

Managing Western Washington Wildfire Risk in a Changing Climate

Workshop Summary
December 3, 2018



NORTHWEST
Climate Adaptation
Science Center



CLIMATE
Preparedness
Collaborative

RECOMMENDED CITATION

Morgan, H.A., Bagley, A., McGill, L., Raymond, C.L. 2019. Managing Washington Wildfire Risk in a Changing Climate. Workshop summary report prepared by the Northwest Climate Adaptation Science Center and the Climate Impacts Group, University of Washington, Seattle.

COVER PHOTO

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INTRODUCTION

WORKSHOP PURPOSE & FINDINGS

In recent years, concern has risen among western Washington communities about climate change and the impacts of increased wildfire risk in the region. This concern is motivated by large wildfires in eastern Washington and California, smoke events in western Washington, and growing evidence that changes in the climate are increasing the likelihood of wildfire in the Pacific Northwest.

Individuals in westside communities are increasingly asking:

- What is the risk of wildfire in the dense, wet forests of western Washington, and how does climate change affect that risk?
- How can we manage wildfire risk, particularly at the wildland-urban interface, while also recognizing the ecological role that fire plays?
- How can we raise awareness of increasing wildfire risk west of the Cascades?

To help address these questions, the Puget Sound Climate Preparedness Collaborative, Northwest Climate Adaptation Science Center, the Tulalip Tribes, and the University of Washington Climate Impacts Group, co-hosted a one-day workshop on December 3rd, 2018 titled *Managing Western Washington Wildfire Risk in a Changing Climate*.

The following themes emerged from the workshop presentations and participant discussions:

1. Fire plays an important ecological and cultural role west of the Cascades.
2. Wildfire risk on the west of the Cascades is higher than most people realize, and we may need more outreach to effectively communicate this growing risk in order for individuals and communities to take action.
3. Wildland fire is fundamentally different east and west of the Cascades, and we may need different management strategies to cope with westside fire moving forward.
4. The risk of wildfire west of the Cascades will likely increase with climate change and population growth.
5. Collaboration will be critical to deal with increasing wildfire risk in a changing climate.

This workshop provided an opportunity to share what is currently known, (and unknown), about climate change impacts on wildfire risk west of the Cascades and to discuss strategies that may help reduce this risk. Workshop participants identified research and coordination needs for managing westside fire risk. The workshop served as an opportunity for participants to engage in peer-to-peer learning, networking, and a cross-disciplinary exchange of knowledge and ideas regarding approaches to preparing for wildfire.

This workshop convened experts from Northwest Tribes, academia, the non-profit and private sectors, and federal, state, and local governments. Participants ranged from fire chiefs, fire marshals, and emergency planning coordinators to natural resource managers and planners, scientists, and teachers (for more information see Workshop Attendees section).

These themes are expanded upon in greater detail in the subsequent sections of this workshop summary.

THEME 1

FIRE PLAYS AN IMPORTANT ECOLOGICAL AND CULTURAL ROLE WEST OF THE CASCADES

Evidence from early land surveys, firsthand accounts, modeling, and observations demonstrate that wildland fire plays an important ecological and cultural role west of the Cascade Mountain Crest, including the Puget Lowlands, Olympic Peninsula, and Coast Range. For most areas west of the Cascade Crest, wildland fires were naturally occurring, large, infrequent (200 to 600 years between fires) disturbances to forests. These fires included large patches (1,000s to greater than 100,000 acres) of stand-replacing wildland fire. Other areas such as the rain shadow on the Olympic Peninsula and the Puget Lowlands had more frequent and mixed-severity fires with smaller patches of stand-replacing fire. All fires had a mix of burn severities within the fire perimeter, influencing which tree species grow in the forest and where, as well as ecosystem processes such as nitrogen fixation and nutrient cycling.

