2017

Puget Sound Ecological Fire Program

2017 Summary Report

Ecological Fire Partnership
Land Managing Partners

Washington – Puget Sound
Center for Natural Lands Management
Fisher Ranch
Joint Base Lewis McChord
The Nature Conservancy
Thurston County
WA Department of Fish and Wildlife
WA Department of Natural Resources
Wolf Haven International
Pacific Rim Institute
Whidbey Camano Land Trust

Oregon
City of Eugene
Lane County
The Nature Conservancy
Oregon Department of Fish and Wildlife
Oregon Department of Forestry
US Army Corps of Engineers
US Bureau of Land Management
US Fish and Wildlife Service
US Forest Service

Questions or comments? Contact:
Mason McKinley, Center for Natural Lands Management, mmckinley@cnlm.org.
John Richardson, Joint Base Lewis-McChord, john.f.richardson1.civ@mail.mil
Amanda Stamper, The Nature Conservancy, amanda.stamper@tnc.org

Cover: South Sound fire team integrates with Oregon burn crews at The Nature Conservancy's Sycan Marsh Preserve, completing a 600-acre prairie enhancement burn unit on Coyote Creek.

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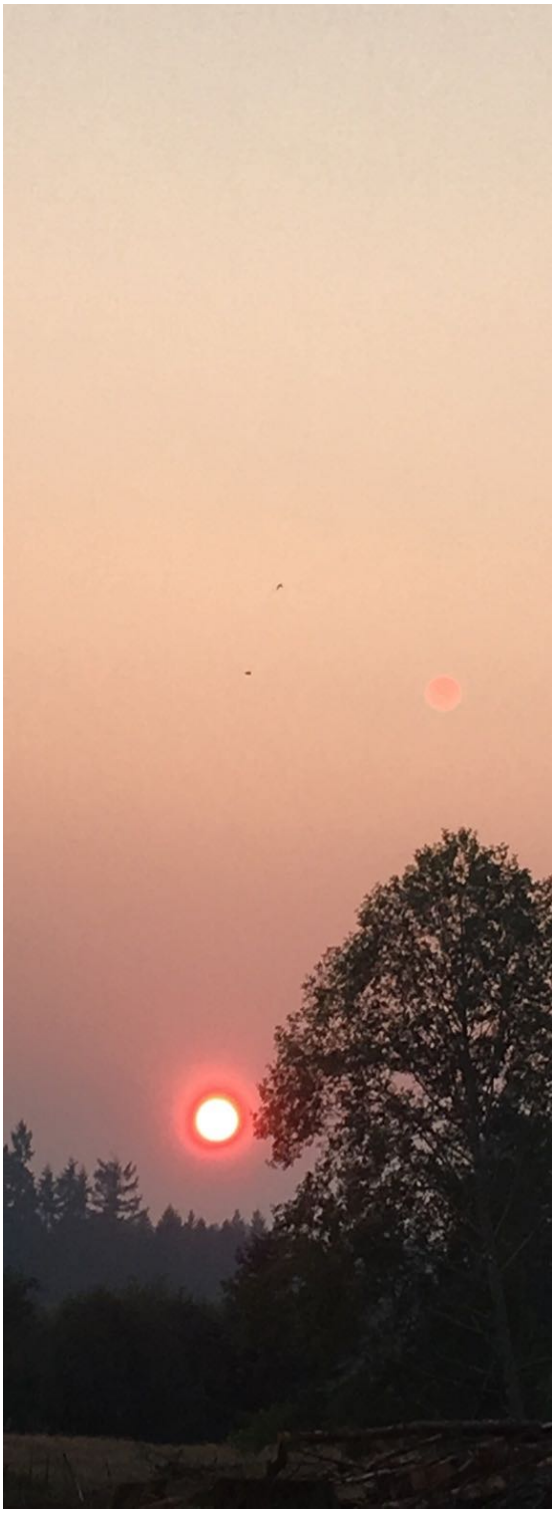
Introduction

The 2017 burn season is most notable in five ways: 1) unprecedented heavy smoke inundation in Puget Sound from big wildfires throughout the west; 2) an offsite wildfire that spread onto Scatter Creek Wildlife Area and burned almost half of the property; 3) spending freeze on ACUB funds and lack of an approved state capital budget; 4) our first year of collaborating with Willamette Prescribed Fire Partnership and Sycan Marsh Preserve burn programs in Oregon; and 5) our burn program was awarded PNW Society of Ecological Restoration's "Program of the Year Award" and their annual "Special Award".



A smoky sunset during the intrusion from British Columbia (M.McKinley)

We started burning late-May at JBLM (focused on Ponderosa pine litter reduction) and made good progress on ACUB and JBLM sites up through the end of July. Just as our native prairie plants were becoming fully cured, a series of multi-day smoke incursions from the east side of the Cascades repeatedly shut down our operations. During the six weeks between August 1 and Sept 9 (normally our primary burn window), we were shut down due to bad air quality for three weeks. During that same time the wildfire burned 345 acres of Scatter Creek, which ended up re-directing already limited burn operation funds to do wildfire restoration. Smoke and fire danger sensitivities in the community led to further shutdowns for Thurston County burns until October 2nd, by which point, the fall rains were well underway. State and ACUB funding restrictions also impacted our ability to burn on Thurston County sites.

In spite of these challenges, we were able to complete many of our goals in South and North Sounds and sent crews to assist on several burns in Oregon (under a new improved agreement). At JBLM, integration of Forestry and ITAM crews into our burn efforts was further improved, allowing us to take better advantage of our reduced burn window. Though we didn't get much opportunity to utilize it, the DNR approval process for burning off-JBLM during the summer burn ban was greatly improved this year. Unfortunately, several priority Thurston County burn sites went unburned due to all the unusual challenges we faced. In total, we completed 2037 acres during 80 prescribed burns on seven different properties in Puget Sound. Though plans by Oregon burn partners to assist in Puget Sound were thwarted by weeks of bad air quality, our Puget prescribed fire crews were able to support them on 13 burns in Oregon, totaling 1442 acres.

Background

A diverse mosaic of fire dependent prairies once dominated the south Puget Sound region and was scattered throughout the rest of lowland Washington. The prairies were interspersed with coniferous and deciduous woodlands and wetlands. Prairies and oaks were maintained through frequent anthropogenic fire until around the mid-1800's. As settlement increased, burning was halted and these habitats were converted to agriculture, housing and industry, or were invaded by conifer forest. Lack of managed fire during the past 150 years has contributed to significant habitat loss and impact to native species. Today, residual native prairies are thought to be restricted to about 3% of their former extent.

A robust and highly active collaborative conservation program has evolved over the past few decades to protect and restore the remaining prairie/oak mosaic habitat and its dependent species. Regional planning for these habitats and associated rare species has identified the integrated use of fire as a cornerstone for restoration.

Spring bloom following 2016 burn at Tenalquot (M.McKinley) and post burn seed sowing at JBLM (B.Kronland).

Unable to rely on existing local fire suppression resources to support ecological burns at the needed scale, local conservation partners have implemented a partner-driven prescribed ecological burn program with capacity to accomplish burning at the landscape-level. Prior to 2008, we were only conducting one to two burns annually. Since then, we have steadily scaled up our operational capacity, regularly completing 70-90 burns in a year.

Fire is one of several tools that we utilize in our conservation approach and is not simply an end in itself. Fire is being returned to a highly fragmented system that has been altered by invasive plants and lack of fire. Rare populations of plants and animals also need special consideration when planning fire, especially when habitat structure has been altered by invasives and fuel build-up. Fires are one part of our comprehensive and evolving science-based restoration approach that also includes: additional weed control measures; establishment of native plants through planting and sowing; and species specific strategies to recover the rarest species. On JBLM, burns also target reduction of invasive shrubs for improved military training in low quality habitats, in an effort to reduce training pressure on higher quality prairies and woodlands.

Collaborative Approach

The core principle behind the Puget Sound ecological burn program is collaboration: together we are more effective and efficient at meeting our shared objectives than we are on our own. Indeed, this approach extends to all our ecological management activities. By pooling resources, each partner's overall commitment of resources can remain relatively low, but when combined, the team has remarkable capacity that is more easily sustained over the long-term.

Spring Ponderosa pine under burn at JBLM TA12 (M.McKinley).

Joint Base Lewis-McChord (JBLM) has the largest prescribed burn program of any of the Puget Sound partners, but currently has insufficient internal capacity to meet its ecological burn objectives. In 2012, Center for Natural Lands Management (CNLM) inherited its burn program from The Nature Conservancy (TNC), which has a robust international prescribed fire infrastructure, with a more than 50-year proven track record. CNLM has developed a strong fire management program and continues to be a coordination hub for regional ecological burning. There has been a notable deficit in regionally available and nationally qualified burn bosses. Both CNLM and JBLM have been able to fill that need by bringing in burn bosses from out of the region and training up local firefighters. These burn bosses are important to support training, provide burn program and planning reviews, and implement burns. The other land-managing partners have significant limitations in their capacity to burn, either having few resources, or limited availability during the summer burn window.

First 2017 Puget Sound assisted burn in the Willamette Valley at Finley Wildlife Area (M.McKinley)

The collaborative strategy has proven very effective. The Puget Sound Ecological Fire Partnership has demonstrated its capacity and, when conditions allow, can meet most of the current demand for ecological fire in the Puget Sound region. Our collaborative efforts are expanding beyond Puget Sound, as we seek mutually beneficial partnerships with partners throughout Washington and Oregon that share ecological fire objectives. Burn windows of different regions often do not fully overlap, providing opportunities to share resources when and where they are most needed and further improving training and learning exchange.

Additional Information

The appendices of this report provide additional background information. Appendix 1 provides a rationale for ecological burning in Puget Sound prairie, oak and pine habitats. Appendix 2 describes the South Puget Sound's fire program goals. Appendix 3 lists additional supporting documents.

2017 Burn Program Accomplishments

Season Summary

As noted in the introduction, 2017 was a burn season of smoke, heat and funding challenges. Though we were unable to complete some of our highest priority Thurston County burns, overall, the program demonstrated great resiliency and ended up with another year of impressive results. In total, we completed 2037 acres during 80 prescribed burns on seven different properties in Puget Sound. In addition, our Puget prescribed fire crews were able to support ecological burning in Oregon (13 burns, totaling 1442 acres) thanks to a newly updated fire memorandum of understanding that facilitates responsive exchange of resources and funding. A long list of unusual challenges limited our ability to burn in Thurston County off JBLM, and several high priority burn units were left unburned. See Appendix 5 for complete list of burn units.

Completing final ignitions on a unit on a day with intense fire effects at Training Area 14 (S.Krock)

Weather and Burn Conditions

The 2017 summer was the hottest (average daily temperature), driest (total precipitation) and smokiest (since air quality measurements began) for the Puget Sound Region. Fortunately for regional stream flows, this followed an unusually wet and cold winter/early spring. The tile plots below give a helpful graphic depiction of weather and air quality conditions since 2008. The dry conditions allowed fuels to become well-cured by mid- to late-July and restricted late season green-up until early-October. This provided for a long burn window in our region – from May 22 until October 11. Many of our prime weeks in this window were shut down due to smoke inundation from out-of-region wildfires, which pushed more of our burns to cooler days and promoted a mix of fire effects.

