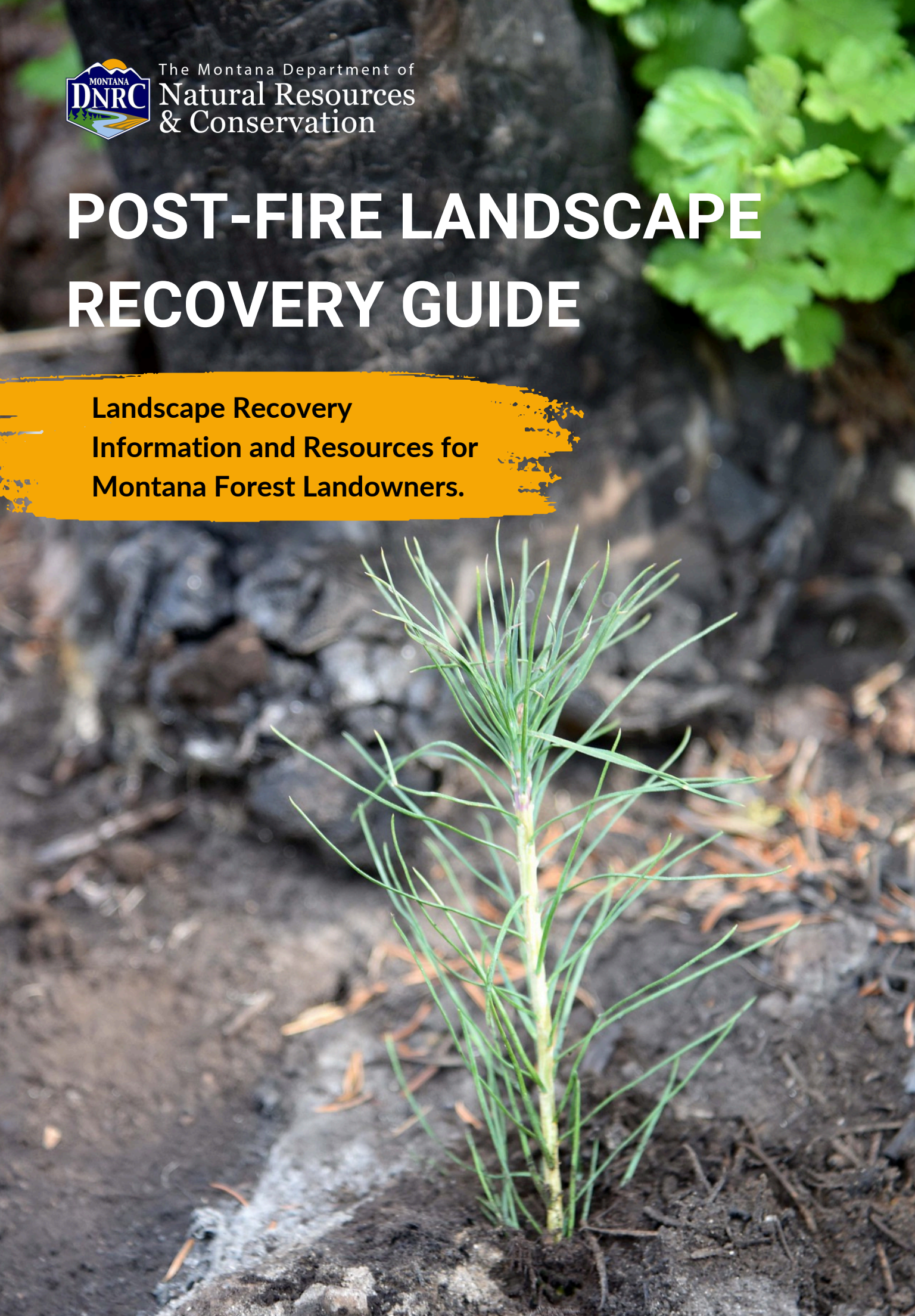
The Montana Department of Natural Resources & Conservation

POST-FIRE LANDSCAPE RECOVERY GUIDE

Landscape Recovery Information and Resources for Montana Forest Landowners.



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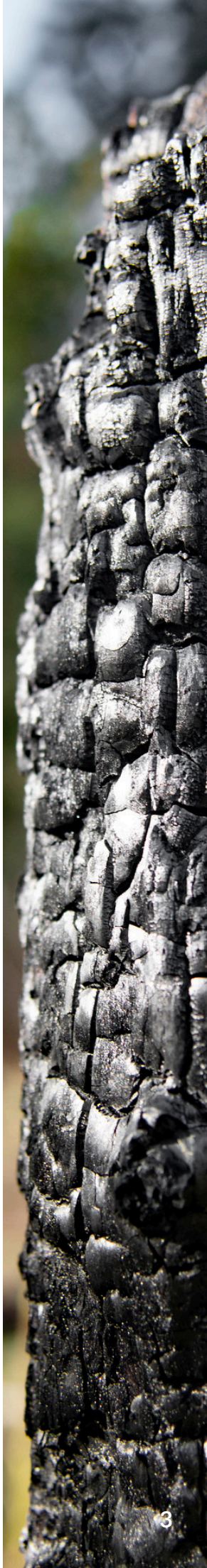
Introduction

Fire has shaped Montana's forests for tens of thousands of years and is a crucial process for maintaining the health of our forest ecosystems. Most of our lower elevation forests in Montana (below ~ 4,500 feet) experienced low-severity fires every 5 to 25 years. Fire can recycle nutrients back into the soil, improve wildlife habitat, and reduce the risk of more severe wildfires. Despite the many benefits, wildfires can be destructive and the current state of Montana's forests has created a landscape more susceptible to high-severity wildfires that are impacting communities, homes, and livelihoods.