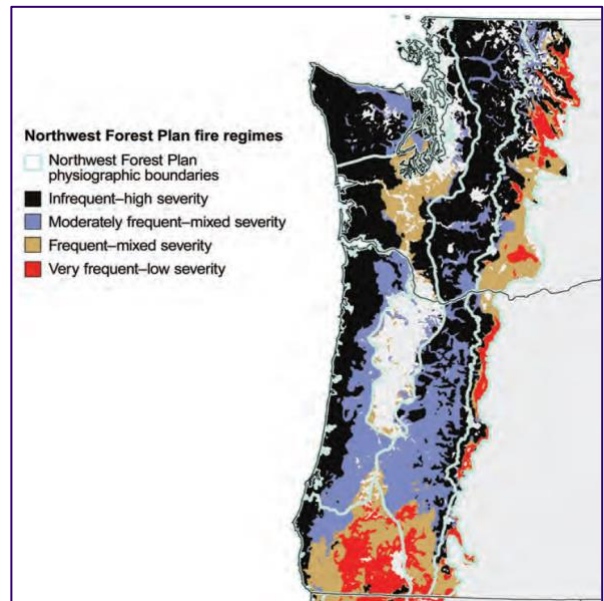


Figure 1. Generalized fire regimes for the Northwest Forest Plan (NWFP) area in OR and WA based on climate and lightning density. Adapted from Spies et al. 2018.¹

Indigenous Peoples also used wildland fire as a tool for centuries to remove undergrowth for easier travel and to promote growth of edible plants. Throughout the workshop, some participants expressed the desire to use fire to manage natural ecosystems and help restore a historical landscape with patches of young and old vegetation that directly support treaty and cultural resources. Examples of successful management of both naturally occurring fires and prescribed burns showcased the potential utility of fire as a management tool. For example, in Olympic National Park recent forest fires have promoted meadow restoration through the removal of tree canopy cover and the subsequent creation of open clearings. Additionally, the Tulalip Tribes are using prescribed burning to manage small patches of meadow habitat that support mountain huckleberry, a culturally important but declining resource. In this instance, small-scale use of fire helps preserve cultural traditions and heritage, increases efficiency of vegetation removal, and promotes huckleberry growth.

Despite this desire to preserve the role of fire in the landscape, participants acknowledged that barriers to its use as a management tool exist and will likely increase in the future. For example, Washington Department of Natural Resources is required to actively and aggressively suppress all fires, so there is little flexibility to manage wildland fire as a natural process. Furthermore, projected warming and declines in summer precipitation may decrease the windows of time each year when climate conditions are suitable for prescribed burns. The additional smoke produced by these burns is also a challenge to the quality of life for a growing population in the wildland-urban interface where homes intersect with undeveloped forested areas. Engaging the public in the wildland-urban interface early in the decision-making process regarding if or when prescribed burning is used, and understanding the relationship of prescribed burning to other fire management strategies are both crucial in deciding the most appropriate use of prescribed burning in these forests.

¹ Spies, T.A.; et al., tech. coords. 2018. Synthesis of science to inform land management within the Northwest Forest Plan area. Gen. Tech. Rep. PNW-GTR-966. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 1020 p. 3 vol.

THEME 2

WILDFIRE RISK WEST OF THE CASCADES IS HIGHER THAN MOST PEOPLE REALIZE, AND WE MAY NEED MORE OUTREACH TO EFFECTIVELY COMMUNICATE THIS GROWING RISK IN ORDER FOR INDIVIDUALS AND COMMUNITIES TO TAKE ACTION.

Workshop participants agreed that many people living in the wildland-urban interface do not fully realize the risk that wildfires pose to western Washington communities, and that education and outreach will be necessary to motivate the adoption of actions that can help prepare communities for the growing wildfire risk.

Rarely, but under the right weather conditions, westside fires can be large (100,000 to >1,000,000 acres) and fast-moving events. For example, the Tillamook fire of 1933 burned approximately 350,000 acres in the Oregon Coast Range and more than 200,000 acres burned in 24 hours. The Yaoclt fire in the Southern Washington Cascades burned more than one million acres and spread 30 miles in 36 hours (see Theme 4 for more information on projected changes in wildfire risk). Aggressively suppressing fires while they are small is a vital fire response strategy because fires have the potential to increase rapidly in size and make containment difficult to impossible. In addition, preventing human-caused ignitions and adapting to wildland fire will also be necessary for reducing injury and infrastructure damage because fire suppression capacity may be limited by understaffed firefighter crews that already have significant fire response commitments. To understand the risk better and increase community awareness, several participants advocated for approaching wildfire risk in the same way we approach the risk of an earthquake or volcanic eruption. In order to prepare, it is necessary to acknowledge and accept the current risk, plan and prepare given the resources we have, and revisit the topic as new information becomes available. Participants noted that education campaigns for the Cascadia Subduction Zone earthquake have been successful at increasing preparedness and may offer lessons for westside fire.