	April	May	June	July	August	September
2008	53	64	69	75	76	73
2009	58	66	73	81	75	73
2010	56	61	66	75	75	68
2011	52	60	67	73	76	74
2012	58	64	65	73	78	73
2013	57	66	73	77	78	69
2014	60	67	70	80	80	74
2015	59	67	79	82	79	69
2016	66	68	72	75	80	70
2017	56	66	72	78	82	73

Tile plot of burn season average max temperature for the past 8 years in Olympia (K. Hill)

Ecological Fire Resources

It was a mixed year for resources. While our core team of dedicated firefighters was lower than in recent years due to funding restrictions, our collaboration on JBLM with Forestry and ITAM has continued to improve. Further complicating matters, JBLM was unable to support any burns on ACUB designated properties due to an ongoing audit of the national ACUB program. Firefighter support from WDFW and DNR's Natural Areas Program went largely untested due to the various challenges those programs faced.

In total, we had a pool of 88 NWCG qualified firefighters among our primary partners. Of these, about 25 of the JBLM and CNLM firefighters formed the core dedicated

burn crew. Partners also provided access to four Type 6 engines, five Type 7 engines and six UTV engines, plus a list of fire equipment managed by JBLM's forestry program.

Burn Activity Beyond South Sound

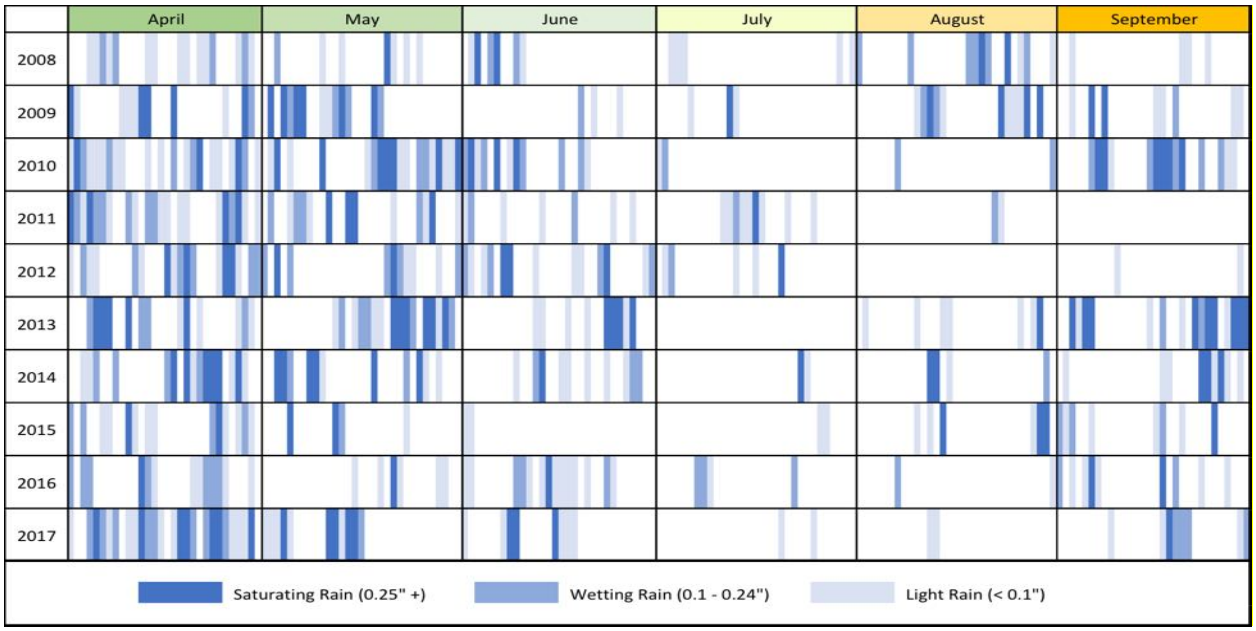
In addition to the Oregon burn work mentioned above, we returned to Whidbey Island, where we worked with a local DNR engine team to complete four burn units for Pacific Rim Institute and Whidbey Camano Land Trust.

Training

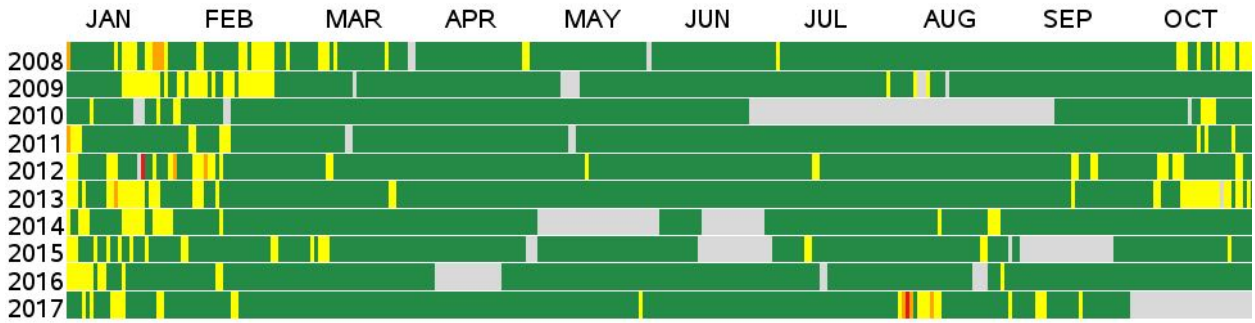
2017 added a fifth Type Two Burn Boss to our team, the third to achieve this qualification after years of training as a member of our program. This has further boosted our flexibility and puts us in a good position to take advantage of sudden burn opportunities and reduces burn boss fatigue.

Awards

This year, our burn program was honored to receive the PNW Society of Ecological Restoration's "Program of the Year Award" in recognition of our advancement of prescribed ecological fire in the region. In addition, Mason McKinley received their annual "Special Award" for his role in the development and success of the burn program over the past 10 years.



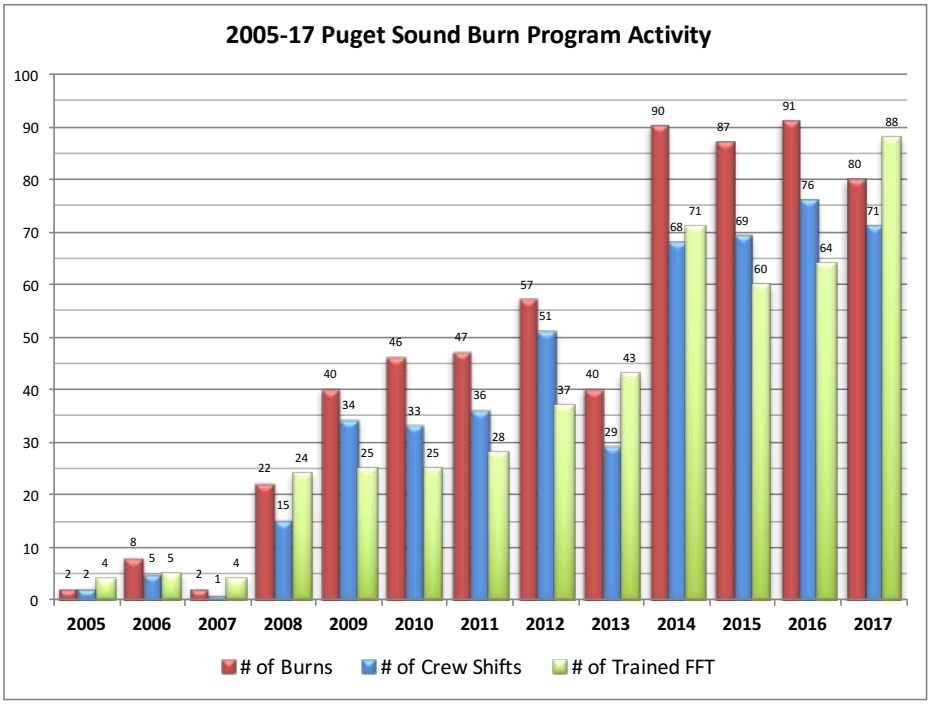
Tile plots of burn season precipitation for the past 8 years in Olympia (K. Hill)



Tile plot of PM2.5 daily AQI values from 2008 to 2017 for Olympia, WA. (www.epa.gov)

I. Operations

CNLM along with JBLM are the two major participants to the South Sound burn program and both continue to play a central coordinating, management and implementation role throughout the region. The ability to conduct numerous burns during our short and unpredictable burn window is made possible by the high degree of cooperation and flexibility from core and external partners and volunteers. The partnership makes concerted efforts to rank burn projects by regional importance, matching burn objectives and regional prioritization with daily changing conditions. Resources work across ownerships to optimize the quantity and quality of our fire activities, often burning with multiple burn teams than may burn on multiple ownerships on the same day.



2005-2017 summary of south and north sound burn activity. A total of 600 burns have been completed since 2008, when our program ramped up.

Operations – Joint Base Lewis-McChord

The JBLM installation is federal owned and has its own fire response capability, placing it outside the jurisdiction of DNR's permitting process and summer burn ban. Burning at JBLM began this year on May 22nd (with a renewed focus on early-season Ponderosa pine understory burning) and continued until October 12th. Throughout the burn season, we took advantage of periods of favorable weather, with periodic no-go days created by rain, smoke intrusions or extreme weather. We curtailed burning for much of August and the beginning of September due to smoke intrusions from Canada, and the Pacific Northwest. We were able to make up for the lost days in the middle of the season because of an extended dry period at the end of September and beginning of October that allowed for successful burning into the second week of October. We completed a total of 64 burns totaling 1895 acres, including six blackline operations and 1 pile burn supporting conversion of forest back to prairie. (See Appendix 5 for list of JBLM burns).

Blackline that was established during peak dry season with burn units on either side completed after rain at TA15 (K.Hill)

2017 was the ninth year that JBLM has implemented its expanded ecological burn program. During August 2012, JBLM delegated responsibility for controlled burning to JBLM Fish and Wildlife. To prepare for this, Fish and Wildlife developed a Prescribed Fire Management Plan, and revamped the burn planning process to better accommodate specific ecological objectives. JBLM's fire management unit (FMU) plans are standardized with the CNLM burn plan template to facilitate use across projects. The FMU planning was implemented in 2013 and continues to be a successful approach, improving operational flexibility and planning efficiency.

We are currently working to establish fuel loading indices to refine our smoke production tonnage calculations. Without confirmed fuel loadings for our prairies, non-site specific photo series are used. Based on these photo series it is assumed that prairie burns consume ¾ tons per acre treated. Preliminary data from fuel load monitoring suggests that fuels on JBLM are representative of the photo series used. Using this fuel loading burning on JBLM is restricted to units 133 acres or smaller in order to meet DNR smoke management permitting requirements. To mitigate for the reduction in unit size, we have made an effort to increase the capacity of the Puget Sound Ecological Fire Partnership to allow for multiple units to be burned per day in different locations. Thanks to support from visiting firefighters and a greatly increased team of qualified firefighters and equipment, we were able to successfully implement this strategy several times this year.

With another large crew of new firefighters this year, we focused on establishing crew cohesion, fireline skill and interoperability. Given the number of operational shifts, JBLM continues to offer an excellent training ground for core and secondary partners, and this provides the added benefit of increasing overall regional prescribed fire expertise.

Spring training burn in canary grass at TA 13 (M.McKinley)

JBLM Operations This Year

- *Rainier Training Area Complex (Weir and Johnson Prairies, Pines Runway and Pipeline).* Completed 9 burn projects totaling 309 acres. Burns within Johnson prairie were curtailed this year due to a wildfire that occurred on the west side of the prairie and covered the majority of blocks JP_01 and JP_04. The wildfire covered almost 1/3 of the prairie habitat. Burns in the RTA targeted general habitat enhancement for Mazama pocket gophers and other rare species, as well as noxious weed control.

