Woodland Fish & Wildlife

My Forest Burned: Now What?

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Mountain Bluebird, a snag dependent species. Photo by Gregg Thompson.

Introduction

Fire! The very word elicits powerful emotions of dread and even flight. Yet, fire is a natural phenomenon and in fact, a driving force with deep and profound effects in ecosystems. Habitats invariably change with time and disturbance. Most forests in the Pacific Northwest cycle between fire events of varying intensities and the resulting changes in vegetation and wildlife species composition. Human objectives, goals, infrastructure and dreams juxtaposed on this landscape create a complex situation. None of this is good, nor bad; it just is.

Consider a mixed conifer forest in the east Cascades, where stands of ponderosa pine, Douglas-fir and grand fir, are inhabited by Douglas or red squirrels, Western tanager, mountain chickadee and pileated woodpeckers. A crown fire could produce massive tree mortality, and suddenly, the deep green forest is a sea of standing dead trees (snags), with the understory gone (for now). Those species dependent on green crowns and cone crops are displaced and unable to utilize this site for a long while. But the burned habitat recovers remarkably quickly with new vegetation and in short order, a new set of wildlife will occupy the site. Bluebirds replace tanagers, flickers replace pileated woodpecker, and deer flourish in the new habitat.

Conversely, more open, drier forests stands often come through a fire with high survival of overstory trees if the trees are mature enough, fuel loadings low enough , and the fire not too hot. These types of habitats are resilient to low intensity fire, and the basic habitats can remain largely unchanged through low intensity fire events. In these cases, wildlife species will not change after the fire.

Newly burned areas will offer new habitats. The sudden influx of dead trees can create opportunities for birds to feed on insects (such as flat head borers) now living in the dead wood, and places to build nest cavities, particularly in the upper reaches of trees newly breaking off. The burned soil can be "fertilizer", and the recovering or newly seeded plants will thrive as a result of the nutrient input.

Intensely burned habitat, Methow Valley, WA. Photo by Ken Bevis.

Aspen regeneration four years post-fire. Photo by Ken Bevis.

Broadleaf trees and shrubs will rebound with startling vigor (provided the fire intensity was less than extreme). For example, aspens can grow several feet per year immediately after a fire, and many shrub species, such a chokecherry or serviceberry re-sprout from root crowns. Grasses and some forbs return quickly, and the ground level vegetation can be a richer habitat than before the fire in a few short years.

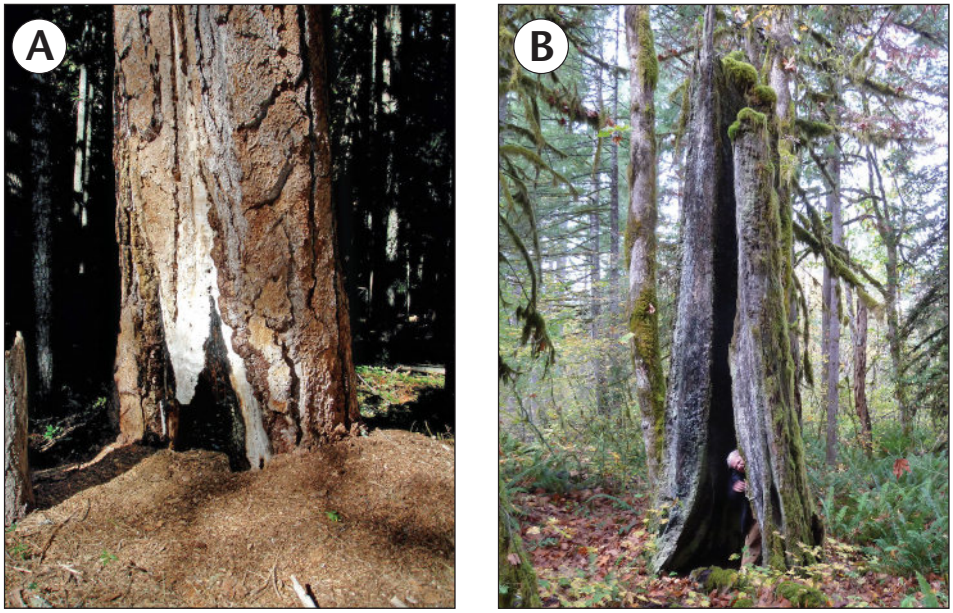
Wildlife adjusts to changes in habitats, but the effects on humans can be profound.