Participants emphasized that any outreach program intended to reach a wide audience needs to be consistent, engaging, and memorable. Examples include Firewise USA² workshops where communities learn evacuation procedures and how to create a defensible space around homes. Seattle City Light took a creative approach to community engagement when it developed a short, humorous safety awareness video, “Escape from Diablo.” This film outlines emergency evacuation procedures for the town of Diablo, a part of Seattle City Light’s Skagit Hydroelectric Project in the North Cascades. Diablo had to be evacuated during a wildfire in August 2015 and lessons learned from this experience resulted in the evacuation plan and video.

Opportunities exist, such as the Washington Fire Adapted Communities Learning Network and Community Wildfire Protection Plan, to share and adapt wildfire prevention, mitigation, and education plans already developed by the state, western Washington counties, and communities for use at the local level. It is important to emphasize that extra care needs be taken when initiating programs, as any outreach program will need to reach diverse community groups, often with a language barrier.



Figure 2. A demonstration at DNR's 2012 wildfire awareness week event near the Bear Creek campground on the Olympic Peninsula. Image credit: Washington DNR.

² Firewise USA[®] is a program of National Fire Protection Association that teaches people how to adapt to living with wildland fire and encourages neighbors to work together and take action now to prevent losses.

THEME 3

WILDLAND FIRE IS FUNDAMENTALLY DIFFERENT EAST AND WEST OF THE CASCADES, AND WE NEED DIFFERENT MANAGEMENT STRATEGIES TO COPE WITH WESTSIDE FIRE MOVING FORWARD

Climate, forests, and the ecological function of fire in ecosystems are distinct between eastern and western Washington. The maritime climate west of the Cascade Crest facilitates the growth of wet forests that are dense, productive, and long-lived. In contrast, eastern Washington is defined by a continental climate with drier, hotter summers and low soil moisture. Eastside forests are typically dry, less dense and more open.

Historically, dry forests in eastern Washington experienced frequent, low-severity fires, which enabled forests to persist through these disturbance events. Undergrowth burned, but larger, fire-tolerant trees survived. However, nearly a century of fire exclusion by humans has resulted in uncharacteristically dense forests in eastern Washington. This increased density of trees and vegetation (also called fuel accumulation because the vegetation becomes fuel for fires) increases the potential for severely burned forests over larger areas. Western Washington forests, on the other hand, historically experienced high or moderate severity fires with centuries between major fires. These fires, that killed most trees in the forest, burned hundreds of thousands of acres. Given the naturally long intervals between fires, human exclusion of wildland fire in the last century has not had a large-scale effect on wildfire risk.

The role that fire plays on the landscape is distinct between eastern and western Washington. Thus, the options for managing fire that are effective on the eastside might not be suitable for the westside.³ For example, the naturally dense, wet forests of western Washington preclude landscape-scale fuel management (e.g., thinning) as an effective fire management technique. These differences in appropriate fire management techniques for the two regions were raised but not fully addressed during the workshop, and are an important topic for further discussion.



Figure 3. An aerial photo of the Dog Mountain fire in Lewis County, Washington on May 6th, 2013. The fire burned approximately 60 acres. Image Credit: Washington State Department of Transportation.

Partnerships that span the crest of the Cascades, for example the Washington Fire Adapted Communities Learning Network, are important to ensure that resources and lessons learned from past fires continue to be shared with more communities, even those that experience less frequent fire in western Washington.

³ Halofsky, J. S., D. C. Donato, J. F. Franklin, J. E. Halofsky, D. L. Peterson, and B. J. Harvey. 2018. The nature of the beast: examining climate adaptation options in forests with stand-replacing fire regimes. *Ecosphere* 9(3):e02140.10.1002/ecs2.2140

THEME 4

THE RISK OF WILDFIRE WEST OF THE CASCADES WILL LIKELY INCREASE WITH CLIMATE CHANGE AND POPULATION GROWTH.