- *13th Division Prairie (Training Areas 13-15*). Completed 17 burns totaling 691 acres. Included burns to benefit federally-listed streaked horned lark habitat, future Taylor's checkerspot butterfly release areas, and to promote noxious weed control. Burns in 13th division prairie benefited from the extended season that occurred in early October with 5 of the 17 burns totaling 233 acres occurring after October 1st.
- *Training Area 6.* Completed nine burns totaling 279 acres in pine woodland and streaked horned lark habitat and to promote noxious weed control.
- *Training Areas 7-12.* Completed 18 burn units totaling 250 acres primarily to benefit oak and pine woodland and prairie edge habitat as well as for Taylor's checkerspot butterfly benefit in TA 7S. Burns within TA 7s occupied TCB habitat required multiple exclusions and softlines which required increased resources and slowed burn operations and reduced the ability to conduct multiple operations in a single day. In 2017 spring pine burns were a focus in TA 10 and 12 pine, with 5 of 7 burns within this FMU occurring prior to July 1st.

One of the few remaining old broom patches on priority prairie habitat at JBLM TA15. (K. Hill)

Operations – Thurston County - Army Compatible Use Buffer (ACUB) Sites

Background - Unlike JBLM, which has fire protection responsibility for its lands, Thurston County burns fall under the regulatory jurisdiction of Washington Department of Natural Resources. Almost all the Thurston County burn sites are enrolled in the Army Compatible Use Buffer (ACUB) program, which emphasizes conservation of rare species and habitats to offset regulatory impacts to training on JBLM. ACUB has helped to fund the Thurston County burn program since 2007. Washington Wildlife and Recreation Program (WWRP), US Fish and Wildlife Service, and Washington State Wildlife grants also support many of the burns on Thurston County sites.

Blackline, holding and interior ignition off of a soft line – Unit B at Glacial Heritage.

The Nature Conservancy initially coordinated 1-2 South Sound burns per year starting in 2001 at Glacial Heritage. In 2007, the ecological burn program completed the first fire on TNC's Tenalquot Prairie. These early burns relied heavily on support from DNR regional and local fire districts, and were often restricted by county burn bans. Other ACUB prairie preserves had a similarly limited recent history of fire. In 2007, the ecological exemption was successfully applied to prairie burns on non-federal property during the county burn ban. This was a critical step, allowing us to expand our burn window into the preferred period of late July through early October. In 2013, DNR's Commissioner of Public Lands began to impose state-wide summer burn bans during our core burn season. The effort to develop a clear, reliable and responsive exception process with DNR has been ongoing, and showed promising signs of progress this year.

Thurston County Operations This Year – There has been a notable increase in support by DNR's Wildfire Division for prescribed fire in Washington state following the election of a new Public Lands Commissioner and recent interest by the state legislature. This was demonstrated by delayed implementation of the state summer burn ban to match extreme condition and the transfer of daily burn permit approval during the burn ban back to the region (with streamlined feedback from the Wildfire Division). Opportunities to fully test this new approach were restricted by heavy smoke inundation during our primary burn window, and public concerns posed by the wildfire that burned 345 acres of Scatter Creek South (see Appendix 4) and the extremely dry summer. Notably, we were allowed to burn during high fire danger in July, recognizing actual on-the-ground conditions and our burn team's capacity to mitigate the risks presented on the given burn days. Our non-JBLM operations were also complicated by a last-minute administrative decision that JBLM resources could not augment burns on any ACUB designated sites and that froze ACUB funding. This reduced our operational flexibility and ability to rapidly respond to burn windows.

Burning on Thurston County sites began July 12, when fuels began to cure at our driest site (Glacial Heritage). As our other drier units began to cure, we continued burning Glacial and Tenalquot until August 1, when the smoke inundation from Canada shut down operations for two weeks. After the air cleared, we were able to complete one burn in mid-August at Wolf Haven on a unit that was suitable for

the dry conditions that had developed in the region (light fuels and contingency lines). The following Tuesday, a 345-acre wildfire spread from an adjacent property, burning a majority of Scatter Creek South and some on-site buildings. This elevated political and public concern for the rest of the summer. The wildfire required funding for site rehabilitation, which essentially used up a majority of our remaining operations funds (this was coupled by the state's inability to approve a capital budget). See map of wildfire impact in Appendix 4.

Careful ignitions in main butterfly release swale at Glacial.

The statewide DNR burn ban was issued September 5 and continued until September 30. In spite of the significant rain that fell during the middle of September, requests for exceptions to the burn ban (at Mima, Cavness and Deschutes) were not approved by DNR due to lingering concerns following the Scatter Creek wildfire.. We were finally able to burn again on October 3, and completed burns at Mima Mounds, Glacial and Deschutes under very mild but effective conditions before green up and heavy rains ended the burn season. Budgetary impacts on the burn budget due to ACUB freeze and impacts of Scatter Creek wildfire were fortunately mitigated by our burn work with TNC in Oregon.

Overall, we managed to complete 16 burn units, totaling 160 acres (down from 27 and 222 acres in 2016). Fire effects generally met management objectives, removing sufficient vegetation to facilitate seeding success and weed control. Being able to burn in late-July and August meant drier ground-contacting fuels, and much more satisfactory results than we have had for the past several years when we were restricted from burning during dry conditions by the DNR burn ban.

List of all completed burns in 2017 on Thurston County (non-JBLM) properties.

Count	Shift	Day	Date	Location	Unit	Acres	Burn Boss	Incident #
1	1	1	07/12/17	Glacial Heritage Prairie	2017-B	16	Mason McKinley	GL-RX17.07.12A
2	1	1	07/12/17	Glacial Heritage Prairie	UW Plots	1	Mason McKinley	GL-RX17.07.12B
3	2	2	07/19/17	Glacial Heritage Prairie	2017-D	14	Mason McKinley	GL-RX17.07.19A
4	2	2	07/19/17	Glacial Heritage Prairie	2017-F	34	Mason McKinley	GL-RX17.07.19B
5	3	3	07/26/17	Glacial Heritage Prairie	2017-A	23	Mason McKinley	GL-RX17.07.26A
6	3	3	07/26/17	Glacial Heritage Prairie	2017-C	2	Mason McKinley	GL-RX17.07.26B
7	4	4	08/01/17	Tenalquot Prairie	2017-A	6	Mason McKinley	TQ-RX17.08.01A
8	5	5	08/16/17	Wolf Haven	2017-B	5	Mason McKinley	WH-RX17.08.16A
9	6	6	10/03/17	Glacial Heritage Prairie	2017-E	26	Mason McKinley	GH-RX17.10.03A
10	7	6	10/03/17	Mima Mounds	2017-E	6	Mason McKinley	GH-RX17.10.03B
11	8	7	10/09/17	Deschutes Prairie	2017-A	19	Mason McKinley	DP-RX17.10.09A

Restoration Burns. Burn unit sizes are generally smaller on ACUB sites than on JBLM due to increased adjacency and sensitivity to neighborhoods, working around populations of rare species and smaller management areas.

- *Cavness.* Last minute funding freeze and other complications resulted in no burning at this site.

- *Deschutes Prairie*. This was the last burn off-JBLM, with sufficient cured grass to overcome the effects of green-up and still kill broom. One 19-acre burn unit was completed.
- *Fisher Ranch*. Fisher was a lower priority this year. Last minute funding and other complications resulted in no burning at this site. Burning at this site supports general prairie enhancement, ecological grazing studies and Mazama pocket gopher.
- *Glacial Heritage*. We applied fire to six of the seven planned burn units, totaling 90 acres. These burns support ongoing habitat enhancement for Taylor's Checkerspot butterfly recovery, weed control, site preparation for native seed reintroduction and maintenance of ongoing research blocks.
- *Mazama Meadows Preserve*. While we had a permit and burn plan for this site, we did not have committed plans to conduct any burns, due to lack of specific funding. It is hoped that Mazama will become a mitigation site for Mazama pocket gopher.
- *Mima Mounds NAP*. We completed one burn at Mima this year. This was the last year to use an important restoration grant, making this site a priority for burning. This site is hemmed in by housing, and smoke management is often a challenge. We did not get an opportunity to burn the second priority unit while conditions were sufficiently dry.
- *Scatter Creek Wildlife Area*. A wildfire from an adjacent property burned a majority of Scatter Creek South (345 acres). Rehabilitation of this wildfire consumed all of the available limited funding that were intended for burn operations at Scatter Creek and West Rocky Prairie Wildlife Areas. Burning at this site promotes weed control, native seed establishment, as well as Checkerspot butterfly recovery and Mazama pocket gopher habitat.
- *Tenalquot Preserve*. Conducted high priority, 6-acre burn unit at Tenalquot. Funding freeze limited our ability to get to the second burn unit. Planned burns totaling 30 acres. Burns benefit weed and conifer control, Mazama pocket gopher habitat and planned Taylor's Checkerspot butterfly release.
- *Violet Prairie*. Last minute funding freeze and other restrictions resulted in no burning at this site. Burns at this site support restoration prairie habitat, and likely future colonization by Mazama pocket gopher.
- *West Rocky Wildlife Area*. Unable to complete any burns at this site due to funding freeze and wildfire at Scatter Creek Wildlife Area.
- *Wolf Haven*. One 14-acre burn unit was completed this year. Primary objectives included: benefit for Mazama pocket gopher, weed control, shrub reduction and preparation for subsequent native seeding.

Finishing up test fire at the north end of Mima Mounds Natural Area (D.WIlderman)

Operations – North Sound and throughout Washington

North Puget Sound has some of the longest running Puget Sound prairie burn work in recent history. Yellow Island is a TNC preserve that has had regular fire since 1987, and the National Park Service has been burning at American Camp on San Juan Island for many years. The South Sound burn program has supported prairie burning projects in the North Sound at TNC's Yellow Island and Ebey's Landing preserves, Fort Casey State Park, Pacific Rim Institute (PRI) and Whidbey Camano Land Trust (WCLT) Naas Preserve since 2006. Burns have supported both restoration and research objectives. The South Sound burn program assists with development and review of burn plans and provides burn bosses and other needed crew and resources.

Final moments of ignition at PRI prairie, after a long day of work on Whidbey Island. (J.Deir)

North Sound. We led a total of four burns on one day at the end of August in the North Sound, with crew support from DNR. CNLM worked with PRI and WCLT to develop burn plans for two units at each site and led the burn operations with a mix of South Sound and local DNR crew. Dry conditions on these marine-influenced sites promoted desired fire effects - good consumption of fuels that can be difficult to achieve at these sites. PRI hired a drone operator to film the burns, offering a unique perspective of the crew's activities. The burns will be followed up with weed control and native plant establishment to promote prairie habitat restoration.

2017 North Sound Burns Led and Supported by South Sound Burn Team

Count	Shift	Day	Date	Location	Unit	Acres	Burn Boss	Incident #
1	1	1	8/31/17	Naas-WCLT	Unit 2	2	Mason McKinley	WCLT-RX17.08.31A
2	1	1	8/31/17	Naas-WCLT	Unit 1	1	Mason McKinley	WCLT-RX17.08.31B
3	1	1	8/31/17	PRI Prairie	Unit B	2	Mason McKinley	PRI-RX17.08.31A
4	1	1	8/31/17	PRI Prairie	Unit A	4	Mason McKinley	PRI-RX17.08.31B

Operations – Oregon/South Sound Ecological Fire Collaboration

The South Sound burn program and TNC-Oregon have been working towards a more integrated partnership for many years. The finalization of a new Memorandum of Understanding between CNLM and TNC in 2017 marks a milestone in that relationship. This new MOU covers TNC Oregon and Washington and facilitates the exchange of funds making more feasible to shift resources where and when they are needed most. Our peak burn windows do not overlap, presenting opportunities to optimize deployment of our collaboratively available fire resources, in addition to exchanging knowledge and expertise in the ecological application of fire.

