



Leveraging the Work of Wildfire Before, During, and After Fires

In June 2024, the Washington State Department of Natural Resources Resilience Division (DNR) and Northwest Fire Science Consortium (NWFS) convened a workshop with the Colville National Forest in northeastern Washington. The broad intent was to bring together a diverse group of researchers, managers, and practitioners to explore key topics in fire ecology, landscape restoration, and wildfire management in an interactive, field-based setting. This year's workshop focused on integrating the "work of wildfire" with post-fire management and landscape restoration planning. DNR and others use the term "work of wildfire" to understand the degree to which fire effects are consistent with the landscape resilience and wildfire risk reduction objectives.¹ As forested landscapes experience more wildfire and climate impacts, and managers increase their restoration efforts, there are numerous opportunities and challenges for implementing "green restoration", determining post-fire objectives and treatment options "in the black", and integrating pre-and post-fire management to support landscape resilience.



Photo: Patrick Shults

¹ "Work of wildfire" reports are available online: <https://deptofnaturalresources.app.box.com/s/gjnmcm0py2f3n447ba18wz5zkyjuwdgq> sss

Workshop themes & objectives:

- Build relationships among scientists and managers to facilitate information exchange, partnership opportunities, and new ideas.
- Observe post-fire management treatments in both high- and moderate-severity areas, and discuss barriers and needs related to scaling up these treatments.
- Discuss approaches to quantifying and increasing the extent of beneficial wildfire, including the design and location of treatments before fires and utilization of treatments during fires.
- Identify strategies, research and resource needs, and policy changes for improving landscape-level integration of the work of wildfire with green restoration treatments.



Photo: Autumn Ellison

Workshop approach

A collaborative team of individuals from DNR and the NWFSC met for several months to design the workshop objectives and agenda. The concept of a field-based workshop was drawn from California, where a group of scientists and managers have conducted an annual field retreat over the last decade to build relationships and shared knowledge. For the first Washington workshop, organizers sought a setting with relatively recent wildfire events where a variety of pre- and post-fire treatments had been implemented. The availability and willingness of Colville National Forest managers to help identify field sites and present information and perspectives was also crucial.

The workshop consisted of one half-day and one full day in the field, with one site on day one and three sites on day two. Site engagement occurred from the roadside and via short hikes. To allow for discussion of a range of fire histories, effects, and management strategies, the following sites were visited:

1. A recent non-commercial thinning and pile and burn treatment in a dense cold and dry forest that naturally regenerated in high-severity areas of the 1998 White Mountain Fire.
2. Variable post-fire salvage treatments applied to a high-severity site of the 2015 Stickpin Fire.
3. Commercial dead and green thinning treatments in moderate-severity portions of the 2015 Stickpin Fire to fully restore stands (i.e. species, density, fuel loading, spatial pattern).
4. The 2021 Bulldog Mountain Fire where a big box approach was utilized resulting in the accomplishment of prescribed-fire objectives that were established prior to the fire.

To foster connections with the landscape and each other, a group campsite was arranged in advance and participants stayed for two nights to socialize, debrief, and participate in small group exercises to elicit key priorities for research, management, and policy. An important co-benefit of this workshop magnified by the camping component was the opportunity to build relationships. Several attendees noted the workshop provided an opportunity to spend time with people they had only known from online interactions or had not seen in several years, as well as a chance to meet new people working in their field. This format facilitated sustained discussions about the themes of the workshop, which resulted in the identified priorities below.