When wildfire impacts your property, whether it be a small portion or hundreds of acres, the results can feel devastating, and you may feel overwhelmed with where to start. While every landowner and situation are unique, this guidebook provides information for assessing post-fire conditions, deciding when and what restoration actions might be right for your forest land and identifies resources for technical and financial assistance for post-fire recovery. The actions and decisions you make for your property will depend on the impact the fire had on your forest, the type of forest you have, your financial situation, and your management goals.

We hope you find this guide useful as you make land management decisions to meet your goals for your forest after the flames are out.

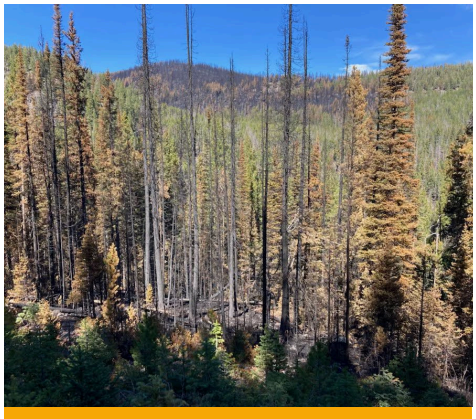
This guide does not address immediate considerations to your physical and emotional health when returning to your property. Before beginning post-fire landscape recovery, prioritize you and your family's immediate safety, mental health, and home. View the Fire Adapted Montana Learning Network's Post-Fire Homeowner Guide for needs immediately after a wildfire.



Understanding Fire Severity

Fire severity is the impact of fire on the environment, usually measured by vegetation loss and impacts to the soil.[1] In forests, severity is often determined by tree mortality, how much of the upper canopy was lost, and percent of crown scorch.

Low-severity Fire
25% or less of the upper canopy killed



Mixed-severity Fire
26-75% of the upper canopy killed

High-severity Fire
More than 75% of the upper canopy killed

Certain types of fire are more common in particular forest types.

Low-severity fires are often associated with open ponderosa pine groves.

The close-knit growth of lodgepole forests makes high-severity fires more likely.

Low-, mixed-, and high-severity fires provide ecological benefits and challenges for Montana forests. Understanding fire severity will be helpful as you assess conditions and make land management decisions following a wildfire. Keep in mind that the fire likely burned at varying intensities across your property, resulting in patches of low to mixed and possibly high-severity fire impacts.

Indigenous Relationship and Use of Fire[2]

Though the state of Montana is only 130 years old, Indigenous Peoples have lived in these valleys, mountains, prairies, and woodlands since time immemorial. Tribes actively employ many tools to nurture the foods and materials that are important to human life. The single most powerful of these tools is fire. For thousands of years, many of the region's prairies and woodlands were shaped by the deliberate and skilled application of fire by Indigenous Peoples. Tribal nations apply fire to the landscape for a variety of reasons and in many specific ways, each of them learned and honed over thousands of years living in this place. First Nations in Montana are working to reintroduce fire by partnering across jurisdictions while integrating cultural and ecological knowledge after over a century of fire suppression.

For more information, visit Fire on the Land.

[1] Northwest Fire Science Consortium. (n.d.) What is? FIRE SEVERITY. https://www.nwfirescience.org/sites/default/files/publications/Fire%20Severity.pdf. Accessed January, 2023.
{2} Montana Forest Action Council. (2020, December). Montana Forest Action Plan: Statewide Assessment of Conditions. Retrieved 9/15/24, from https://www.montanaforestactionplan.org/pages/assessment

Fire Severity Classes 3 & 4

Low-severity fires primarily burn surface fuels, such as duff, pine litter, and branches, and some vegetation such as shrubs and small trees. Mortality of overstory trees is low (25% or less).

Low-severity fires reduce competition for resources, increasing light and water available for remaining trees. In addition, nutrients are released from burned material, increasing soil fertility. Low-severity fires reduce fuel in the forest, mostly ladder fuels and surface fuels on the forest floor, which reduces future wildfire risk. Individual trees that are damaged or stressed from the fire may be more susceptible to impact from other stressors such as bark beetles.

Mixed-severity fires are characterized by 26%-75% mortality of the overstory, with a moderate impact on the topsoil – underlying soil is not visibly impacted. After a mixed-severity fire, a typical forest may consist of a mix of healthy, alive, and damaged trees with small patches of high mortality resulting in small openings in the forest.

This variability results in habitat diversity which can benefit a variety of wildlife. Canopy openings allow light to the forest floor, increasing availability of water and soil nutrients. Standing dead trees, often referred to as snags, can benefit wildlife and provide shade to protect tree seedlings and reduce soil moisture loss. However, excess fallen dead trees can increase the surface fuel load, raising wildfire risk during potential future events. Partially scorched trees can also become stressed, making them more vulnerable to bark beetle outbreaks. Moderate burn severity in the soil can present erosion concerns due to the loss of vegetation on the forest floor.

High-severity fires are defined by greater than 75% mortality of the overstory and varying degrees of impacts to soils based on the understory's fuel load.