The proximity of Oregon, our mutual support of ecological fire in similar habitats for similar purposes, the offset of our peak burn windows and diverse fuel/burn conditions makes for an ideal informal training exchange between our programs. South Sounders have been able participate on Oregon burns, and vice-versa on a limited training basis for several years, and this year represents a big move forward to formalizing the partnership.

Basket Slough blackline ignition (F.Edwards)

Oregon TNC firefighters attempted to support Puget Sound burning during our main burn season, but were turned back due to smoke impacts from wildfires that occurred during the summer throughout the Pacific Northwest. On the other hand, CNLM and JBLM were able to send firefighters and engines to Oregon for a total of four weeks at the end of September and most of October. This worked well – the Oregon burn season was just getting started as the Puget Sound burns were slowing down due to green-up and cooler/wetter weather. Funding to support CNLM crews helped to offset Thurston County burn program funding reductions. Puget Sound crews were generally only needed in Oregon mid-week, allowing us to accomplish a burn at home, before heading south to burn with the Willamette team.

Willamette Valley. Primary partners this year were USFWS and TNC. NRCS provided support in planning and funding burning on private lands under the Wetland Reserve Program in collaboration with the USFWS Partners for Fish and Wildlife Program. Burning in the south Willamette valley was conducted in cooperation with the City of Eugene and Northwest Oregon District Bureau of Land Management. CNLM is exploring ways to become more involved with conservation in the Willamette Valley - a natural extension of the South Sound prairie and oak ecoregion. Fire is a good early step towards growing that collaboration.

Setting up for research during test fire at Sycan Marsh (F.Edwards),

Sycan Marsh. Sycan Marsh Preserve is another TNC collaborative conservation program, located northeast of Klamath Falls in Oregon. It is an area of high conservation value, providing a network of grasslands, wetlands and dry east-Cascades forest. The burning this year was part of a larger research effort involving many partners (EPA, USFS Rocky Mountain Research Station, USFS Pacific Southwest Research Station, and the National Center for Atmospheric Research, Western Wildland Environmental Threat Assessment Center, Missoula Firelab, Oregon State University, and Montana State University), that broke ground on air quality and fire behavior and effects monitoring and modeling. Additionally, the different fuels and burning conditions provided ample learning opportunities for our South Sound crew.

2017 Puget Sound and Oregon Collaborative Burns

Count	Shift	Day	Date	Location	Unit	Acres	Burn Boss	Incident #
1	1	1	8/31/17	Naas-WCLT	Unit 2	2	Mason McKinley	WCLT-RX17.08.31A
2	1	1	8/31/17	Naas-WCLT	Unit 1	1	Mason McKinley	WCLT-RX17.08.31B
3	1	1	8/31/17	PRI Prairie	Unit B	2	Mason McKinley	PRI-RX17.08.31A
4	1	1	8/31/17	PRI Prairie	Unit A	4	Mason McKinley	PRI-RX17.08.31B
5	3	2	9/27/17	Finley Wildlife Refugue	Middle Prairie Field 31	148	Amanda Stamper	ORFIN-FY17-RX-Middle Prairie
6	5	3	9/28/17	Basket Slough Refugue	Units 4 & 31	60	Amanda Stamper	ORBKS-FY17-RX-Units 31&4
7	5	3	9/28/17	Basket Slough Refugue	Units 2 & 1	70	Amanda Stamper	ORBKS-FY17-RX-Units1&2
8	5	3	9/28/17	Basket Slough Refugue	Unit 8- partial burn	17	Amanda Stamper	ORBKS-FY17-RX-Unit8
9	7	4	10/4/17	Finley Wildlife Refugue	Wood Duck - NRCS unit	15	Amanda Stamper	ORFIN-FY18-RX-Wood Duck
10	7	4	10/4/17	Finley Wildlife Refugue	Field 12	50	Amanda Stamper	ORFIN-FY18-RX-Field12
11	9	5	10/5/17	Willow Creek Preserve	East Unit	44	Amanda Stamper	2017-OR-ORPN-019
12	9	5	10/5/17	Willow Creek Preserve	Hayfield	14	Amanda Stamper	2017-OR-ORPN-020
13	11	6	10/11/17	Sycan Marsh Preserve	Unit 1 Coyote Creek	630	Katie Sauerbrey	2017-OR-ORPN--000017
14	13	7	10/12/17	Sycan Marsh Preserve	Unit 2 North block-abort	0.25	Katie Sauerbrey/John Richardson (T)	N/A
15	15	8	10/17/17	Sycan Marsh Preserve	Unit Middle 2 blocks	147	Katie Sauerbrey/Portell (T)	2017-OR-ORPN--000015
16	16	9	10/18/17	Sycan Marsh Preserve	South block	140	Katie Sauerbrey/Portell (T)	2017-OR-ORPN--000016
17	16	9	10/18/17	Sycan Marsh Preserve	South block	140	Katie Sauerbrey/Portell (T)	2017-OR-ORPN--000018
						1484		

II. Information Development and Exchange

Burn Program Information Package

Since 2013, partners have prepared or updated a fire program information package, intended to provide rationale for the safe and ecologically responsible application of fire to our prairie and woodland habitats. It is composed of several documents, all of which are available. The primary documents included in the package are:

- Pre-Season Overview of 2017 South Puget Sound Burn Season
- Prescribed burning in the Puget Sound: Rationale for the continued safe application of ecological fire during the summer months
- Scientific background for prescribed fire use in western Washington prairies and oak woodlands

Fire Research Projects Supported by Burn Program

Research Papers Published in 2017

Hill, K.C., J.D. Bakker, and P.W. Dunwiddie. 2017. Prescribed fire in grassland butterfly habitat: targeting weather and fuel conditions to reduce soil temperatures and burn severity. *Fire Ecology* 13:24-41. doi:10.4996/fireecology.130302441

University of Washington Prairie Habitat Restoration for Rare Species Project

Background: Restoration of highly degraded sites, such as abandoned agricultural fields, presents a great opportunity to address the limited availability of decent quality extant habitat to support many prairie dependent rare plant and animal species. This project broke new ground by developing techniques for restoring highly degraded sites through an adaptive, iterative approach. This project significantly increased the breadth of potential sites that can be considered for restoration, and resulted in the creation of new habitats that can support viable populations of target prairie species. There were two locations in South Puget Sound associated with this project: West Rocky Prairie and Glacial Heritage. There were also two locations in North Puget Sound: Pacific Rim Institute and Ebey's Landing Preserve. The project concluded its initial experimental phase in 2012 and entered a maintenance phase, which requires prescribed fire as an integral tool.

A new experiment has been superimposed onto the three arrays of experimental plots at Glacial Heritage. This experiment tests the effects of fire frequency (annual vs. triannual) and seasonality (early vs. late in the fire season) on plant communities. A no-fire alternative, annual mowing, is also included. In 2017, early burns occurred on July 12 and mowing on August 11. Late burns did not occur due to the constraints noted elsewhere in this report. The vegetation in the small arrays was monitored in Spring 2017. In addition, a graduate student is studying how fire frequency affects production of iridoid glycosides, secondary chemicals that are important cues for Taylor's checkerspot, by golden paintbrush and lanceleaf plantain. Overall, the UW restoration site, which we burn portions of each year, continues to support one of the largest population of golden paintbrush anywhere in the world. The population there this year numbered almost 29,000 flowering plants.

JBLM Fire Effects Monitoring Program

Prudent management necessitates understanding fire's variability across seasons, weather conditions, and fuel conditions, as well as fire's role in shaping prairie communities and species distributions. Our overarching goal for the fire effects monitoring project is to build a multi-year dataset and create a robust model linking burn-day prescriptions to desired restoration outcomes. Such a model may potentially allow for better understanding of what range of restoration outcomes could be achieved

under different fire prescriptions. To this end, our objectives for this project are to quantify fuel, weather, and soil conditions during the burn season and use an information-theoretic approach to build robust models that describe the influence of these conditions on subsoil and surface temperatures and heat doses, as well as on burn severity. We then examine the effect of these burn temperatures and severity on changes in vegetation structure and composition and Mazama pocket gopher occupancy. While we do not directly measure fire effects on soil organisms, we can use burn temperatures to infer potential detrimental effects on microorganisms and insects. Further detail regarding design, methods, and analytical approach can be found in our *JBLM Fire Effects Monitoring Protocol*.

We have monitored 36 prescribed burns over three seasons. Average weather conditions (air temperature and RH) have been similar across all three years, but precipitation patterns throughout each season have differed. In 2015, a 3-month dry spell occurred from mid-May to mid-August; 2016 saw regular small precipitation events throughout the summer; and in 2017, a 3-month dry spell occurred, but this time from mid-June to mid-September. Even though 2017 had a record wet winter and spring, the timing of the 95-day period without significant rain – aligning with both the warmest months of the year *and* the greatest curing of fuels – wreaked havoc on soil heating during burning (Figure 1). We normally kill a small percentage of our temperature datalogger equipment by overheating each year – in 2015 we lost 1.8% of dataloggers placed in a burn and in 2016 we lost 0.4%. However, in 2017, we lost 5.8% of all dataloggers placed, more than ¾ of which overheated while 2cm underground, and over half of which were killed during just two burn days in early September.

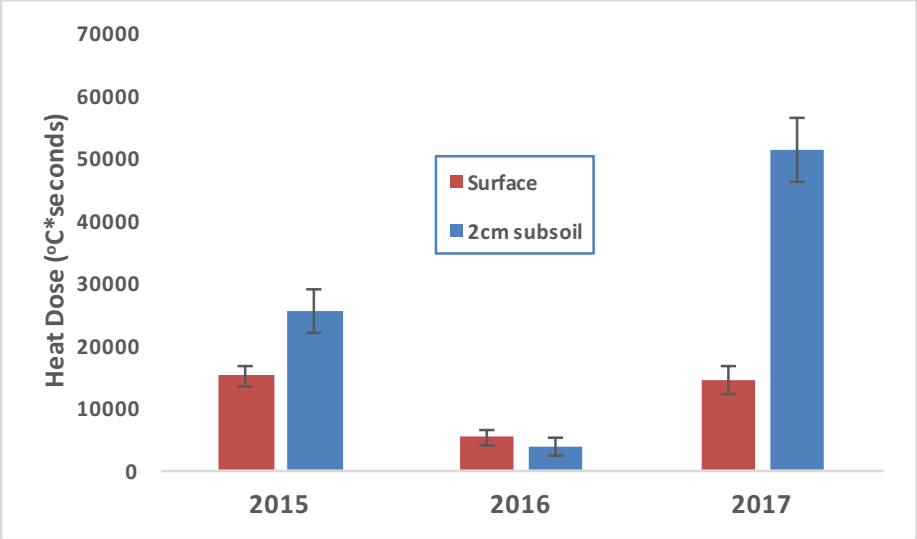


Figure 1. Average heat dose at the soil surface and 2cm belowground for each burn monitoring year. Heat dose calculated as the summation across all >60°C temperatures of [degrees above 60°C]*[number of seconds at that temperature]. Error bars represent standard error of the mean.