Forest landowners have deep connections to their land and work hard to grow, protect and maintain their trees. Experiencing wildfire on your land can be emotionally and financially devastating. After considerable time, energy, and money spent caring for your woodland, it can be overwhelming to deal with fire outcomes and perhaps start all over again. The good news is there are many people who can provide technical assistance, guidance to financial resources, and other support as you chart a path forward (see "Who to Contact" at the end of this publication). Given time, and the best materials, nature, with a little help, can do a remarkable job of healing fire effects and moving your forest back towards your objectives.

This publication is intended to provide initial guidance for restoring your land in a way that emphasizes the wildlife habitat this post-fire landscape can provide.

Why are we Seeing All This Fire?

Dry ecosystems, especially lower- elevation dry forests east of the Cascades in Oregon and Washington, were once routinely shaped by fire. Scientific research, including the study of fire scars on trees and stumps, historic photo analysis and old site descriptions, show us that these forests historically burned every ten to twenty-five years with low-intensity, stand maintaining fires (Churchill et al 2017, Merschel et al 2014). The resulting forest structure was a mix of open stands with large fire-resistant trees, clumps of regenerating trees and shrubs, openings with grasses and forbs, and structures like large snags and down logs. This normal fire acted as a regulating force in dry forests, reducing the number of trees on the landscape, prevented the accumulation of excessive combustible material, and provided important ecosystem benefits such as nutrient cycling and wildlife habitat creation.



Fire ecology evidence: (A) Burn scar on live Ponderosa pine. (B) Old burned snag and bear den. Photos by Ken Bevis.

How Wildlife have Adapted to Wildfire

Wildlife have adapted many mechanisms for dealing with fire. Some fire effects are direct and lethal, particularly for low mobility species that are unable to escape the heat by either going underground or deep into rotting wood or cracks and cavities in standing trees. Larger, more mobile wildlife can move away from the flames and smoke, and depending on the scale and intensity of the fire, generally survive. For example, deer or elk can run away, and most birds can fly away. There are numerous anecdotes of large ungulates grazing, apparently unconcerned, near the edge of large fires (such as in Yellowstone).

Post-fire habitats revert to early successional habitat in varying degrees (depending on tree survival) but generally result in an increase in grass, forbs and shrubs in the near-term years following a fire. Fires eventually benefit those species tied to early successional habitats, despite creating later successional habitat loss immediately after fire. Post-fire habitats usually have an abundance of dead wood structure (standing snags and down logs) that can persist for many years in the new forest. In general, our native wildlife species are adapted to fire over the long term by using habitats influenced and created by fire.

However, beginning with the arrival of European American settlers and increasing in the era of effective 20th century firefighting, we largely removed fire from the forests. Some inadvertent consequences of successful fire suppression include an increase in combustible fuels, and an in-filling of forest stands with large numbers of small trees, each competing for limited moisture, sunlight and growing space. Add Climate Change, which indicates current trends of longer, hotter, and drier summers as the new norm, and what we now see are many overstocked stands ready to burn hot. This places entire forests at extreme risk for high severity wildfire and the associated degradation of other values that society cares about such as tree health, wildlife habitat resilience, and overall watershed health. Now, when fires get started, they often are not the low intensity fires of the past. Today's "megafires" are hotter, last longer, and burn over greater extents of land. (Hessburg et al 2015).

Many landowners are actively managing their forests to reduce this risk, but value wildlife habitats and wish to take steps to ensure habitat quality while addressing fuel loads and forest health. Our prior publication "Wildlife-Friendly Fuels Reduction in Dry Forests of the Pacific Northwest" addresses these questions.