When we look across the western U.S. as whole, fire activity is increasing and it is partly related to climate change. Across the western U.S., the dryness of forest vegetation during the fire season (sometimes called fuel aridity) has increased since 1979 and about 55% of this increase is due to human-caused climate change.⁴ In the Pacific Northwest specifically, the area burned, fire season length, and number of fires greater than 1,000 acres has increased since 1973⁵. Looking to the future, the average area burned each year in the Pacific Northwest is expected to more than triple by the 2040s (relative to 1916-2006) if greenhouse gas emissions continue at a moderate rate.

Narrowing in on western Washington, the trend in fire activity and its relationship to climate change are less clear. Warming, decreases in summer precipitation, and earlier snowmelt are all expected to cause drier fuels in summer and lengthen the fire season, increasing the potential for wildland fire. On average for western Washington, the number of very high fire danger days (days with 100-hr fuel moisture below the historical 10 percentile) is projected to increase to 43 days for the 2020s and 48 days by the 2050s, up from 36 days for the 1971 to 2000 period.



Figure 4. Ecosections used for sub-regional fire modeling.⁶

For much of western Washington, however; quantitative projections of future changes in fire frequency or area burned are limited or not available. For part of western Washington, specifically the area of the Western Cascades Ecosection (Figure 4), area burned is projected to triple by the 2040s (relative to 1980 to 2006). While this is a large *relative* increase, the *actual* increase in acreage burned (from 2,700 acres to 8,000 acres per year) is still small compared to the eastern Cascades where 63,000 acres burned per year on average for 1980 to 2006. For other areas in western Washington (Coast Range and Puget Trough, Figure 4) there is insufficient data on historical fires to make future projections.⁶ Furthermore, the models on which these projections are based do not

include some of the critical regional weather patterns, such as east winds, that are typically important for the largest fires to burn in western Washington. Despite the lack of quantitative projections of future area burned, the potential for small to moderate wildfires in western Washington is expected to increase due to drier conditions, as well as population growth and development expanding into the wildland-urban interface.

4 Abatzoglou, J.T., Williams, P.A. 2016. Impact of anthropogenic climate change on wildfire across western US forests. *Proceedings of the National Academy of Sciences*. DOI: 10.1073/pnas.1607171113

5 Westerling, A.L. 2016. Increasing western US forest wildfire activity: sensitivity to changes in the timing of spring. *Philosophical Transactions of the Royal Society B*. 371: 20150178. <http://dx.doi.org/10.1098/rstb.2015.0178>

6 Littell, J.S., Oneil, E.E., McKenzie, D., Hicke, J.A., Lutz, J.A., Norheim, R.A., Elsner, M.M. 2010. Forest ecosystems, disturbance, and climatic change in Washington State, USA. *Climatic Change* 102, 129-158.

Containing and managing wildland fires when they do burn may also become more difficult, contributing to future wildfire risk. Workshop participants noted shifts in fire behavior in eastern Washington that make containing and managing wildfire more challenging. For example, historically fires rarely burned through wet riparian areas, and cooler nighttime temperatures offered an opportunity to contain fires. However, fires are increasingly burning through these wet forest areas and during the night, so these places and times are less effective as opportunities for containment.



Figure 5. Firefighters in DNR's western Washington fire training from June 22 through July 2, 2015 in Rainier. Image credit: Washington Department of Natural Resources.

Many workshop participants also shared observations of resource limitations that could contribute to increasing wildfire risk in western Washington. Staff at Washington Department of Natural Resources (DNR) noted that since the fire season has lengthened, it has been harder to recruit fire suppression volunteers because of the increased time commitment. DNR staff at the workshop noted that the agency only has 43 permanent, year-round firefighters; the vast majority of firefighters are seasonal employees or permanent staff at DNR in other non-fire programs who participate in firefighting seasonally. Previously, fire crews were in the field for five to seven days, two times per year. Now crews are in the field for two (occasionally three) weeks at a time, six to seven times per year. The longer fire season increasingly pulls these staff away from their jobs in non-fire programs, leaving DNR with a growing need for firefighter capacity. The agency has cooperative agreements with firefighters from outside the region, both nationally and internationally (e.g., 17 states, Australia, New Zealand, Canada).