Precipitation had a strong significant influence on temperatures and heat doses both above and belowground, as well as on substrate and vegetation burn severity. The precipitation variable we used in our analyses was the number of days prior to the burn date over which a cumulative total of 0.5" of rain had fallen. This was to account for periods, such as in summer 2016, when no saturating rain events occur, but regular wetting rain events occur throughout the burn season. At the soil surface, ambient air temperature was a primary driver of peak sustained burn temperatures, but longer dry spells intensified those temperatures (Figure 2). Instantaneous peak burn temperatures – measured by thermal paints instead of dataloggers – were only influenced by precipitation and not ambient air temperature,

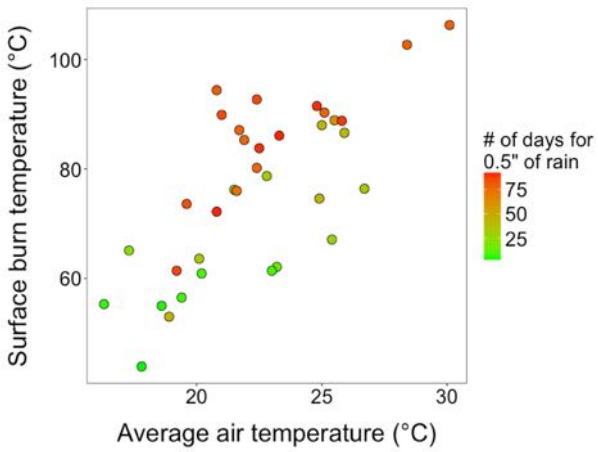


Figure 2. Peak sustained burn temperature at the soil surface as a function of ambient air temperature; color gradient represents the number of days prior to a burn over which a cumulative total of 0.5" of precipitation had fallen. Linear model with both predictors has $R^2_{adj} = 0.78$ ($p < 0.001$).

indicating that the actual direct flame temperatures are mainly a result of drier fuels producing greater heat.

Belowground, those longer dry spells were also a primary driver of soil heating, but this relationship was only strong in late summer (i.e., after mid-August). Burning in mid-July or early August did not produce exceedingly high soil temperatures – even when rain had been largely absent for over two months, as was the case in 2015 – indicating that the timing of dry spells is important, in addition to the duration (Figure 3). While live fuel moisture was not measured, it is likely that fuels at the end of the 3-month dry period in early August of 2015 were not as parched as fuels at the end of the 3-month dry period in early September of 2017. This exacerbated lack of moisture is likely to extend belowground to deeper soil moisture (>2") – in future years, we hope to measure this directly to better predict these effects. Lower soil burn temperatures were also seen in areas with deeper thatch, which may be due to the thatch slowing the overall rate of soil drying over the summer.

The influence of these burn temperatures and severity on vegetation patterns is less clear, although some weak significant relationships have emerged after accounting for differences in species suites across prairie sites, year of burn, and restoration activity. As expected, hotter surface burn temperatures tended to increase exotic annual forb cover ($R^2_{marg} = 0.15$; $p = 0.001$) and decrease exotic woody (i.e., Scotch broom) cover ($R^2_{marg} = 0.21$; $p < 0.001$) the following spring. No discernible effects on richness or cover of native functional groups have been observed. The decrease in native perennial grass cover was significantly greater in the spring following the 2015 burn season than after the 2016 burn season ($R^2 = 0.30$; $p < 0.001$), but it is difficult to determine whether that difference is due to the much higher burn temperatures in 2015 or other factors such as fall/spring precipitation and temperature patterns that play a role in native productivity. Burn temperature also had a very weak effect on vegetation structure, with hotter fires producing slightly shorter vegetation height and lower heterogeneity of height structure ($R^2_{marg} = 0.09$; $p < 0.001$).

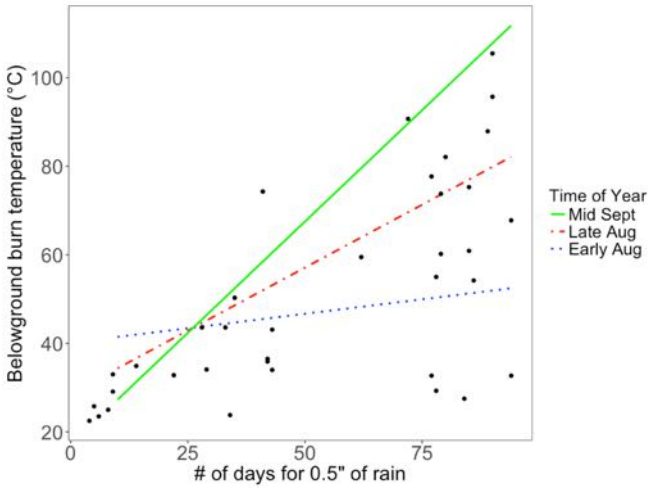


Figure 3. Peak sustained burn temperature 2cm belowground as a function of the number of days prior to a burn over which a cumulative total of 0.5" of precipitation had fallen. Lines show predicted relationships at different times of year. Interaction model with both predictors has $R^2_{adj} = 0.73$ ($p < 0.001$).

This year we also initiated a pilot investigation of how live shrub fuel moisture and 10-hour dead fuel moisture change over the summer months, so that in future years we can explore the relationship between these fuel moistures and fire behavior. Live fuel moistures of Scotch broom and snowberry were well-correlated with days since saturating rain (r = -0.71 and r = -0.84, respectively; Figure 4), but conifer needle moisture was somewhat constant. Fuel sticks that we used to assess 10-hour dead fuel moisture in unshaded areas primarily responded to daily minimum relative humidity (r = 0.48).

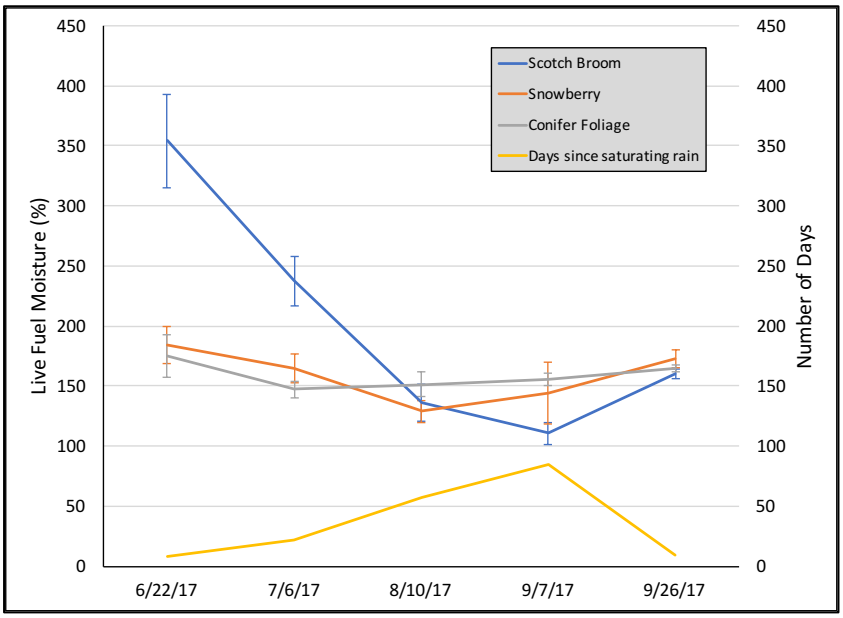


Figure 5. Live fuel moisture of three shrub species over a 2-month period in 2017. Error bars represent standard error of the mean. Secondary y-axis displays number of days since a saturating rain (≥ 0.5") event.

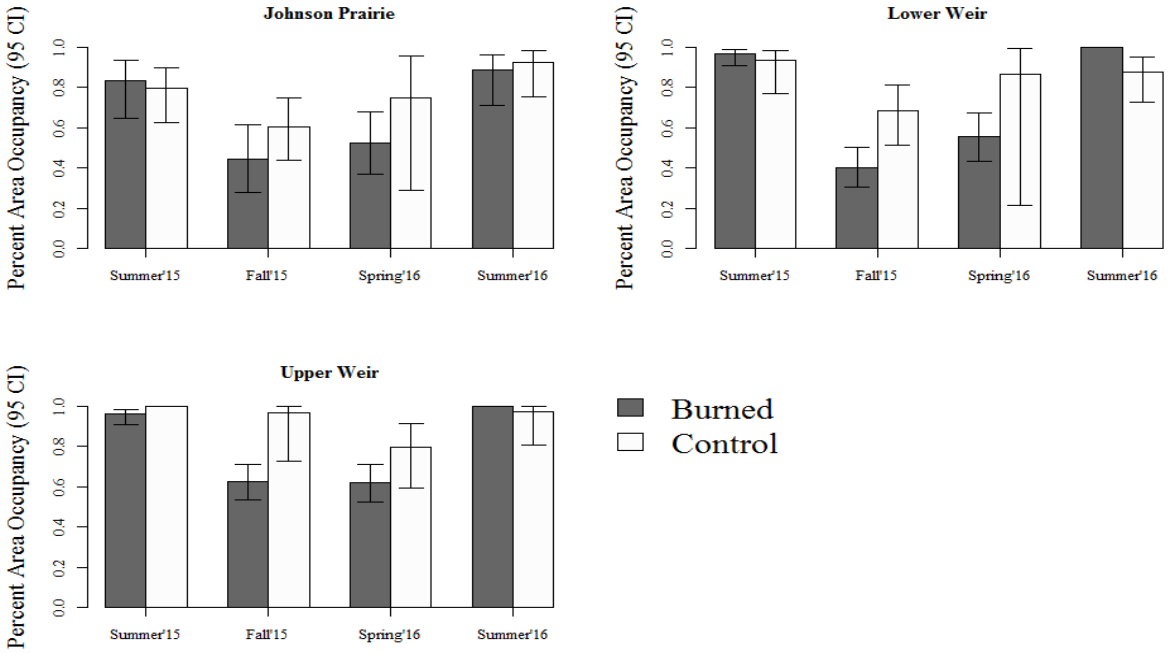


Figure 4. Percent area occupancy of Mazama pocket gopher in burned blocks (burned in summer 2015) vs unburned blocks at the time of burning and across seasons following the burn. Error bars represent 95% confidence intervals.

We have comprehensively surveyed the Rainier Training Area for Mazama pocket gopher occupancy every summer, fall, and spring, starting in summer 2015; occupancy appears to respond to burning differently depending on season. Fall occupancy is lowest in the most recently burned areas (Figure 5), but spring and summer occupancy decreases as time since burning increases. Effect sizes were

significant but exceedingly small, suggesting the overall influence of fire on gopher occupancy is minimal at the time scale being investigated.

South Sound Fire Effects and Severity Monitoring Program

Four types of monitoring are necessary to fully understand how prescribed burning can be used to achieve desired ecological and management objectives: Fire weather, fire intensity, fire severity and fire effects monitoring. Due to limited funds, we only conducted post-burn monitoring on burns conducted in previous years (no pre-burn monitoring on planned 2017 burns). We completed 2017 fire effects monitoring on the following projects: 1st year post-burn monitoring of three 2015 units, 2nd year post-burn monitoring of two 2014 burn units, and 5th year post-burn monitoring of two 2011 burn units.