After a fire has passed, the forest can be profoundly altered. There are areas where green trees and lush understory are gone, replaced by blackened tree stems and branches (though often these trees are still alive) Stubs and sticks stand where shrubs once grew, and blackened soil with clumps of charred vegetative material where forbs or grass once persisted are all around. Soil is sometimes reduced to powdery ash. Larger fire-resistant trees that were a safe distance from fuel concentrations or fire crowning will often survive, providing a seed source for the regenerating forest. Islands of unburned vegetation sometimes exist near wet spots or on the back side of slopes where the fire burned slowly, which can provide small oases of available forage and hiding cover.

Your resulting post-fire plant communities can be wildly changed from what occurred before, or, in a relatively short time, return to roughly the same. Fire has widely varied effects depending on the circumstances.

Trees dying from direct fire effects may look green for a few months, but will lose their needles and show death within a season of the fire. Trees like ponderosa pine can experience scorch up to 90% of their crown but survive and regenerate new needles the following year.

Assessing Fire's Impact on Your Property

First, you must gather information. Investigate your burned land. Find fire maps from local, state or federal agencies. These aerial images will inform your situation. Create a new map and make a list of your various stands with descriptors including:

- Intensity Burned (Low, Mixed, High)
- Signs of Soil Scorch
- Vigor of Remaining Trees (Low, Medium, High)
- Estimated expected Survival Rate of Overstory Trees (%)*
- Down and standing dead wood (estimate stems/acre)

*An excellent publication from Idaho, "After the Burn" by Yvonne Barkley, (2006 – available online) has tables depicting percentage of crown scorch linked to likelihood of tree survival. These can be used as a rough guide to help you assess the likely stand outcomes post burn. Trees dying from direct fire effects may look green for a few months, but will lose their needles and show death within a season of the fire. Trees like ponderosa pine can experience scorch up to 90% of their crown but survive and regenerate new needles the following year.

Fire severity images. Photos by Ken Bevis.

ACTIONS

Forestry professionals would recommend some, or all, of the following practices to help you restore your forest land. These tips will help you plan these activities in a way that can also benefit wildlife.

Soil Erosion Control

The most significant negative impacts from high intensity wildfire are on the soil. Losing vegetative cover can leave forest soils vulnerable to significant erosion, especially in the first few years after fire. Without protective root mass, leaf litter and overhead vegetation, rain hits the loose, fluffy soil with considerable energy, causing splashes that loosen fire scorched soil, causing it to flow away with very little water. This eroded soil can enter streams and degrade aquatic ecosystems for many years. Sometimes in steep terrain, landslides occur, causing significant damage to roads, homes and other infrastructure. Burned areas in flat or gentle terrain will generally not suffer erosion and recover surprisingly well in a just a few seasons.

Tips for Soil Erosion Control

The following practices can be used to address erosion risk on high intensity burn sites in excessively steep locations, as well as gullies and draws. In more gentle terrain, erosion control is probably not necessary. Check with your local Stewardship Forester or Conservation Districts to confirm what is best for your land.

These practices help intercept water running down a slope, reducing erosion, trapping sediments and encouraging vegetation regeneration.

- If you have many small dead trees (4-12" diameter) you can cut some of these and anchor them in contact with the soil with rocks (or other means)
- When trees are not available, install straw wattles or coconut rolls across the contour.
- Seed with native grasses or a forage mix for deer and elk.
- Install straw bales, stumps, logs or large rocks in the bottom of draws to prevent sediment from reaching bodies of water.
- Place logs perpendicular to drainages in draws.

A Note About Seeding: Common fire rehabilitation practices include seeding of grass species in order to establish a root mass quickly and help prevent erosion. Grasses can help in certain circumstances such as areas where rangeland restoration is a goal, but care must be taken to not introduce any new aggressive and invasive species. You might consider using native grass mixes, or a species such as sterile wheat, which has been used successfully on some fires to establish grass cover, stabilize sites without introducing a sod forming grass that would inhibit forest reestablishment.