High severity wildfires can result in large-scale impacts on the soil, called high soil burn severity. High soil burn severity can lead to nutrient loss, erosion, and, if they burned hot enough, water repellent layers. Additionally, if patches of tree mortality are large, forest regeneration may be delayed. Remaining dead and downed trees can increase the fuel load in your forest, increasing future wildfire risk. This severity class presents the greatest concern for private landowners, as large-scale tree mortality can directly impact income earned from family forests, present dangers such as flooding and hazard trees, and be emotionally difficult due to the dramatic change in scenic landscape.

[3] USDA, USFS. Fire Effects Information System Glossary: Low, Mixed, and High-severity Fire. https://www.fs.usda.gov/database/feis/glossary2.html#L Accessed January, 2023.
[4] Shive, Kristen and Kocher, Susan. (2017). Recovering from Wildfire: A Guide for California's Forest Landowners. University of California Agriculture and Natural Resources, ANR Publication 8386. https://anrcatalog.ucanr.edu/pdf/8386.pdf.

Post-fire Assessment

Before assessing your forest to make land management decisions, first assess and plan for immediate threats such as hazard trees and post-fire flooding. View the Post-Fire Landscape Management & Considerations section of the "Post-Fire Homeowner Guide" to assess for immediate risks. Wear a hardhat, durable footwear, and take caution when returning to your property.

Walking your property following a fire will allow you to assess fire severity, keeping in mind general characterizations of the three forest fire severity classes. The Montana Department of Natural Resources and Conservation (DNRC) Service Foresters can assist private landowners in assessing ecological conditions post-fire. The financial and technical assistance section of this guide provides further details and contact information for resources.

Since Montana's low- to mid-elevation forests historically experienced frequent, low- to mixed severity fires, native forest vegetation has multiple ways of surviving post-fire. If the wildfire was low- to mixed-severity, your forest may recover naturally and require no land management actions. However, if a high-severity wildfire occurs, you may want to take land management actions, some of which may need to occur shortly after the fire.

As previously mentioned, fire severity is measured by loss of vegetation and impacts to the soil. To determine the severity of a fire on your property, and what impacts there may be, you'll need to assess tree mortality and soil burn severity.

Determining Tree Mortality

Since trees are the dominant vegetation type in a forest, determining overall tree mortality is the most important indicator of forest fire severity. Certain factors make trees more susceptible to fire damage, including the age, overall health, and species of the tree. Some tree species have characteristics such as thick bark or high, open crowns that make them more resistant to fire. In Montana, such fire-adapted species include western larch and ponderosa pine.

There are a number of variables that can be used to assess if a tree is dead or likely to die from fire damage. The probability of a tree surviving primarily depends on damage to the crown and the cambium.[5] As a general rule, the likelihood of tree mortality increases as the percentage of crown scorch increases and the thickness of bark decreases.[6] For example, ponderosa pines have thick, flame-resistant bark, whereas lodgepole pines have thin bark. Even if both trees were the same size in diameter and had the same percent of their crowns scorched, the ponderosa pine is much more likely to survive since its thick outer bark helps protect the inner bark and cambium layers. Since tree species have different adaptions to withstand fire and varying responses in recovering post-fire, identifying the species will be the first step in evaluating mortality. View tree identification resources at MTForestInfo.org.

[5] Hood, S., Ragenovich, I., and Schaupp, B.. 2021. Post-fire Assessment of Tree Status and Marketing Guidelines for Conifers in Oregon and Washington. USDA Forest Service. Pacific Northwest Region. pg. 5. https://www.firelab.org/sites/default/files/2022-01/Hood_508-compliant-Final_Post-fire_tree%20assessmentR6-FHP-RO-2020-02-revised2021.pdf.

[6] Barkley, Yvonne. After the Burn: Assessing and Managing Your Forestland After a Wildfire. (2006). University of Idaho Extension. Station Bulletin No. 76. pg. 50. https://idahofirewise.org/wp-content/uploads/2017/04/uXofXiXafterXtheXburn.pdf

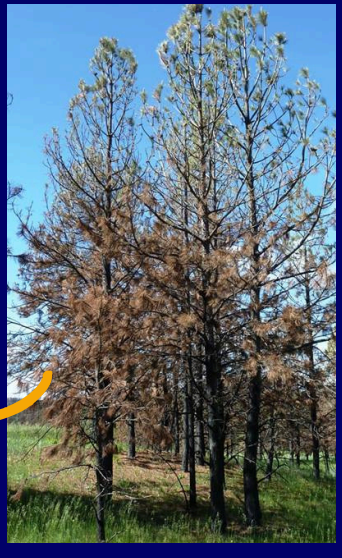
Generally, if the tree crown is scorched and stems are blackened and bare, the tree is likely dead. If the crown is scorched so that the leaves/needles are brown or red and the tree is not bare and black, the tree may survive, depending on the species.[7]

There are various resources that guide landowners through determining tree mortality post-fire.

- Montana State University Extension offers a guide to assessing tree mortality, including photos specific to Montana species. View "Wildfire Severity Photo-guide for Assessing Damage and Aiding Recovery of Trees and Forests across the Northern Rockies".
- The University of Idaho Extension offers a publication titled "After the Burn" for forest landowners after a fire. On page 50, the guide goes through assessing and predicting tree mortality at the species level. View "After the Burn" for information on predicting tree mortality after a fire.