Discussion themes and overarching questions

- **Recognizing the role of high-severity wildfire in restoring landscape mosaics that include non-forest patches:** To change the landscape ecology of fire at very large spatial and temporal scales will require considering emergent properties of non-forest (e.g., wetlands, prairies, savanna) in driving climate adaptation, and deliberate focus on cultivating vegetation structure and composition that both reflects historical landscape patterns and supports desirable future fire effects. Widespread replanting and relegating non-forest to unsuitable sites may not provide adequate heterogeneity or reflect prior conditions.
- **Fire severity:** In areas that experience high- and moderate-severity fire, this field tour raised questions about fire effects, reburn potential, and treatment options, including if high-severity fire may create more homogenous forest patterns in the future, and how moderate-severity fire may offer good opportunities to “continue the work of wildfire.” Although severity matters, pre-fire conditions also drive post-fire options by determining the structure and composition available on a site.
- **Post-fire treatment objectives and outcomes:** Post-fire treatments can be motivated by future fire risk reduction and fire management needs (e.g. establishing control lines for reburns), public safety (e.g. roadside hazard tree removal), forest resilience goals such replanting, creation of non-forest habitats, setting the stage for future characteristic fire severity, and other objectives. Improved understanding and articulation of the interactions and tradeoffs among different objectives at stand and landscape levels is needed to broaden how managers, researchers, and stakeholders approach post-fire management.
- **Prioritization between green and black:** Given the scale at which wildfires and climate change are affecting and projected to affect forests, how should we prioritize management “in the green versus the black”? What conditions might drive prioritizing one over the other or integrating the two?
- **Restoration and climate-adaptation work in higher-elevation, cold forests:** In contrast to lower-elevation drier forests, there are more management considerations and constraints (e.g., wildlife habitat, roadless areas), and there is less scientific knowledge and social engagement around restoration and post-fire treatment options in higher-elevation, cold forests. Even so, scientific information exists for these forest types and evidence suggests higher fire frequencies and more low- and moderate-severity fire than the common narrative that these forests were dominated by high-severity fire.
- **Social and economic context:** Partners helped the Colville National Forest develop post-fire treatment options, monitoring, and research after the 2015 fire season. However, charting a post-fire course is often socially difficult due to differing views and conflict about treatment approaches. From an economic standpoint, species composition, and timing and extent of wildfire events can affect markets and viability for post-fire treatments.
- **Institutional and policy factors:** Green restoration and post-fire actions are typically planned separately and with different policy and management requirements, making it challenging to integrate them through longer-term, holistic, adaptive management approaches. Replanting requirements for sites “suitable” for timber cultivation can drive reforestation versus potentially more climate-adaptive, landscape-scale approaches such as leaving and enhancing non-forest for heterogeneity.
- **Big box fire management:** The 2021 Bulldog Mountain Fire was managed with a fire suppression objective but the big box approach allowed for the accomplishment of about 6,000 acres of previously planned prescribed fire and thinning work. Many conditions need to align for this approach to be possible, yet it is the primary way to achieve the amount of burning that is needed.



Potential research and analysis needs

Monitoring and modelling

- Existing models are limited in their capacity to demonstrate spatial variability in fuels and feedbacks between subsequent fire events (i.e., reburns); what other approaches could overcome this?
- Existing remote sensing data/approaches are not granular enough to adequately assess post-fire conditions at scale. How can we streamline application of new data to land management as remote sensing technology develops? Are there other cost-effective approaches we can take to assess post-fire conditions?
- Reburn fire intensity can impact regeneration and structure of post-fire forests. Can we apply existing or develop new modelling tools to post-fire sites to determine how reburns will affect future stand conditions?



Forest structure, fuels and fire regimes

- More research is needed on the effects of green/dead post-fire thinning treatments in moderately burned areas compared to untreated areas. Effects include fuel trajectories and future fuel loading, ongoing tree mortality from insects and other agents, vegetation trajectories, snags and associated wildlife habitat, options for future treatments, etc.
- How can we utilize post-fire monitoring to gauge the cumulative effect of multiple burns on forest structure, composition, and future fire risk? How are these affected by pre- and post-fire treatments?
- We need to better define and articulate the positive work of high-severity fire, especially related to restoring non-forest patches. This includes improved mapping of wet and dry meadows that have been encroached, and good sites for shrubland and grassland patches in areas that can sustain forests. What site conditions should be prioritized and how can this overlap with climate-related shifts in vegetation? What tools and resources exist or could be created to identify sites, including resources on long-term landscape management?
- Identifying and describing indicators within cold and/or high elevation forest that can be used to identify areas that had low- or moderate-severity fire regimes. Examples include: proportion of non-serotinous cones, presence of large shade-tolerant species or stumps with evidence of fire, grass dominated understories, etc.