Invasive Plant Prevention and Control

Many invasive plant species respond vigorously to fire and the removal of competing vegetation. They are often aggressive interlopers who occupy

Straw bales in burned gully and straw rolls on steep burned slope . Photo courtesy of Okanogan Conservation District Bevis.

growing space and provide poor habitat. Seeds can be present in the soil before the fire came along, blow in on the wind, carried in on firefighting equipment or by animals. Landowners need to be vigilant, especially in the seasons immediately after a fire, to identify and aggressively remove noxious newcomers. Some weeds are only temporary members of the plant community and will disappear with time as they get outcompeted or shaded out, such as thistle. Consult your local technical assistance expert for recommendations on which invasive species will need immediate attention in your area. Use whatever tools at your disposal to remove these undesirable invaders so they do not become a persistent member of your forest community.

Salvage Logging

Whether or not to salvage log your burned property is a big, immediate decision you need to make. Salvage logging can help recover your investment after a fire, sometimes reduce chances of the next fire, and reduce hazard from trees potentially falling on roads or buildings. Sometimes, however, the damage to the site, the cost/benefit equation and the need for urgency, make salvage logging either difficult, inappropriate or impossible to implement. Salvage logging on heavily damaged soils, particularly on steep ground, can irreversibly damage a site. Invasive plants may be inadvertently introduced on logging equipment. Some of the most common barriers to salvage logging include unfavorable markets (especially in the case of large fire events), haul distance to mills, and available facilities and contractors overwhelmed with salvage volume and demand for service, particularly after large fires. There is always a short time line to harvest burned wood before it dries out and begins to crack and stain. There is usually one season to harvest before marketable wood quality for saw timber is lost. If a market does exist, and loggers are available to salvage log, you will need to be careful to consider other variables:

- How will logging affect your exposed soil? How steep is your land? How hot did it burn? What type of soils do you have? What is their condition post-fire?
- Is your road infrastructure intact and adequate enough for logging equipment? Will you have to build roads?
- What will happen to slash that is generated?
- When is a contractor available? Can they log in optimal conditions when your soil is frozen or dry?

Habitat Considerations in Salvage Logging:

- Target retention of at least 8-12 standing dead (snags) trees per acre in stands with complete mortality. Strive for snags greater than 15 ft. tall and greater than 12" in diameter. These provide important foraging and nesting habitat for woodpeckers, nuthatches, and other cavity nesting and insect-dependent birds and small mammals.
- In stands with mixed survival, retain at least 16-21 trees per acre.
- Strategically salvage log closer to roads, buildings, trails, and areas when concerned about falling trees. You can then plan your leave areas in more isolated spots, that would be hard to reach anyway, and out of sight of any potential un-invited firewood cutters.
- Research shows that retaining snags in clumps can be more beneficial than leaving them spread out throughout the stand. Leave these areas out of your harvested units.
- If using Felling machines, snip some harvested trees at 12-20 feet as created snags. These will be less likely to blow over. Count these in snag totals. Start with a target number (at least 2 per acre) to be created and communicate with operator.
- Leave down logs across the site. These logs will help trap sediments and water, and provide habitat for small animals and insects, hiding cover for small mammals, and eventually denning habitat. Large down logs might

Salvage Logging in Okanogan County, WA. Photo by Ken Bevis.

How Native Trees and Plants have Adapted to Post-Fire Habitats

Many native trees have adapted to withstand wildfire, with thick flaking bark, high moisture content in needles, and self-pruning limbs. Trees have also adapted to regenerate after wildfire. Surviving trees provide seeds that are dispersed by animals and wind. These seeds are adapted to regenerate in full sun with exposed mineral soil. Lodgepole has a particular life history whereby some cones are "serotinous", being only opened by fire. Western larch can only grow in open sunny locations and readily colonizes burned areas. Other trees such as madrone, oaks and bigleaf maple can resprout from roots and thus recolonize burned areas. Many shrubs, such as bitterbrush, serviceberry, manzanita or chokecherry, re-sprout from their singed root crowns, provided the fire was not so hot that it heated the soil deep enough to kill the roots. Grasses and forbs often re-sprout within days of a burn. Some fungi, such as morels, are only found in post-fire environments.

smolder in the event of a future fire, but will not carry flames and should not be considered a high risk.