Entire tree foliage consumption with blackened and bare stems usually indicates tree death

Depending on tree species, if the tree is scorched but the entire tree is not consumed, the tree may survive.



Photos taken from the "Wildfire Severity Photo-guide for Assessing Damage and Aiding Recover of Trees and Forests across the Norther Rockies". Information written and photos taken by MSU Extension Forestry Specialist Peter Kolb.

Determining Soil Burn Severity

Soil burn severity is "the effect of a fire on ground surface characteristics, described in terms of char depth, organic matter loss, altered color and structure of soil, and reduced infiltration" (USFS).[8] How severely your soil was burned will give insight into the potential for further damage related to erosion, nutrient loss, and water repellency. These factors are closely tied to a forest's ability to naturally recover and regenerate. Burn severity, combined with slope and soil type, is a key factor in determining erosion and flooding risk[9] Knowing the degree and type of soil burn severity will help you to make the best decisions for your forest to meet your goals.

Determining soil burn severity can be difficult and you may want to reach out for technical assistance (resources listed at the end of this guide). The Rocky Mountain Research Station's "Field Guide for Mapping Post-fire Burn Severity" can be referenced to identify soil burn severity. The burn severity images and descriptions on the next page are adapted from the publication for a quick reference.

[7] Kolb, Peter. Wildfire Severity Photo-guide for Assessing Damage and Aiding Recovery of Trees and Forests across the Norther Rockies. MSU Extension Forestry. https://www.montana.edu/extension/forestry/publications/Fireseverity%20assessment%202020.pdf. Accessed January, 2024.
[8] USDA, USFS. Fire Effects Information System Glossary: Soil burn severity. https://www.fs.usda.gov/database/feis/glossary2.html#L Accessed February, 2023.
9] Barkley, Yvonne. After the Burn: Assessing and Managing Your Forestland After a Wildfire. (2006). University of Idaho Extension, Station Bulletin No. 76. pg. 50. https://idahofirewise.org/wp-content/uploads/2017/04/uXofXiXafterXtheXburn.pdf

Soil Burn Severity[10]

Low Soil Burn Severity

- Debris & litter, such as pine needles, are not completely consumed.
- Structure of soil mostly unchanged.
- Roots likely not altered
- Soil bown/black but understory and overstory vegetation likely “green”.

Moderate Soil Burn Severity

- Up to 80% of pre-fire ground litter.
- Fine roots may have some scorching but not completely burned.
- Soil structure likely unchanged.
- Soil color brown .

High Soil Burn Severity

- Most to all of ground cover has been consumed.
- Fine roots consumed, large roots may have charring or be completely burned.
- Soil structure may be less stable, with bare soil and ash exposed.
- Gray/white ash may cover the ground but soil beneath is grey, orange, or reddish.

Post-fire Management

After assessing the fire's severity and determining your land management goals and budget for restoration, you are ready to decide what next steps are right for your forest. The management decisions you make will result in both short- and long-term outcomes for your forest. Depending on the severity of fire, your forest type, and your land management goals, you may want to let your forest recover without active management. If you are interested in actively managing your forest post-fire, the following sections cover common land management concerns and mitigation options.

Lodgepole regeneration after fire

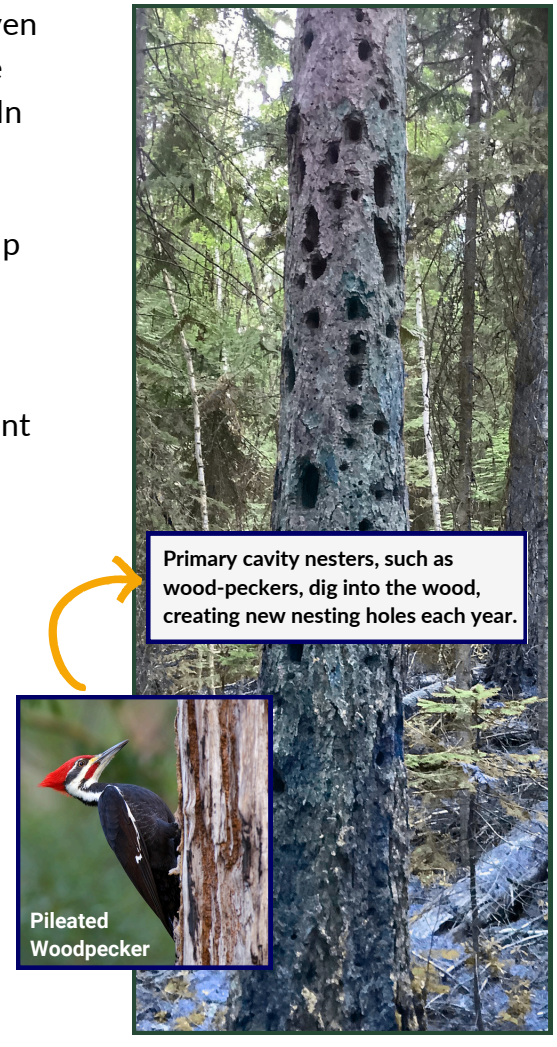
Salvage Logging

Salvage logging is the removal of dead and dying trees after disturbance, such as fire, to recover the economic value. Since dead and damaged trees lose their value over time, this is one of the first management decisions to be made, usually within a year after the fire. What tree species make up your forest, the severity of the fire, and the current market determine the possible economic gain from salvage harvesting. Surplus money from salvaging can be used towards paying for land-

