
BRHY	<i>Brodiaea hyacinthina</i>	forb	Native
BRRI	<i>Bromus rigidus</i>	grass	Non-native
BRST	<i>Bromus sterilis</i>	grass	Non-native
BRTE	<i>Bromus tectorum</i>	grass	Non-native
CAOL	<i>Cardamine oligosperma</i>	grass	Native
CEVI	<i>Cerastium viscosum</i>	forb	Non-native
CIVU	<i>Cirsium vulgare</i>	forb	Non-native
CYEC	<i>Cynosurus echinatus</i>	grass	Non-native
DAGL	<i>Dactylis glomerata</i>	forb	Non-native
ELGL	<i>Elymus glaucus</i>	grass	Native
FEBR	<i>Festuca brachyphylla</i>	grass	Native
GAAP	<i>Galium aparine</i>	forb	Native
GECA	<i>Geranium carolinianum</i>	forb	Native

GEMO	Geranium molle	forb	Non-native
HOLA	Holcus lanatus	grass	Non-native
HYRA	Hypochaeris radicata	forb	Non-native
LASE	Lactuca serriola	forb	Non-native
LOMI	Lotus micranthus	forb	Native
MELU	Medicago lupulina	forb	Non-native
POCO	Poa compressa	grass	Non-native
POTR	Poa trivialis	grass	Non-native
RUAC	Rumex acetosella	forb	Non-native
RUUR	Rubus ursinus	vine	Native
SHAR	Sherardia arvensis	forb	Non-native
SIGA	Silene gallica	forb	Non-native
VEAR	Veronica arvensis	forb	Non-native
VISA	Vicia sativa	forb	Non-native
VUMIP	Vulpia microstachys var. pauciflora	grass	Native

Appendix 5.

WHMI List of Species Encountered on Grass Transects

Code	Species Name	lifeform	nativity
AMRE	Amsinckia retrorsa	forb	Native
ANSC	Anthriscus scandicina	forb	Non-native
BRTE	Bromus tectorum	grass	Non-native
CACH	Cardaria chalapensis	forb	Non-native
CIAR	Cirsium arvense	forb	Non-native
COAR	Convolvulus arvensis	vine	Non-native
COMA	Conium maculatum	forb	Non-native
ELCI	Elymus cinereus	grass	Native
ELEL	Elymus elymoides	grass	Native
GAAP	Galium aparine	forb	Native
LASE	Lactuca serriola	forb	Non-native
NECA	Nepeta cataria	forb	Non-native
ONAC	Onopordum acanthium	forb	Non-native
PHAR	Phalaris arundinacea	grass	Native
SIAL	Sisymbrium altissimum	forb	Non-native
THPO	Thinopyrum ponticum	grass	Native