Population growth in western Washington, and specifically in the wildland-urban interface (WUI), will exacerbate the challenge of managing and containing wildfires in western Washington. One workshop participant noted that over the past four years more than 95% of the fires in western Washington have been ignited by humans. In Snohomish County alone, there are 127,000 people and \$10 billion of infrastructure located in the WUI, and the WUI is expanding rapidly. One workshop participant noted that federal wildland firefighters are spending significant time protecting structures on private land. Individuals building homes in the western Washington WUI are often unaware of the risk of building in this area. Education is essential for individuals or communities residing in the WUI to ensure they can take the necessary steps to create defensible space around their homes.

THEME 5

COLLABORATION WILL BE CRITICAL TO DEAL WITH INCREASING WILDFIRE RISK IN A CHANGING CLIMATE

Workshop participants widely agreed that collaboration is a key component to preparing for, responding to, and managing the impacts of wildland fire in a changing climate. Participants identified two types of collaboration: (1) collaboration between agencies and organizations, and (2) collaboration among communities. Both types of collaboration call for resource and information sharing to better equip communities on the westside of the Cascades for future fire events.

Participants emphasized that fires transcend organizational boundaries, and therefore require an interagency approach. Participants noted that this approach is currently being practiced by the states of Washington and Oregon, the federal government, and the Bureau of Indian Affairs through the 2014 – 2019 Pacific Northwest Operating Plan. This operating plan outlines fire management activities and resource movement among the agencies involved. The 2018 Maple Fire in the Olympic National Park was identified as a situation where this operating plan was extremely beneficial. Alluding to the operating plan and the Maple Fire, a participant from DNR noted that the collaboration among agencies permitted fire crews to have access to helicopters, making a large difference in their fire suppression efforts. Additionally, the Good Neighbor Authority, authorized by Congress in the 2014 Farm Bill, is an agreement with the U.S. Forest Service that enables DNR to enter contracts for forest restoration work across Washington that spans state and federal property lines. This tool provides additional capacity to the U.S. Forest Service by enabling DNR to conduct work that aims to reduce wildfire risk to state trust lands and communities. The Pacific Northwest Operating Plan and the Good Neighbor Authority are both examples of interagency collaboration that facilitate resource pooling and increase capacity to actively manage Washington's forests to reduce wildfire risk.

On a more local scale, some Tribes are working with fire districts to create plans in preparation for managing wildland fire on and off reservations. The Tulalip Tribes noted that they are working with their local fire districts to develop fire management strategies.

Local collaboration efforts in this region are helping communities plan and prepare for wildfire. For example, Snohomish County, Fire District 26, DNR, and others collaborated to create a Community Wildfire Protection Plan, which was developed to strengthen collaboration and cooperation in wildfire prevention, mitigation, resilience, and response. The protection plan identifies shared community values at risk from wildfire and provides actions community members can take to increase resilience to wildland fire. The plan also provides a framework that will help implement actions or strategies to reduce the probability of wildfire spreading through the community and reduce the impacts or losses of property and infrastructure. The Washington Fire Adapted Communities Learning Network was also highlighted as an excellent resource for communities to connect and share best practices on learning to live with wildland fire. Many individuals expressed that current collaboration is satisfactory but should continue to grow and become a more widespread practice.

ACTIONABLE SCIENCE AGENDA

The *Managing Western Washington Wildfire Risk in a Changing Climate* workshop provided an opportunity for federal, state, county, and city agencies, tribes, non-governmental organizations, researchers, and the private sector to come together to learn more about current and projected fire risk west of the Cascades and to discuss the unique aspects of managing wildfire risk in western Washington.

Through participant presentations, panels, and discussions, key research and information needs were highlighted, as well as opportunities for greater collaboration.