- Make sure you have a plan to deal with remaining small diameter slash and debris. You do not want to increase your future fire risk.
- Create some habitat piles with remaining slash or non-commercial logs. Retain smaller piles (15-30 feet in diameter) spaced around the project. Place larger material down low. Target at least 2/acre.
- Salvage log during times when soil damage is minimized – winter logging on solid frozen ground with snow cover can be optimal.
- Strongly recommend the loggers wash equipment prior to moving it in to control the introduction of invasive species.
- You may be responsible for replanting after a harvest. Please check with the appropriate Oregon Stewardship Forester or Washington Department of Natural Resources office to confirm.

Reforestation

Reforestation can be an immediate concern. If an adequate number of trees have survived, natural seeding can produce a vigorous batch of new trees. There may be a need to replant if adequate seed trees are not present, or if you want to modify stand species composition, perhaps to give fire-resistant species a leg up over less fire-resistant species (encouraging ponderosa pine over grand fir for example). Fire does a great job of natural site preparation by creating openings for sunlight and exposing bare mineral soil. The conditions to get new trees in the ground is very good in the first couple of years after a fire. Reforestation via planted seedlings and/or natural regeneration will usually succeed whether or not salvage logging occurs. Different jurisdictions may have requirements for reforestation, and opportunities for rehabilitation grants or cost share, on burned lands. Check with the state forestry agencies for this information.

Generally, replanting is done with native species similar to what was on the site. Ho-Consideration may be needed for replacement with species appropriate to post-fire conditions; for example you may choose to establish ponderosa pine on south facing slopes where fir grew before the fire. Trees need to be ordered as soon as possible after a fire, as nurseries usually have trees pre-ordered and will have a limited supply of appropriate stock by species and seed zone. The raw site will immediately begin to be occupied by grass, shrubs and weeds, so the window for utilizing fire-based site preparation is generally only 1 to 3 years, depending how moist the site is.

Mechanical fuel reduction treatment in Eastern Washington. Photo by Ken Bevis.

You will have to navigate between your desires to re-establish native trees with your willingness to provide early seral wildlife habitat. Clumps of grasses, shrubs and wildflowers provide important habitat for pollinators, birds and small mammals, (which then feed raptors and carnivores), and forage for deer and elk. Post-fire habitats are rich in standing dead trees, and produce a plentiful supply of down wood in a few short years, both critical habitat features in our landscapes.

Tips for Wildlife-Friendly Reforestation:

- Pick native, fire resistant tree species. These trees are most likely to thrive on the site and will help you create a fire resilient forest in the future.
- Plant in an un-even density to promote future openings (enabling snowpack retention), clumps for hiding cover, and thus reduce the extent to which you will need to conduct pre-commercial thinning.
- Include potential surviving trees as part of your reforestation planning. If they do die, will they become valuable wildlife snags.
- Limit active site preparation to areas immediately surrounding seedlings to encourage native grasses, fruiting shrubs, wildflowers, and other important species for wildlife.
- Consider aspect. Hot dry south slopes may not support tree species or only specific species adapted to hot dry conditions, while cooler north facing slopes may support different tree species.
- Riparian zones or wet areas with access to year round moisture can be planted with willow, cottonwood, or other species adapted to riparian zones.
- Seedling survival can be lower post-fire because blackened soils are hotter and water runs off rather than soak in. In areas with no snags plant seedlings on the north side of stumps and logs, or use shade cards. On steep slopes dig a small pocket to plant seedlings in.

Preventative Treatment

The best strategy for living in a fire-prone forest ecosystem is to maintain healthy and resilient stands, stocked at appropriate and survivable levels. This generally means maintenance of appropriate stocking densities and species compositions throughout stand development to help forest stands survive, and even thrive should a fire occur. Treatments that remove most of the forest fuels are appropriate in the immediate vicinity of buildings and settlements, but "parked out", clean stands of evenly spaced, pruned trees with little to no understory, provide reduced wildlife habitat value. Consciously maintaining some habitat complexity will benefit wildlife, while reducing catastrophic fire risks.