[10] Parson, A., Robichaud, P., Lewis, S., Napper, C., Clark, J. (2010). Field guide for mapping post-fire soil burn severity. General Technical Report RMRS-GTR-243. USDA Forest Service, Rocky Mountain Research Station. https://www.fs.usda.gov/rm/pubs/rmrs_gtr243.pdf

restoration efforts such as revegetation and erosion control. Even if the cost to salvage does not produce an economic gain, there are additional reasons a landowner may choose to salvage log. In the years following a fire, some dead trees will fall, which presents a safety hazard and increases the surface fuel load in your forest. Proactively removing dead and dying trees may help reduce future wildfire risk and minimize personal safety risks.

However, in some situations, salvage logging can have undesirable impacts on your forest. Depending on the equipment used to log, the timing of removal, and conditions of the site, salvage logging can increase soil erosion in your forest. In addition, having some standing dead trees, often referred to as snags, can benefit both wildlife habitat and the health of your forest by providing future coarse woody debris. Snags also provide shade to shelter emerging tree seedlings and moderate soil temperatures on exposed sites. When choosing a forester and contractor, ensure they will work with your forest management goals to avoid possible negative impacts to your land. View the Montana Logging Association's (MLA) list of Accredited Logging Professionals. These loggers have gone through a voluntary education program to provide a higher level of service to landowners.



Snag, Photo by Torrey Ritter

Derby Fire: Ash and organic soils erode off site immediately after with first rain.

Erosion Control

Soil erosion is one of the most common management concerns following a wildfire. Erosion not only increases risk of flooding but can also lead to loss of soil nutrients and increased sediment levels in waterways, roadsides, and ditches. Depending on fire severity, your property may recover without the need for erosion control. If control measures are needed, you'll want to act quickly, as erosion risk is typically highest in the first two years following a fire. To determine possible erosion risk, review your soil burn severity assessment. Erosion hazard increases as burn severity and slope increases and vegetative cover decreases; make sure to consider the loss of vegetation after the fire along with the steepness of your property.[11]

Generally, most erosion mitigation measures are only needed following mixed- to high-severity fires. Erosion treatments vary in cost depending on your own labor experience and abilities, accessibility and terrain of your site, and access to services. On the next page is a snapshot overview of erosion descriptions based on New Mexico's After Wildfire treatment guide. This guide provides descriptions and outcomes of the treatments and attempts to give a cost range for hillslope, channel, road, and trail treatments. View the entire "Post-Fire Treatments: A Primer for New Mexico Communities".

[11] Barkley, Yvonne. After the Burn: Assessing and Managing Your Forestland After a Wildfire. (2006). University of Idaho Extension, Station Bulletin No. 76. pg. 50. https://idahofirewise.org/wp-content/uploads/2017/04/uXofXiXafterXtheXburn.pdf.

Management Options for Mitigating Soil Erosion [12]

Seeding

For more information, please visit the following pages:

NRCS After the Fire-Seeding

NRCS After the Fire-Some Notes About Seeding Grasses Following Wildfire

Overview:

Seeding, usually with grass seed, is a common post-fire erosion control treatment. The intention of seeding is to increase vegetative cover on the ground, which in turn can help stabilize the soil and reduce erosion.

Considerations:

- Not often very effective alone (low germination rates) and can suppress native vegetation.
- Seeding during gentle spring rains and combining with mulch can increase success.
- Has possibility for introducing non-native and invasive species.

Where:

Moderate- to high-severity hill slopes.

Reach out to your local Natural Resources and Conservation Service (NRCS) or conservation district for seed recommendations.

Mulching

For more information, please visit the following pages:

NRCS After the Fire-Wood Chips Versus Straw Mulch

NRCS After the Fire-Hydromulching

Overview:

Mulching treatments provide ground cover, protecting the soil from rain drop impacts and decreasing the amount of runoff. There are a variety of mulch treatments, but the two general categories are wet mulch and dry mulch such as straw, wood, and fiber materials.

Considerations:

- Dry mulches are highly effective when applied correctly (not on areas exposed to high winds) and when application > 60% ground coverage.
- Wet mulch (hydromulch) is wind resistant but effectiveness changes with factors such as slope length, application rates, etc..
- Can be costly.

Where:

Moderate- to high-severity. Due to cost, especially hydromulch, prioritize areas of high value such as those near the home.

Barriers

Barrier erosion applications are intended to slow runoff, increase infiltration, and trap sediment. The barriers below are installed on hillslopes. Examples include log barriers, straw & wood filled wattles, and silt fences. Sandbags and straw bales can be used as a temporary barrier but won't be effective past a couple of months. The below outline barrier treatments for the ground. For more information on stream treatments view "Post-Fire Treatments: A Primer for New Mexico Communities".

Log barriers are applied by anchoring felled and limbed trees into place on the contour of burned slopes to slow down water flow.

Where: Moderate to severely burned areas with slopes ranging from 20-60%.

More information: NRCS After the Fire - Log Erosion Barriers

Wattles, either straw or wood, are used to slow and filter moving water on slopes, trapping loose sediment before it travels downslope.

Where: Moderate to severely burned areas with slopes < 40% ground cover.