Research

- East winds carry hot, dry air from eastern Washington across the Cascade Mountains into western Washington. These wind events reduce relative humidity and dry live and dead vegetation faster than normal, causing large and fast-moving wildfires in western Washington. Research is needed to evaluate how climate change will affect the frequency and/or magnitude of the type of east winds associated with wildland fire throughout the fire season.
- Research has shown that there is an interaction between wildfire risk and insect disturbance. For example, in the Rocky Mountains, bark beetle outbreaks reduce wildfire risk in the long-term, but it is less clear how this disturbance affects wildfire risk in early phases of an outbreak. Research is needed to identify how insect and pathogen disturbances local to western Washington (e.g., laminated root rot, Douglas fir beetle) may affect wildfire risk in this region.
- Wildland fire significantly affects aquatic habitats (e.g., sedimentation, wood input, increase flood risk), which will impact habitat quality for salmonids. Research is needed to quantify the downstream impacts of wildfire on aquatic species, sedimentation, and wood input west of the Cascades. Additionally, there is a need to identify effective management strategies to reduce wildfire impacts to aquatic habitats.
- Fire regimes are fundamentally different east and west of the Cascades. Therefore, the options for managing fire that are effective on the eastside may not be suitable on the westside. Additional research is needed to evaluate the effectiveness of fire management strategies (e.g., fuel breaks, hardwood density, and fire suppression) on reducing wildfire risk west of the Cascades.
- Formal risk assessments are needed that evaluate wildfire hazards and risk to valued resources and assets for local areas. These assessments can form the basis for decisions in a risk management context.

Collaboration

- Common terminology and language across agencies, organizations, and communities;
- Joint database that provides GIS layers (e.g., WUI maps, projected change in fire risk, fire regimes), informational materials, land use plans, and to other fire information resources;
- Regional alert/warning systems for wildfire location and severity level;
- Training with DNR and fire districts in rural communities to increase fire response capabilities;
- Greater adoption of Firewise USA® practices and outreach efforts to communities through programs like the Washington Fire Adapted Communities Learning Network, which is currently mostly on the eastside, but interested in expanding to more communities on the westside.

Several participants expressed that the research needs identified in the workshop are specific to the wildland fire conditions west of the Cascades. This work will be most effective if coupled with local and regional efforts

focused on community preparedness. In addition, more funding is needed for fire preparation planning. While it is important to prepare for wildfires, there is also a need for more integration of fire suppression and natural resource management, especially when considering native plants such as mountain huckleberry. A final takeaway discussed by several participants is the benefit of having people with diverse backgrounds and interests at the table to share ideas and strategies. On-going conversations about preparing for and managing wildfires are necessary as communities in western Washington continue to identify appropriate responses to the risk.

WORKSHOP ATTENDEES

This workshop generated significant interest from a wide variety of sectors. It brought together about 100 participants from academia, regional Tribes, the public and private sector, as well as county, state, and federal levels of government. The participants' areas of expertise varied broadly, ranging from fire, emergency, and hazard management to policy, planning, and climate adaptation specialists (Figure 6 & 7).

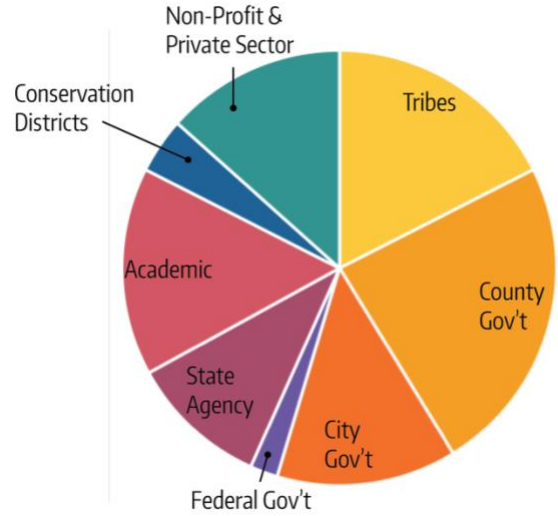


Figure 6. Affiliations of workshop participants. Affiliations include: Tribes (n=17), County Government (n=23), City Government (n=13), Federal Government (n=15), Academic (n=15), State Agency (n=10), Conservation Districts (n=4), and the Non-Profit and Private Sector (n=13).