Most fuels treatments on small private forestlands are either mechanical chipping of woody material, or small scale burning of piles during the wet seasons. Prescribed burns broadcast across the forest, are an excellent mimic of natural forest processes and a tool to consider for long term management of large, dry forest lands. Despite their complexity and expense, such controlled burns can really make a dry forest stand resistant to high intensity fire.

If you live in a dry forest environment, being ahead of the fire through fuels treatments is a very wise move. Wildlife habitat can be considered while treating stands for fuel build up too. See our Woodland Publication, "Wildlife-Friendly Fuels Treatments in Dry Forests of the Pacific Northwest" for more ideas.

In closing

An unexpected wildfire can produce significant changes to forest conditions and profound emotional shock for woodland landowners. However, your land can provide renewed wildlife habitat, biodiversity, and regenerate a new forest rapidly, especially if given strategic, well-timed help. There are many resources available to you as you move forward.

Fire scar in natural Ponderosa pine forest, East Cascades, WA. Photo by Ken Bevis.

Post salvage forest, Rosenblatt property, Okanogan County WA, July 2019. Photo by Ken Bevis

Habitat pile left for wildlife. Note larger material on bottom. Photo by Ken Bevis

Case Study

Rosenblatt Tree Farm, near Buzzard Lake, Okanogan County, Eastern WA

The Rosenblatt family owns a large tree farm dominated by ponderosa pine and aspen near Okanogan, Washington. They engaged in thoughtful, informed forestry over the years using thinning, selective harvest, planting, and a host of other techniques. Unfortunately, in August of 2015, the Okanogan Complex consumed their forest in a hot, wind driven fire, resulting in complete tree mortality and loss of their home.

They elected to salvage log, but included these elements in their project intended to provide habitats in the re-growing forest in the future.

- **Survival:** Any tree with green foliage and a chance of survival was retained. (there were very few and most died)
- **Snag retention:** Target was a minimum of 4-8 per acre. Many trees that could have been removed were left.
- Pile retention: Piles created in the logging were selectively retained across the property
- **Planting:** A 5 year window was allowed to assess levels of natural regeneration before planning planting projects. Some areas have excellent natural regeneration.
- **Shrub regrowth and regeneration:** Willow, snowberry, ceonothus, serviceberry and other shrub species rebounded spectacularly. The aspen grove in a wet soil type, grew an astounding 12 feet in 4 years. Fireweed is everywhere. Natural regeneration of ponderosa pine, is abundant on portions of the property. Supplemental tree planting may be necessary on parts of the land.
- **Winter Logging:** They were fortunate that the land is relatively flat, and they were able to find a logger to work in the winter in perfect conditions. As a result, there was virtually no soil damage.

Outcome: The new forest will be multi-layered; young ponderosa pine with a snag overstory a rich shrub layer, grasses and forbs in abundance.

Fire landscape 4 years post-fire: Foreground salvage logged Ponderosa, Note shrub clumps. Mid ground – aspen stand regenerating. Back ground, thin pine stand with lots of survival. Distant, unburned. Photo by Ken Bevis.

For More Information

Oregon:

Oregon Department of Forestry: https://www.oregon.gov/ODF/Fire/Pages/AfterAFire.aspx

Oregon State University Extension Service: https://extension.oregonstate.edu/forests/fire

Oregon Department of Fish and Wildlife: https://www.dfw.state.or.us/

Natural Resources Conservation Service: https://www.nrcs.usda.gov/wps/portal/nrcs/site/or/home/

Washington:

Washington Department of Natural Resources: https://www.dnr.wa.gov/

Washington University Extension Service: https://extension.wsu.edu/

Natural Resources Conservation Service: https://www.nrcs.usda.gov/wps/portal/nrcs/site/wa/home/

And Local Conservation Districts in all areas for site specific expertise.

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About the Woodland Fish and Wildlife Group

The Woodland Fish and Wildlife Group is a consortium of public agencies, universities, and private organizations which collaborates to produce educational publications about fish and wildlife species, and habitat management, for use by family forest owners in the Pacific Northwest.

Currently available publications can be viewed and downloaded, free of charge, at the organization's website:

www.woodlandfishandwildlife.com

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