In 2017 we measured fire effects on vegetation in the same 50-1m^2 quadrats as we had monitored in previous years in three burn units. In early June 2017 we collected the following data within each quadrat: 1) Frequency (i.e. presence/absence) of all species within nested quadrats of 0.1m^2, 1.0m^2 and 4m^2, 2) percent cover of each non-native species and bare ground, and 3) moss and lichen cover and functional group (collected from half of the 2017 pre-burn 0.1m^2 nested quadrats). Due to funding restrictions associated with the ACUB funding freeze, we have not been able to analyze the 2017 data.

ACUB Fire Effects Monitoring program burn units grouped by burn season

Burn Season	Burn Unit	Date	Years Monitored
Mid Season	Glacial Heritage-Butterfly*	8/17/2011	Pre, 1yr-Post, 2yr-Post
	Mima Mounds Central	8/31/2011	Pre, 1yr-Post, 2yr-Post, 5yr-Post
	Scatter Creek North	8/26/2011	Pre, 1yr-Post, 2yr-Post, 5yr-Post
	West Rocky*	9/06/2011	Pre, 1yr-Post, 2yr-Post
	Tenalquot Central*	8/22/2012	Pre, 1yr-Post, 2yr-Post
Late Season	Mima Mounds North	11/10/2012	Pre, 1yr-Post, 2yr-Post
	Glacial East	9/12/2013	Pre, 1yr-Post, 2yr-Post
	Tenalquot Northeast	9/18/2013	Pre, 1yr-Post, 2yr-Post
	Tenalquot Central	9/22/2014	Pre, 1yr-Post, 2yr-Post
	Upper Weir Oaks	9/08/2014	Pre, 1yr-Post, 2yr-Post
	Mima South	9/15/2015	Pre, 1yr-Post, 2yr-Post
	Scatter Creek South	9/15/2015	Pre, 1yr-Post, 2yr-Post
	Tenalquot Northeast	9/11/2015	Pre, 1yr-Post, 2yr-Post

**These units were re-burned before 2016*

Evaluation of integrated control strategies for reed canary grass.

Our recently completed 4-year study at Joint Base Lewis-McChord determined that repeat burning, when combined with a pre-burn mid-summer herbicide treatment, was an effective tool for RCG removal. Summer mowing and late summer herbicide was also effective at removing RCG and promoting native establishment. Both sets of treatments must be applied for at least two years (preferably three) to reduce RCG to manageable levels (< 20% grass cover and < 5 cm thatch depth) for native planting. Ongoing efforts currently involve mowing and herbicide treatments at JBLM, and mowing at West Rocky Prairie and Mima Creek Preserve in preparation for experimental pre-vegetated mat placement to promote establishment of native low-stature sedges in Oregon spotted frog habitat.

Hamman, S.T. 2016. Evaluating integrated control strategies for reed canary grass on Joint Base Lewis-McChord. Final Report to the Nisqually Indian Tribe. Center for Natural Lands Management, Olympia, WA.

III. Ecological Fire Management Planning

Prairie and rare species management entails comprehensive planning that balances a given site's capacity to provide ecological benefit for multiple species over the short and long term and also considers how that site best fits into regional conservation strategies. All our sites have specific plans (such as site conservation action plans) and many fall into regional planning for habitat or species management. All sites where we burn include fire as a management objective and often consider prescribed ecological fire to be one of the cornerstones of their management plans.

Securing protective blackline around long-term research plot at Upper Weir Prairie (N.Miller)

IV. Partnership and Burn Program Sustainability

Puget Sound Burn Program partners recognize the need for a core fireline leadership team and a pool of additional firefighters that is large enough to make the most of our narrow burn window. We follow the standards of NWCG, and leadership qualifications are advanced through fireline experience, specific coursework and performance evaluations. There are many benefits to cultivating a robust leadership pool. More experienced firefighters provide better oversight for newer to prescribed burners. Improved leadership increases overall team technical and production capacity and improves the likelihood of early detection and resolutions for emerging problems. It also provides increased flexibility in crew assignments, and a given burn is not dependent on the participation of one or two key participants.

Interior ignition squad getting ready for next burn block at Sycan Marsh, Oregon(M.McKinley)

In addition to a core group of firefighters that have primary responsibilities to support the burn program, our operations depend on participation from a larger pool of regionally available firefighters. This group includes: land management staff that are only able to participate on a handful of burns each year; agencies that do not have specific land management objectives, but participate on controlled burns as training opportunities; and organizations and individuals that are seeking fireline experience. Our program's success is attributable to the willingness of these varied groups and individuals to come together.

South Sound burns are also good for partnership building, and we regularly integrate burn crews from regional fire organizations. This type of exchange increases the familiarity of local suppression teams with our South Sound burn program and visa-versa. It also provides these firefighters with fireline training and opportunities to get signed off on NWCG position qualification tasks. On our burns,

firefighters benefit from exposure to a wide variety of operational, ecological and fuel conditions and repeated opportunities to perform in leadership roles.

Community Outreach

Community outreach for specific prescribed ecological fires consists mostly of neighbor and agency notifications, press releases, Facebook posts and announcements to local radio and news services. Outreach also occurs at community events such as Howl-ins at Wolf Haven, Earth Day and Kids Day at JBLM and Prairie Appreciation Day at Glacial Heritage. Prairie Appreciation Day is an annual event that regularly draws 1,000 or more people from around Puget Sound to come learn about prairie and oak habitats. The event supports a fire booth which offers information on the role of fire in these habitats and how it is safely managed for ecological benefit.

Local volunteer firefighter helps with early spring pine burn at TA6 JBLM (M.McKinley)

Local Partnerships

Improved communication, cooperation and understanding between local fire entities increases trust and ability to troubleshoot regulatory or political issues as they arise. The partnership with JBLM Forestry improved again this year. Now, we essentially operate with them as an integrated unit. JBLM Forestry and Fish and Wildlife are able to mutually support their shared missions of ecological fire and fire protection. CNLM is able to provide limited support on wildfires to meet firefighter qualification advancement requirements.

We were only able to successfully integrate with DNR crews at Whidbey Island this year. The busy wildfire season restricted DNR suppression crews from participating on JBLM burns (unlike last year). The local DNR region is still unable to participate on Thurston County burns due to perceived conflict of interest. This year, to begin to address this issue, we had DNR submit their own burn permits on their own lands, so that CNLM can support DNR - allowing us to integrate with DNR resources on the fireline. Unfortunately, the many challenges of this season conspired against our ability to test this approach, and we did not burn with DNR on their lands either. We look forward to trying again both on and off JBLM in 2019.

Puget Sound firefighter as engine boss trainee at Sycan Marsh (M.McKinley)

Field Training and Training Exchanges

Classroom and fireline training and training exchanges provide unparalleled opportunities for learning, networking and cross-boundary integration. Participating with other burn programs offers direct learning and a chance to see your home program with fresh eyes. From the beginning, these exchanges have been an important strategy to support programmatic growth and improvement. Classroom training is an important part of the NWCG qualification process, and

can also help firefighters to network and learn from new people.

Every year, we make a focused effort to move firefighters through a range of experiences and advance them in their qualifications. In addition to a few other fireline qualification advancements, we most notably added our fifth Type 2 Burn Boss (RXB2) at JBLM Fish and Wildlife. This puts us at a long-awaited and more robust level of capacity.

In addition to the routine exchange of firefighters between South Sound partners, our burn program provided opportunities to partner organizations and individuals to get fireline experience and training. In total, we had more than 135 firefighter days' worth of support from AmeriCorps, Vet Corps, JBLM natural resource interns, volunteers and local fire departments. While this resource pool consists mostly of entry-level firefighters, they regularly helped us to reach target staffing levels and many of them will take their experiences forward as they develop careers in natural resources.

This year, our exchanges with out-of-region burn programs primarily occurred through our upgraded partnership with Oregon TNC. This will likely be the model for our future exchanges. Burning with Oregon TNC offers a good variety of burn conditions, allows for more flexible and responsive travel logistics, strengthens relationships in the greater region and fosters cross-region training/learning. Two firefighters also participated in spring TREX's in Oregon. In total, we sent firefighters out of region for 140 firefighter-days (including travel and non-burn days).

NWCG Course Training

The Puget Sound burn program provided a couple advanced NWCG training courses this year. We put five of our firefighters through S-131 (Type 1 Firefighter class) and eight completed S-219 (Firing Operations). Five JBLM firefighters participated in six courses at DNR's western Washington fire training academy in the spring and two others took advantage of courses held through the Department of Defense. We offered the annual refresher course (RT-130) to 46 partner and other regional firefighters and two of our firefighters attended refreshers with other partners. We also qualified 16 Type 2 Firefighters by providing the required courses online (S-130, S-190, I-100 and I-700) and an intensive field training day.

Forty-six firefighters completed their annual safety refresher with our program, for the first time including JBLM Forestry

V. Ecoregional and Statewide Networking

Priority Action Areas for the WPFC:

- Training, Certification and Expertise Exchange
- Policy Influence and Issues Resolution
- Public Understanding, Outreach and Education
- Partnering and Collaboration
- Council Operations, Funding &

Washington Prescribed Fire Council

The Washington Prescribed Fire Council (WPFC) held it's 6th annual conference at the Coast Wenatchee Center Hotel in Wenatchee, WA in association with the annual EPA Smoke Management Meeting on March 1st and 2nd, 2017. The theme this year was 'Past, Present and Future of Prescribed Fire in Washington'. Several presentations were given by a range of project partners on the fuels inventory monitoring (Roger Ottmar; USFS), air and smoke monitoring (Janice Peterson; USFS), burn implantation (Mike Barajas; USFS), and communication and outreach achievements (Hilary Lundgren; Chumstick Wildfire Stewardship Coalition, Patrick Haggerty; Cascadia Conservation District) associated with the Forest Resiliency Burning Pilot Project. There was also a legislative update by Tom Bugert (TNC) and presentation and discussion about the Smoke Management Plan, by Karen Arnold and Jonathan Guzzo (WDNR). Finally, the membership was tasked with evaluating and discussing priorities for the Council in three breakout sessions. Attendees identified what has worked well for the Council over its first 5 years and what they would like to see accomplished over the short (1-3 yrs) and long-term (3-10 yrs).

Northwest Fire Science Consortium

- The Northwest Fire Science Consortium was very productive again this year with several webinars, videos, fire fact sheets, research syntheses, workshops and symposia. One event that was especially relevant to the Puget Sound Ecological Fire Program was the Westside Fire Regime Summit (Title: Fire in the Pacific Northwest – Past, Present, and Future: Implications for ecology, operations, and restoration west of the Cascades). Of note was the Prairie/Grassland Session, moderated by Sarah Hamman. Through several presentations and extended discussions, this session identified major knowledge gaps related to fire In prairies, including: (1) Effects of seasonal burning on prairie and oak habitat, (2) using moisture extinction and vegetation banks (forests) as fire breaks, and (3) effective communication and outreach strategies.

Appendix 1: Importance of Ecological Fire Management

The unparalleled benefit of fire for the management of native grasslands and hardwood savanna is well documented. In the Puget Sound region, more than a century of fire exclusion has led to the loss of thousands of acres of prairie and oak habitat following the unrestricted invasion of conifer forests. In recent decades, exotic species invasions continue to exacerbate habitat loss and degradation. The list of benefits provided by fire for these habitats is extensive, and has been the subject of considerable research. The majority of these benefits cannot be effectively replicated by other means. Below are some of the key ecological benefits of fire.