Wildlife and water

- What are the impacts of post-fire treatments in high- and moderate-severity burned areas on wildlife habitat, including snags? At what scale and patterning should snags and dying trees be maintained? Are we creating snag deserts or viable habitat with post-fire treatment? Reference conditions are required to understand historic distribution of snags and to inform a threshold of concern for management.
- What can be learned about impacts of post-fire treatments on snowpack, snow melt, and associated hydrology? What are the co-benefits and tradeoffs among different treatments and water quantity/quality?
- Increased frequency and severity of wildfire are likely to have greater impact on wetlands. Can we evaluate the impacts of fire on wetlands sites that have burned to determine effective pre- and post-fire treatments?

Policy

- What are the quality, scale, and efficiency of restoration and post-fire management under stable funding scenarios versus singular or short-term funding?
- What is the impact of current regulations on smoke management and fire (pile burning, prescribed fire, and wildfire), and how can they be improved?



Photo: Garrett Meigs

Potential management needs

- Determining thresholds of concern for fuel loading departures post-fire at a landscape scale. These thresholds would provide some idea of tipping points where the departures could lead to movement away from historical range of variation/future range of variation for structure, habitat, species composition, spatial pattern, etc.
- Post-fire replanting can be an opportune time to introduce spatial heterogeneity in forest structure and species composition. Updating or developing management tools and other resources to include information on variable replanting spatial patterns would support land managers to experiment with these practices but further scoping work is needed to understand if this should be prioritized.
- Recognizing that climate change is likely to reduce the success of future regeneration efforts in higher-elevation, cold forests, resources are needed to support land managers to capitalize on and prioritize current areas with successful regeneration for restoration and treatment.
- Present and expected climate impacts on post-fire replanting are driving the need for improved seedling quality and availability. How can we support the reforestation pipeline to meet the resource needs of managers in the context of a changing climate?
- There is continued need to support post-fire management across ownerships and agencies. What tools exist or could be developed to streamline cross-boundary approaches for land managers?

Potential policy and partner engagement needs

- Media coverage and public awareness of forest restoration and fire dynamics in dry forest systems has increased over recent years, but how could this engagement be further extended to broaden understanding of other systems (i.e., cold forest), post-fire management, and beneficial fire?
- What approaches are most effective for meaningfully engaging communities and the public around topics of post-fire ecology and treatments, including management for risks of reburns and climate-fire feedbacks?
- Existing approaches to National Environmental Policy Act (NEPA) planning make conducting rapid post-fire restoration treatments at scale very challenging or impossible. New planning regulations and other institutional and policy changes are needed to facilitate ecologically-based, post-fire management that is integrated with green restoration work. Develop a Work of Wildfire categorical exclusion for post-fire projects.
- To support large landscape management and inclusion of non-forest for climate adaptation, how can appropriate forest cover (per the Forest and Rangeland Renewable Resources Planning Act of 1974 and the Replant Act of 2021) be interpreted, and what are options to incorporate non-forest features in restoration projects through co-stewardship with Tribes and Indigenous communities?

Key recommendations to meet identified needs

- Develop a research paper and/or white paper to better define and articulate the positive work of high-severity fire, especially related to restoration and maintenance of non-forest patches within a landscape mosaic. Additionally, fund improved tools to identify and map wet and dry meadows that have been encroached, as well as good sites for shrubland and grassland patches in forest-capable areas.
- Fund research to better understand the effects of green/dead post-fire thinning treatments in areas that burn at moderate severity compared to areas where no post-fire management occurs. This will help highlight the opportunities to do more of this work and improve these treatments.
- Conduct a policy review to assess policy barriers to implementing ecologically based, rapid post-fire management at scale that is integrated with green restoration work. Identify changes to NEPA or other institutional and policy changes that are needed to facilitate post-fire management.
- Develop approaches to meaningfully engage communities and the public around topics of post-fire ecology and treatments, including reburn risk management and climate adaptation.

Future workshops:

Based on the success of the 2024 workshop and enthusiastic feedback from participants, both WA DNR and NWFSC are interested in planning additional workshops in subsequent years, ideally annually, with rotating themes and locations. Other organizations interested in supporting or participating in future workshops are welcome.

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The Northwest Fire Science Consortium works to accelerate the awareness, understanding, and adoption of wildland fire science. We connect managers, practitioners, scientists, and local communities and collaboratives working on fire issues on forest and range lands in Washington & Oregon. To learn more: www.nwfirescience.org/