More information: NRCS After the Fire - Contour Wattles

Silt fences are made of woven wire and fabric cloth anchored into place. They trap sediment from runoff in areas that are easy to monitor and maintain, such as flatter areas. They are not an effective solution for heavy sediment runoff and debris flows.

Where: Areas accessible for maintenance.

More information: After Wildfire: A Guide for New Mexico Communities - Silt Fence

[11] After Wildfire New Mexico Interagency Team. (2015). Post-Fire Treatments: A Primer for New Mexico Communities. https://extension.usu.edu/post-wildfire/files/Post-Fire-Treatments.pdf

Lupine regeneration after Robertson Draw Fire, Photo by Custer Gallatin National Forest

Vegetation Management

From rehabilitation, to invasive species removal, to managing for future wildfire risk - there are a variety of issues to consider when managing your forest's vegetation following a wildfire.

Invasive Weeds

A weed is any plant growing where it is not wanted. Weeds are some of the first plants to colonize after a fire, often choking out native and desired vegetation. You'll likely need to monitor and treat weeds for several years following a wildfire. As a forest landowner, you will ultimately decide what is or is not a weed on your property.

Invasive and noxious weeds, however, are separate classes of weeds that can significantly impact the vegetation structure and ecosystem function of your forest. Noxious weeds are legally designated by a federal, state, or local government due to negative impacts on agriculture, recreation, wildlife, and public health. An invasive plant is a non-native plant whose introduction causes harm. While noxious weeds are often also invasive, the term is a legal designation that does not necessarily require a plant to be non-native.

Spotted Knapweed

Cheatgrass

You'll want to monitor for noxious and invasive weeds, such as cheatgrass and spotted knapweed, post-fire. Many of these weed species can take advantage of the open space and light conditions associated with a burn. Deeply buried seeds or root systems often allow these noxious and invasive weeds to survive a wildfire.

Successful control of invasive and noxious weeds requires a long-term plan that often integrates a variety of control treatments. Develop a treatment a plan that takes local site conditions into consideration. For educational resources on weed management and lists of noxious weeds in your area, visit Montana Weed Control Association's website. For treatment recommendations to control weeds on your land, contact your local weed district.

Reforestation

Montana's forests are fire-adapted ecosystems. Low- and mixed-severity fires remove branches and litter on the forest floor along with small, shade-tolerant trees. In post-fire forests, more light can reach the forest floor and more nutrients are available to the remaining mature trees and for new growth. In these conditions, reforestation will often happen naturally. Allowing your forest to naturally regenerate has the benefit of being cost-effective since seedlings are free and already adapted to the site. Success will depend, however, on the species and proximity of live trees that can provide seed. If tree mortality is high across your property (and neighboring properties), you may need to seed or plant for reforestation to occur. Different tree species have different seed dispersal distances based on the characteristics of their seeds and the seed dispersal mechanism (falling from the tree, transported by wind, or cached by wildlife). In general, most conifer species can disperse seeds up to 200-400 feet from the live, cone-bearing trees (seed source). Some tree species regenerate prolifically after fire, though it may take several years for seedlings to establish.

Depending on your management objectives, you may want to speed up the regeneration process. A landowner who manages their property for timber will likely want to plant throughout, whereas a landowner who manages for wildlife habitat may only want to plant in patches of high-severity fire where there are not live trees nearby to provide seeds for regeneration. Manually reforesting can be beneficial because you can select specific tree species and spacing to meet your forest management goals. For example, you may choose species that are fire resistant, such as ponderosa pine and western larch, and/or tree species that will be resilient and adapt to impacts from changes in climate. The plant species you select will depend on the characteristics of the site, your objectives, and your budget.

Selecting Seedlings

The species you choose should be appropriate for the site. You'll want to consider factors such as soil type, shade, elevation, slope, and aspect (direction surface faces) of the areas you want to plant in. For example, ponderosa pine is well suited to low- to mid-elevation sites that are open with little overstory, which are often created by high-severity wildfire. Spruce, on the other hand, is considered shade-tolerant species and thrive best when not planted in direct sunlight.

It is also important to consider where your seedlings come from. Seedlings that are grown from seeds collected at sites with similar elevation and conditions to your forest are more likely to succeed. Local conservation district representatives and your local DNRC Service Forester can assist you with selecting which tree species would grow best in your forest to meet your land management goals.

Ordering Seedlings

Nurseries may require a contract when ordering large quantities of seedlings. These contracts are generally placed one to two years in advance of when seedlings are needed for planting. Seedlings from nurseries can be ordered as bareroot stock or containerized, plug stock. Bareroot stocks are grown and transplanted to field sites in a dormant state with no soil on their roots whereas plug stock are seedlings that are not in a dormant state and retain the soil they were grown in. Both options have benefits and drawbacks. The nursery you order from can help you determine which option or combination of options is best for you.

DNRC's Conservation Seedling Nursery provides plants for conservation projects throughout Montana, including post-fire land restoration. The nursery offers seedlings that are locally adapted and sourced to grow on various sites across Montana. One way to order seedlings is through the general sale on January 21. While stock is first come first serve, the seedlings are available to plant the following spring.

Visit the DNRC Montana Conservation Seedling Nursery's webpage to learn more about seedling available and how to place an order.