- Fire is the foundational disturbance that shaped and maintained prairie habitat for thousands of years. Prairie plant and animal species evolved in the presence of fire and have developed complex adaptations and dependency on fire. Without fire, the degradation and loss of prairie habitat and associated species continues.
- Frequent low-intensity fires reduce fuel loads and produce less severe fire behavior – a benefit to both public safety and the habitat itself.
- Many of our grasslands have over 100 years of litter, moss and thatch buildup due to fire exclusion. Fires conducted during the dry season reduce accumulations and expose mineral soil to promote native seed establishment, and are the only research tested means to effectively enhance these key aspects of native prairie habitat.
- Noxious and other invasive weed species have become a major threat to grassland habitats. Fire has proven very effective at controlling Scotch broom and other invasives, and prepares sites for more effective control of invasives that are not killed by fire.

Federally listed golden paintbrush responds very well to fire. Glacial Heritage (M.McKinley).

- Several studies in Puget Sound and beyond show that many native plant species in these fire-dependent ecosystems experience higher germination success when exposed to smoke and ash.
- Fires release nutrients and contribute to soil building. Charcoal enhances water retention and nutrient storage capacity. Fires help moderate soil pH in favor of native species.
- Multiple fire applications maintain a mosaic of plant communities in varying stages of succession, providing a diverse set of resources and conditions for both plant and animal species.
- Fires reduce the density and distribution of pathogens and parasites.

Appendix 2: Program Goals

Program partners recognize fire as invaluable for restoring our fire dependent ecological communities. The primary goal of our burn program is to responsibly integrate fire as a critical natural resources management tool, while holding public and firefighter safety paramount. To that end, all partners have adopted and exceeded the current standards for fire management, firefighter training and risk management as established by the National Wildfire Coordinating Group (NWCG) PMS-310.1.

Below is a conceptual framework that outlines the burn program's approach to fire management. The remainder of this report is structured to reflect this framework.

South Puget Sound Ecological Fire Program Goals Framework

I. Operations, Safety and Continual Improvement

Partners have sufficient funding, equipment, staff availability and training to safely achieve planned ecological burn objectives. Robust burn planning and permit approval processes are in place that are developed and implemented with the best available information, supporting a long-term sustainable regional burn program.

II. Information Development and Exchange

Fire operations, ecological management and science programs are integrated, and together direct regional efforts to assess and meet information needs. Operations encourage and support implementation of research and monitoring before, during and after burns.

III. Ecological Fire Management Planning

Prescribed fire and wildfire activities are guided by mid to long-range fire management plans that are regionally integrated with long-range ecological objectives.

IV. Partnership and Burn Program Sustainability

The multi-partner ecological burn program remains cohesive, resilient and responsive to challenges, and able to implement burning at the scale required to meet ecological objectives:

- The use of fire for ecological benefit is supported by a cooperative infrastructure of local and regional practitioners that have the knowledge, skills and qualifications to successfully and safely implement prescribed ecological burns during constrained burn windows. This is accomplished through fireline experience, specific coursework, performance evaluations and exchange of expertise from around the nation.
- Regulatory agencies support ecological burning and have good working relationships with partners.
- Local affected communities are aware of our ecological fire program and are generally supportive of the goals.
- Partners have planned for risks associated with fire management and have sound operational and administrative structures in place to minimize and buffer against risks.

V. Ecoregional and Statewide Networking

Washington state and the Willamette-Puget Sound-Georgia Basin Ecoregion have a network of fire practitioners to facilitate information sharing among partners. The network extends outward to agencies, legislators, the public, and to adjacent fire managing programs. As a united body, practitioners are able to address external and internal challenges proactively and with a broad base of support.

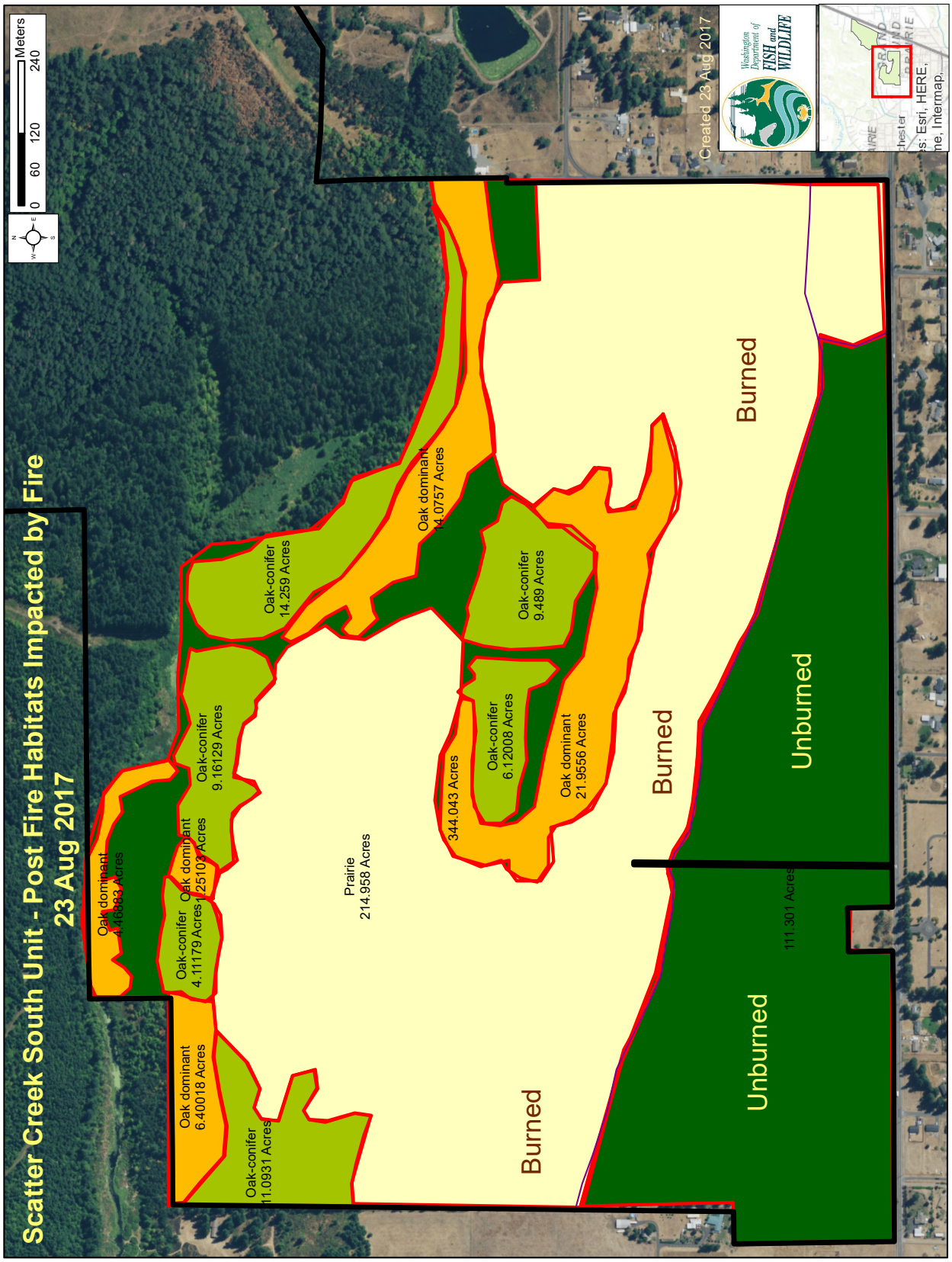
Appendix 3: Other Available Supporting Documents

Fire program related documents available from Center for Natural Lands Management:

- Overview of 2017 Projected South Puget Sound Burn Season (off-JBLM)
- Prescribed burning in the Puget Sound: Rationale for the continued safe application of ecological fire during the summer months
- Scientific background for prescribed fire use in western Washington prairies and oak woodlands

Moderating fire intensity around oaks before heading out into the prairie on a dry September day at TA14