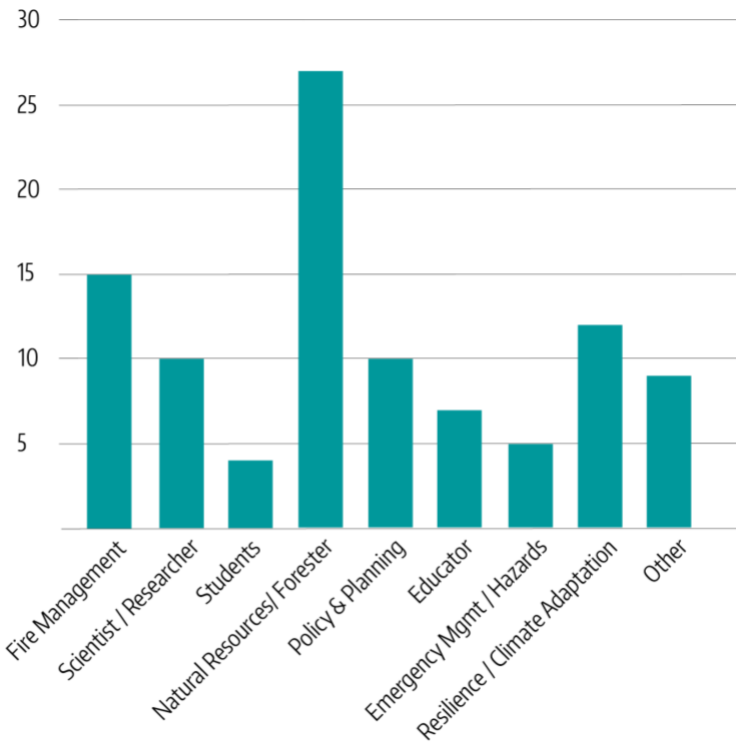


Figure 7. Role of workshop participants. Roles include: Fire Management (n=15), Scientist / Researcher (n=10), Student (n=4), Natural Resources/Forester (n=27), Policy/Planning (n=10), Educator (n=7), Emergency Management / Hazard Management (n=5), Resilience / Climate Adaptation (n=12), Other (n=9).

WORKSHOP AGENDA

Managing Western Washington Wildfire Risk in a Changing Climate

Tulalip Resort Casino | Tulalip, WA

Welcome and Opening Remarks

Lara Whitely Binder, *Climate Preparedness Specialist, King County*

Amy Snover, *Director, University of Washington Climate Impacts Group and University Director, Northwest Climate Adaptation Science Center*

Opening Prayer: **Natosha Gobin**, *Language Teacher, Tulalip Tribes*

Western Washington Wildfire: Past, Present, and Projected Changes

Ross Fenton, *Forester, Tulalip Tribes*

Josh Halofsky, *Research Scientist, Washington Department of Natural Resources*

Libby Nelson, *Treaty Rights Policy Analyst, Tulalip Tribes*

Crystal Raymond, *Adaptation Specialist, University of Washington Climate Impacts Group*

Holly Zox, *Botanist, Consultant for Tulalip Tribes*

Understanding and Managing Today's Wildland Fire Risk and Impacts

Jason Biermann, *Emergency Management Director, Snohomish County*

Jason Gobin, *Natural Resources Manager, Tulalip Tribes*

Todd Rankin, *U.S. Department of Interior Interagency Fire Management Officer, Olympic National Park*

Chuck Turley, *Division Manager for Wildfire, Washington Dept. of Natural Resources*

Cody Watson, *Fire Brigade Chief, Seattle City Light*

Perspectives on Preparing for, Responding to, and Managing the Impacts of Wildland Fire in Western Washington

Ryan Anderson, *Executive Director, Washington Fire Adapted Communities Learning Network*

Tim Cook, *State Hazard Mitigation Officer, Washington Emergency Management Division*

Dave Peterson, *Emeritus Scientist, U.S. Forest Service*

Chuck Turley, *Division Manager for Wildfire, Washington Dept. of Natural Resources*

Preparing for and Responding to Wildland Fire on the Westside

Participants will discuss what we could be doing near-term and longer-term to improve messaging around fire risk and reduce fire risk west of the Cascades, as well as the near-term and longer-term information, research, partnership, and coordination needs that will help enhance our ability to prepare for and respond to fires on the westside.

After the Smoke Clears: A Virtual Field Trip to the 2017 Norse Peak Fire

Brian J. Harvey, *Assistant Professor, UW School of Environmental and Forest Sciences*