Planting and Seedling Care

In Montana, the best time to plant is in early spring when soil moisture is high and temperatures are cool. The site should be prepped to create a favorable seedbed by removing competing vegetation and exposing mineral soil. When planting on burned areas, the fire most likely has done the work of removing vegetation and exposing soil for you.

The seedlings you plant will be vulnerable to predation from deer, insects, mice, rabbits, and other species. You may want to purchase seedling protectors to prevent damage from larger wildlife. Weed control will also be essential to ensuring there is enough space, moisture, and nutrients for seedlings to grow. If possible, give each seedling one to two gallons of water immediately after planting and follow up with regular deep watering, One to two gallons every few weeks during the summer. Do not water if the ground is frozen. Fertilization within the first year is usually not recommended. If you use fertilizer after the first year, follow recommendations carefully. Mulch can help hold soil moisture and keep weeds suppressed. If mulch is used, woven weed fabric is the best for seedlings alongside wood chips, bark chips, straw, and composted sawdust. Mulching isn't common in large reforestation plantings and can be costly when used at a large scale.

DNRC Conservation Seedling Nursery's Seedling Planting and Care Pamphlet provides information on planting tips and post-planting care in Montana.

Firescaping

If the fire burned up to your home and there was loss of yard vegetation, you may want to replant around your home as well. Carefully planning a firescape, beginning with no vegetation in the immediate zone, 0 to 5 feet from your home, and strategically placing fire-resistant plants outside of that zone can help reduce wildfire intensity by reducing available fuel. Firescaping incorporates fire-resistant plants and hardscaping (for example, using fire-resistant materials for fencing) to reduce the possibility of ignition.
Fire-resistant plants have one or more of the following characteristics:
· High moisture content
· Low in sap and resin
· An open-growth structure
· Grows slowly and does not accumulate large amounts of dead branches, needles, or leaves

For more information on firescaping, check out Creating a Fire Smart Landscaping in the Montana Wildland Urban Interface:

Post-fire landscape in the Pioneer Mountains

Insects

Forest insects, diseases, and fire naturally occur in forest ecosystems and have interacted with one another in Montana's forests for tens of thousands of years. While there are a variety of diseases that can impact forests in Montana, there aren't any of concern that are strongly linked with a fire event. However, fire can stress trees and make them more susceptible to additional insect infestations. In addition, trees that have been impacted by insects or diseases may be weakened, which can lead to higher wildfire tree mortality than a healthy forest would experience. Insects are an important aspect of the post-fire environment that can affect the survival of your trees. While not a guarantee, insect impacts to your forest following a fire event are likely, and you should anticipate continued change in your forest. Fire severity and forest type will determine how susceptible your trees will be to insect and disease outbreaks post-fire. Areas impacted by low- to moderate-severity fires that leave partially scorched trees will be most susceptible to attack from insects.

Bark Beetles

Bark beetles colonize weakened, stressed trees. Partially scorched trees with viable inner bark are especially susceptible. They do not, however, infest in dead trees. Once bark beetles have colonized weakened and stressed trees, they will spill over into healthy, green trees. In most tree species, bark beetle attacks are not partial attacks; they completely kill the tree. This may happen at an individual tree or landscape level. Bark beetle attacks are distinctive and are specific to tree species. Bark beetles of concern in Montana following a fire are Douglas-fir beetle, western pine beetle, red turpentine beetle, and pine engraver beetle.

Douglas-fir Beetle

Douglas-fir beetle galleries

Douglas-fir beetles attack Douglas-fir trees and prefer trees that are large and partially scorched. While outbreaks are usually short-lived, Douglas-fir beetle attacks can swiftly alter your forest stand. Since bark beetles do not attack dead trees, you'll want to look for signs of attack in green trees. Evidence of a successful attack by Douglas-fir beetles is orange-brownish boring dust in the crevices in the lower trunk of the tree. To confirm successful attack, you can remove the bark to reveal the distinctive larval patterns of Douglas-fir beetles.

Once you have identified infested green trees, management options include pheromones and thinning the stand to increase remaining vigor. Anti-aggregation pheromones can be used to manipulate Douglas-fir beetle populations by giving a "no vacancy" signal to the beetles. The signal communicates to the beetles that the tree is fully colonized and there is no more room. MCH (3-methylcyclohex-2-en-1-one) is a commonly used anti-aggregation pheromone and can be placed to protect high value trees and stands. For application information, view USDA's MCH pamphlet and manufacture instructions. Do not store infested wood on property, not even as firewood; beetles will continue development and emerge to attack nearby trees.

Western Pine Beetle

Western pine beetle galleries

Western pine beetles prefers weakened, mature pine trees. Scorch further weakens the tree, making them even more vulnerable to attack. Western pine beetles are only a concern to ponderosa pine trees west of the continental divide. Signs of successful western pine beetle attack include pitch tubes on the trunk of the tree and numerous, dispersed exit holes. You may also see woodpecker or other predaceous activity, especially in the winter. To confirm successful attack, bark can be removed to expose egg galleries. Thinning can help reduce competition in a stand and increase residual tree vigor to mitigate further attack. Infested trees can also be removed to help reduce the populations of beetles, but infested logs and firewood must be removed from the stand.