Appendix 4: 2017 Scatter Creek South Wildfire Impact Map



Appendix 5: Burn Season Summary Table

2017 Summary of Completed Prescribed Burns - supported or led by CNLM/JBLM

Count	Unit ID	Date	Unit	Location/Fire Management Unit	Project	Acres	Burn Boss or Lead Entity	Day	Crew Shift
1	JB-RX17.05.22A	05/22/17	TA12N_10	TA 12 Pine	JBLM RX	3	Nick Miller	1	1
2	JB-RX17.05.23A	05/23/17	TA6pine_02	TA 06 Pine	JBLM RX	6	Nick Miller	2	2
3	JB-RX17.05.24A	05/24/17	TA6pine_01	TA 06 Pine	JBLM RX	5	Mason McKinley/John Richardson (T)	3	3
4	JB-RX17.05.30A	05/30/17	TA 12N_10	TA 12 Pine	JBLM RX	3	Mason McKinley/John Richardson (T)	4	4
5	JB-RX17.05.31A	05/31/17	TA12S_02 &03	TA 12 Pine/Oaks	JBLM RX	5	Nick Miller/John Richardson (T)	5	5
6	JB-RX17.05.31B	05/31/17	TA12C_02, 03,06 &07	TA 12 Pine	JBLM RX	19	Mason McKinley	6	6
7	JB-RX17.06.05A	06/05/17	TA12N_06 & 11	TA 12 Pine	JBLM RX	26	Mason McKinley/John Richardson (T)	7	7
8	JB-RX17.06.06A	06/06/17	DEB_06, 08 & 09	TA 10/Debalon	JBLM RX	16	Mason McKinley	8	8
9	JB-RX17.06.07A	06/07/17	TA10_2,3,4 & 5	TA 10/TA 10 Pine	JBLM RX	45	Nick Miller	9	9
10	JB-RX17.06.26A	06/26/17	MP1_4	TA 03/MP1	JBLM RX	16	Nick Miller/John Richardson (T)	10	10
11	JB-RX17.06.29A	06/29/17	SP_08	TA 13/Seed Plot	JBLM RX	17	Bob Wilken	11	11
12	JB-RX17.07.05A	07/05/17	15S_07	TA 15	JBLM RX	16	Bob Wilken	12	12
13	JB-RX17.07.06A	07/06/17	15N_01	TA 15	JBLM RX	23	Mason McKinley/John Richardson (T)	13	13
14	JB-RX17.07.10A	07/10/17	TA 12S_1,3 & 4 & TA12C_01, 0	TA 12/TA 10 & 12 Pine	JBLM RX	45	Nick Miller	14	14
15	JB-RX17.07.11A	07/11/17	SWE_02	TA 23/South Weir	JBLM RX	14	Mason Mckinley	15	15
16	JB-RX17.07.11B	07/11/17	Blackline	TA 05/North AIA	JBLM RX	4	John Richardson (T)/ Nick Miller	16	15
17	JB-RX17.07.12A	07/12/17	NAEG_05	TA 05/North AIA	JBLM RX	15	Nick Miller/ John Richardson (T)	17	16
18	GL-RX17.07.12A	07/12/17	2017-B	Glacial Heritage Prairie	ACUB	16	Mason McKinley	18	16
19	GL-RX17.07.12B	07/12/17	UW Plots	Glacial Heritage Prairie	ACUB	1	Mason McKinley	18	16
20	JB-RX17.07.13A	07/13/17	TA 6E_01 and 07	TA 06 Prairie	JBLM RX	60	Bob Wilken	19	17
21	JB-RX17.07.17A	07/17/17	SOS_14, 15	TA 05/Scouts Out	JBLM RX	26	Bob Wilken/John Richardson (T)	20	18
22	JB-RX17.07.17B	07/17/17	SOS_22 & 24	Ta 05/Scouts Out	JBLM RX	33	Bob Wilken/John Richardson (T)	20	18
23	JB-RX17.07.18A	07/18/17	13W_03 edge of 13W_02	TA 13/13th Div West	JBLM RX	51	Mason McKinley	21	19
24	JB-RX17.07.18B	07/18/17	NAEG_07	TA 05/North AIA	JBLM RX	21	Nick Miller	22	19
25	GL-RX17.07.19A	07/19/17	2017-D	Glacial Heritage Prairie	ACUB	14	Mason McKinley	23	20
26	GL-RX17.07.19B	07/19/17	2017-F	Glacial Heritage Prairie	ACUB	34	Mason McKinley	23	20
27	JB-RX17.07.19A	07/19/17	TA12N_08	TA 12 Pine	JBLM RX	18	Bob Wilken	24	20
28	JB-RX17.07.24A	07/24/17	SIA_13	R88/SIA	JBLM RX	44	Mason McKinley	25	21
29	JB-RX17.07.25A	07/25/17	TA 6N_08, 12, 13 & 18	TA 06 Prairie	JBLM RX	42	Bob Wilken	26	22
30	GL-RX17.07.26A	07/26/17	2017-A	Glacial Heritage Prairie	ACUB	23	Mason McKinley	27	23
31	GL-RX17.07.26B	07/26/17	2017-C	Glacial Heritage Prairie	ACUB	2	Mason McKinley	27	23
32	JB-RX17.07.26A	07/26/17	TA6E_03	TA 06 Prairie	JBLM RX	50	Bob Wilken/Bruce McDonald (T)	28	23
33	JB-RX17.07.27A	07/27/17	MAP_01	TA 18/Marion Prairie	JBLM RX	43	Mason McKinley	29	24
34	JB-RX17.07.27B	07/27/17	LW_07 & 08	TA 21/Lower Weir	JBLM RX	71	Bob Wilken	30	24
35	JB-RX17.07.31A	07/31/17	13W_14	TA 14/13th Div West	JBLM RX	52	Bob Wilken	31	25
36	TQ-RX17.08.01A	08/01/17	2017-A	Tenalquot Prairie	ACUB	6	Mason McKinley	32	26
37	JB-RX17.08.14A	08/14/17	JT_08	TA 22/Johnson Prairie	JBLM RX	11	Bob Wilken	33	27
38	JB-RX17.08.15A	08/15/17	SW_01 & SW_02	TA 23/South Weir	JBLM RX	88	John Richardson (T)/Bob Wilken	34	28
39	WH-RX17.08.16A	08/16/17	2017-B	Wolf Haven	ACUB	5	Mason McKinley	35	29
40	JB-RX17.08.16A	08/16/17	TA6E_08, 10 & 11	TA 06 Prairie	JBLM RX	51	Bob Wilken	36	29
41	JB-RX17.08.17A	08/17/17	RH_02 & RH_07	TA 04/Rumble Hill	JBLM RX	36	Mason McKinley/Bruce McDonald (T)	37	30
42	JB-RX17.08.18A	08/18/17	TA6S_04 & 06	TA 06 Prairie	JBLM RX	32	John Richardson (T)/Nick Miller	38	31
43	JB-RX17.08.21A	08/21/17	TA6N_17 Test & TA6S_05,07&(	TA 06 Prairie	JBLM RX	32	Nick Miller/John Richardson (T)	39	32
44	JB-RX17.08.22A	08/22/17	7S_02 Test and Blackline	TA 7S	JBLM RX	3	John Richardson(T)/Bob Wilken	40	33
45	JB-RX17.08.23A	08/23/17	Blackline W. Plots	TA 22/Johnson Prairie	JBLM RX	0	John Richardson (T)/Bob Wilken	41	34
46	JB-RX17.08.23B	08/23/17	Blackline W. Plots	TA 21/Upper Weir	JBLM RX	0	Nick Miller	42	34
47	JB-RX17.08.24A	08/24/17	NAEG_01 &_02	TA 05/North AIA Grassland	JBLM RX	31	Bob Wilken	43	35
48	JB-RX17.08.25A	08/25/17	13LN_16	TA 14/13th Div East	JBLM RX	26	Bob Wilken/Bruce McDonald (T)	44	36
49	JB-RX17.08.28A	08/28/17	LW_01 Blackline	TA 21/Lower Weir	JBLM RX	4	Mason McKinley	45	37
50	JB-RX17.08.30A	08/30/17	UWP_08	TA21/Upper Weir	JBLM RX	84	Mason McKinley	46	38
51	WCLT-RX17.08.31A	08/31/17	Unit 2	Naas-WCLT	North Sound	2	Mason McKinley	47	39
52	WCLT-RX17.08.31B	08/31/17	Unit 1	Naas-WCLT	North Sound	1	Mason McKinley	47	39
53	PRI-RX17.08.31A	08/31/17	Unit B	PRI Prairie	North Sound	2	Mason McKinley	47	39
54	PRI-RX17.08.31B	08/31/17	Unit A	PRI Prairie	North Sound	4	Mason McKinley	47	39
55	JB-RX17.09.11A	09/11/17	R 74 triangle	TA06/AIA	JBLM RX	6	Nick Miller	48	40
56	JB-RX17.09.11B	09/11/17	SOS_03, SOS_07 & part of 02	Scouts Out	JBLM RX	51	Nick Miller	48	40
57	JB-RX17.09.12A	09/12/17	13LS_01, 13LN_14	TA 14/13th Div East	JBLM RX	78	Mason McKinley	49	41
58	JB-RX17.09.12B	09/12/17	NAMW_05 Test Fire	North AIA Moonshine woods	JBLM RX	0.1	John Richardson	50	41
59	JB-RX17.09.13A	09/13/17	7S_02 & 06 Butterfly plots	TA 07S	JBLM RX	16	John Richardson	51	42
60	JB-RX17.09.13C	09/13/17	7S_18	TA 07S	JBLM RX	5	Nick Miller	52	42

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2017 Summary of Completed Prescribed Burns - supported or led by CNLM/JBLM (continued)

Count	Unit ID	Date	Unit	Location	Project	Acres	Burn Boss or Lead Entity	Day	Crew Shift
61	JB-RX17.09.14A	09/14/17	15S_03 Blackline	TA 15	JBLM RX	3	Mason McKinley	43	53
62	JB-RX17.09.14B	09/14/17	15N_09,15E_11	TA 15	JBLM RX	37	John Richardson	43	54
63	JB-RX17.09.15A	09/15/17	13LN_09	13th Div East	JBLM RX	15	Bob Wilken	44	55
64	JB-RX17.09.22A	09/22/17	15S_03	TA 15	JBLM RX	24	Mason McKinley	45	56
65	JB-RX17.09.26A	09/26/17	13LN_12	TA 14/13th Div East	JBLM RX	110	Bob Wilken	46	57
66	JB-RX17.09.26B	09/26/17	SOS_24 & 25	TA 5/North AIA	JBLM RX	14	John Richardson	46	58
67	ORFIN-FY17-RX-Mid	09/27/17	Middle Prairie Field 31	Finley Wildlife Refugue	Willamette	148	Amanda Stamper	47	59
68	JB-RX17.09.27A	09/27/17	TA 7S_06 & 07	TA 07S	JBLM RX	17	John Richardson	47	60
69	ORBKS-FY17-RX-Uni	09/28/17	Units 4 & 31	Basket Slough Refugue	Willamette	60	Amanda Stamper	48	61
70	ORBKS-FY17-RX-Uni	09/28/17	Units 2 & 1	Basket Slough Refugue	Willamette	70	Amanda Stamper	48	61
71	ORBKS-FY17-RX-Uni	09/28/17	Unit 8- partial burn	Basket Slough Refugue	Willamette	17	Amanda Stamper	48	61
72	JB-RX17.09.28A	09/28/17	HLD_02 & 04	Holden	JBLM RX	12	John Richardson	48	62
73	JB-RX17.09.28B	09/28/17	DEB_01 & 08	DeBalon	JBLM RX	22	Nick Miller	48	63
74	JB-RX17.10.03A	10/03/17	13LN_04 & 05, 13MC_4,5,6 & 7	TA 14/13th Div East	JBLM RX	51	Nick Miller	49	64
75	GH-RX17.10.03A	10/03/17	2017-E	Glacial Heritage Prairie	ACUB	26	Mason McKinley	49	65
76	MM-RX17.10.03B	10/03/17	2017-E	Mima Mounds	ACUB	6	Mason McKinley	49	65
77	ORFIN-FY18-RX-Wood	10/04/17	Wood Duck - NRCS unit	Finley Wildlife Refugue	Willamette	15	Amanda Stamper	50	66
78	ORFIN-FY18-RX-Field1	10/04/17	Field 12	Finley Wildlife Refugue	Willamette	50	Amanda Stamper	50	66
79	JB-RX17.10.04A	10/04/17	LW_09, 10, 11 & 12 & LW_06	Lower Weir	JBLM RX	4	Nick Miller/Bruce McDonald (T)	50	67
80	2017-OR-ORPN-019	10/05/17	East Unit	Willow Creek Preserve	Willamette	44	Amanda Stamper	51	68
81	2017-OR-ORPN-020	10/05/17	Hayfield	Willow Creek Preserve	Willamette	14	Amanda Stamper	51	68
82	JB-RX17.10.05A	10/05/17	13W_13 & 13LS_03A	TA 14/13th Div East	JBLM RX	46	John Richardson	51	69
83	JB-RX17.10.06A	10/06/17	13LS_02, 13LS_03A (W)	TA 14/13th Div East	JBLM RX	90	John Richardson	52	70
84	JB-RX17.10.06B	10/06/17	13W_08	TA 14/13th Div West	JBLM RX	47	John Richardson	52	70
85	DP-RX17.10.09A	10/09/17	2017-A	Deschutes Prairie	ACUB	19	Mason McKinley	53	71
86	JB-RX17.10.10A	10/10/17	TA 20P_01 & 03 Piles/Broadcast	TA 20 Pine	JBLM RX	0	Bob Wilken	54	72
87	2017-OR-ORPN--0017	10/11/17	Sycan BICO RX 1	Sycan Marsh Preserve	Sycan	640	Katie Sauerbrey	55	73
88	JB-RX17.10.11A	10/11/17	SOS_02& 09 Piles/Broadcast	TA 4&5/Scouts Out	JBLM RX	33	Nick Miller	55	74
89	N/A	10/12/17	Sycan BICO RX 2C - abort	Sycan Marsh Preserve	Sycan	0.25	Katie Sauerbrey/John Richardson (T)	56	75
90	JB-RX17.10.12A	10/12/17	SOS_02 & 09 Piles	TA 4 &5/Scouts Out	JBLM RX	0	Nick Miller	56	76
91	2017-OR-ORPN--0015	10/17/17	Sycan BICO RX 2B and C	Sycan Marsh Preserve	Sycan	147	Katie Sauerbrey/Portell (T)	57	77
92	2017-OR-ORPN--0016	10/18/17	Sycan BICO RX 2D	Sycan Marsh Preserve	Sycan	153	Katie Sauerbrey/Portell (T)	58	78
93	2017-OR-ORPN--0018	10/18/17	Sycan BICO RX 1A	Sycan Marsh Preserve	Sycan	84	Katie Sauerbrey/Portell (T)	58	78

	Count	Acres
JBLM	**65**	**1868**
ACUB/Thurston Co.	**11**	**160**
North Sound	**4**	**9**
Oregon	**13**	**1442**
COMBINED TOTAL	**93**	**3471**