Red Turpentine Beetle

Red turpentine beetle

Red turpentine beetles attack a variety of pine species but are commonly found on ponderosa pines in Montana. Outbreaks are not usually severe but can be destructive post-fire. Red turpentine beetles usually attack six feet and lower on the tree. A sign of attack is pitch tubes near the base of the tree, which are usually reddish brown. Red turpentine beetles create a collective feeding chamber that can be identified to confirm attack. One management option is to remove excessively fire-scorched trees (more than half of the crown is scorched). Further damage can be mitigated by thinning the stand to increase remaining vigor and reduce the possibility of future tree mortality. During thinning, equipment should be careful to avoid any damage to residual trees.

Pine Engraver Beetle

Pine engraver beetle galleries

Pine engraver beetles, also called ips, attack all pine species. There are typically two generations of the beetle every year. The first generation occurs when adults become active in early spring and reproduce in fresh slash. The second generation seeks out new material and often attacks the tops of standing or small diameter trees. Reddish-orange boring dust is a sign of attack. Removal of the bark reveals spider-like galleries with no boring dust. Reducing fresh slash when adults are active can mitigate further infestation. To do this, avoid harvesting from December - June. If infested, destroy slash by chipping or burning. If your slash is already infested, you can create a "green chain" by continuously supplying fresh slash during the flight period of adults, during spring, so they will not need to attack nearby trees.

Wood Borers

Wood borers are also common following a fire event. However, they are not aggressive and will only attack highly stressed trees that were extensively scorched by the fire. Therefore, their presence is not a huge concern to remaining healthy trees. Pine sawyers, a type of wood borer with a large antenna, are very common in Montana post-fire alongside metallic woodborers and ichneumonoid wasps.

Technical and Financial Assistance

Deciding what management options are best for your forest land after a wildfire can be daunting, and implementing those management decisions can be costly. The following resource section represents financial and technical assistance that may be available to you from federal, state, and local resources.

Federal Assistance

Farm Service Agency (FSA)

The Emergency Forest Restoration Program (EFRP) helps non-industrial landowners restore forest health following natural disasters. EFRP funds are administered through state and county FSA offices. Landowners can reach out to their local FSA office and inquire about eligibility requirements and enrollment periods. This program is a cost-share where the program pays 75% of eligible restoration practices and the landowner pays 25%. For more information, view the EFRP fact sheet.

USDA - Natural Resource Conservation Service (NRCS)

USDA's Natural Resource Conservation Service (NRCS) may be able to provide landowners with technical assistance and will usually conduct assessments following fires 300 acres or larger, or if significant threats exist from a smaller fire. To inquire about technical assistance, contact your local Service Center.

The Emergency Watershed Protection (EWP) program is a financial assistance program through NRCS designed to provide technical and financial assistance for imminent hazards to life and property after a disaster. EWP is not intended for individual landowners but can assist individuals with a sponsor, such as a city, state, or local government and is often initiated by the NRCS State Conservationist declaring a local watershed emergency. For additional information and to read more about EWP process, visit the EWP webpage.

USDA - United States Forest Service (USFS)

If National Forest lands have been impacted by wildfire, the United States Forest Service (USFS) will be involved with post-fire emergency rehabilitation and long-term recovery work. Depending on availability of programs, USFS may be able to provide technical and financial assistance to neighboring private landowners. Landowners should reach out to their neighboring District Rangers to see what may be available and to coordinate cross-boundary work.

Bureau of Indian Affairs (BIA)

The BIA, through the **Burned Area Emergency Response (BAER) program**, provides assistance on burned First Nations trust lands. Where trust lands adjoin private property, treatments may be prescribed across ownerships and onto private lands. These treatments are primarily emergency treatments, such as erosion stabilization. For additional information, call the BIA Rocky Mountain Region One at 406-247-7943.

U.S. Department of Interior - Bureau of Land Management (BLM)

When BLM lands are impacted by wildfire, the agency's **Burned Area Emergency Response (BAER)** team assists local areas in assessing damage. Resource specialists then develop a cost-effective Emergency Stabilization or Emergency Rehabilitation Plan for the area. While BAER does not include private lands, private landowners who neighbor federal lands can benefit. They will share information from their assessment, including burn severity and mitigative measures for landscape recovery. When completed, a burn severity map will be uploaded and viewed on the BAER website.

State and Local Assistance

Montana Department of Natural Resources and Conservation (DNRC)

DNRC Service Foresters provide technical assistance to private landowners upon request. Service foresters can conduct post-fire assessments for individual landowners and help them develop plans to mitigate the impacts for long-term recovery. Montana DNRC may also be able to offer financial assistance through cost-share programs. Your DNRC Service Forester can also assist with connecting you to other technical and financial assistance programs. Find your local service forester.

Montana Association of Conservation Districts

The Montana Association of Conservation Districts provides sponsorship for technical and financial assistance through cost-share programs from Montana DNRC and NRCS to assist private landowners who have been affected by wildfire. For more information, contact your local conservation district. Visit the Conservation District Map for contact information.

Montana State University (MSU) Extension

MSU Extension offers educational resources and technical assistance via county extension offices and university faculty. Visit MSU Extension's website for publications and a faculty directory for state and county field staff.

County Weed Districts

County Weed District offices can provide technical assistance to help landowners revegetate and develop a weed management plan. County Weed Districts may also have financial assistance available through the Montana Noxious Weed Trust Fund Grants Program. This fund, administered by the Montana Department of Agriculture, may also offer After the Fire grants for immediate post fire invasive species treatment. For more information contact your county weed district.

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The Montana Department of Natural Resources & Conservation