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May 6 2025

Hello Amanda,

Please include these comments in the official record for the Hyalite Cottonwood Fuels Reduction Project.

Since I started writing my comments this project has now been lumped into Trump's Executive Order 14225 declaring a forest health emergency and exempting the project from any real analysis. Over 12 million acres – 59% of all national forest land – is designated for emergency logging. We have seen this movie before with Bush's Logging Without Laws, the Infrastructure and Investment Jobs Act and other attempts to manage public forests into submission. None of it has produced any measurable reduction in wildfire risk and instead has undermined protection of public forests and brought a plethora of stumps and unneeded roads. The only real emergency is the massive ecological threat posed by this insane giveaway to the timber industry.

Of course now we are lucky to even get any chance to comment on a logging proposal on our national forests. These are OUR lands, but the Forest Service and the US Government seem to have forgotten that. President Trump signed an executive order on March 1 to expedite logging and timber production on our national forests and BLM lands. The logging will take place regardless of the impact on all other values such as endangered species, water quality, old growth forest retention, carbon sequestration, scenic beauty, peace and quiet and recreation. The Order conflates logging with wildfire prevention and clearly blames a lack of logging for wildfire disasters that have devasted communities in the United States. One cannot help but recall Trump's absurd claim in his first term that we need to "rake the forest."

I strongly object to the Hyalite Cottonwood Fuels Reduction Project and believe the basic rationale for the project is faulty. The idea that logging will stop or hinder wildfire is false and in fact is dangerous. Wildfire commonly burns through areas already thinned and logged and indeed can burn through almost anywhere with burnable material. Logging as fire prevention has become baked into the Forest Service's basic operational mindset to the point where it is presented as fact, rather than a concept requiring critical thinking or as one of many approaches to forest management. You can see it right in the title of this document where trees and other natural vegetation are labeled as "fuel."

I have attached a 2018 letter to the Trump Administration signed by 215 scientists urging a cautious, science-based approach to fire mitigation rather than a headlong rush to log our way out of a perceived forest health crisis. This letter is even more applicable today with

the Trump Administration declaring an emergency in order to ramp up logging of irreplaceable public forests across the nation.

Forest fire in the dry, flammable forests of the Northern Rockies is driven by weather, not fuel. Drought, lightning, heat and wind are the main factors influencing wildfire here in the Gallatin Range where this project is proposed. The vast majority of forest burning occurs during infrequent high-intensity fires which move fast and affect wide areas of landscape. The 1988 Yellowstone fires are a perfect example. These fires jumped roads, firelines, and even rivers as if they were not even there. Imagine trying to thin or clearcut Yellowstone enough to have prevented these fires! The park would have been a clearcut wasteland. Instead, Yellowstone is a thriving ecosystem where dramatic regrowth of the forests is ongoing.

Another excellent example of fire behavior here in Southwest Montana was the Foothills Fire in the Bridger Range north of Bozeman. The fire erupted from a smoldering snag and blew up in sixty mile per hour wind, burning dozens of homes before it was extinguished by rain and snow. Another day of high wind without rain would have resulted in Bridger Bowl ski area being torched. Short of shaving off all the trees in the Bridger Range, no amount of thinning or logging would have stopped that fire. It was put out by a fortuitous change in weather, just like the Yellowstone fire of 1988.

Fire of high intensity - when most of the burning occurs in the forest canopy - will not be stopped by logging unless you clearcut most of the forest. Fires of lower intensity may be stopped or slowed by logging and thinning, but these fires are relatively cool and beneficial and do not spread far unless weather conditions change dramatically.

There are many examples in the Western US of fires that burned through logged or thinned areas. One example is the 2003 Cooney Ridge Fire (see attached report; Forest Harvest Can Increase Subsequent Forest Fire Severity"). In it the authors state "timber harvesting does not always reduce the intensity or severity of subsequent fires. At Cooney Ridge, much of the extensively and homogeneously logged private lands burned with uniform high severity."

Nor are forest fires a bad thing to be prevented. They are only a problem when you have human developments, property and lives in the way. Western forests, as you know, have evolved with forest fire to the point where many tree and wildlife species depend on forest fire to create the conditions and habitat they require.

It is a grave mistake to equate forest fire with the destructive urban fires that have recently occurred in places like Malibu, Pacific Palisades, Denton Montana, Paradise California, Gatlinburg, Lahaina, Superior and Louisville Colorado, and elsewhere. Read the book *Fire Weather* by John Valiant for a stunning portrayal of urban fire in Fort McMurray, Alberta, wherein an entire city of 80,000 people is engulfed in flames and must be evacuated. Fires such as these may start in grasslands or in forest or in nearly any flammable environment

but when they start burning homes in high winds, the forest has nothing to do with it – it is blowing, glowing embers from burning houses and fuel sources like car gas tanks and propane tanks that drive these fires. In Fort McMurray, entire neighborhoods of new homes were bulldozed in an effort to stop the fire.

Logging and thinning of the forest here in the Gallatin Range opens up the forest canopy and allows sunlight to dry out remaining trees and vegetation. Wind speeds increase in open forests or clearcuts, allowing fire to spread more quickly in these now-dryer environments. Weeds and tall grasses grow in these open sites, which then dry out and create fine fuels to allow the spread of fire to nearby thicker forest. As I recall from talking to Corey Lewellen and Mary Erickson, the plan for the nearly completed Bozeman Municipal Watershed Project was to maintain fire breaks by mowing off the weeds every few years to prevent dry vegetation from taking over the firebreaks and creating fuel. With both Mary and Corey gone from the forest, who will mow it? No one.

If the goal of projects like the one proposed or of the nearby Bozeman Municipal Watershed Project were really to thin the forest then only smaller diameter trees and branches would be cut and either burned or removed. But tens of thousands of mature trees are cut as well, demonstrating that the real goal of these projects is to log and sell large, valuable trees.

I have attached my expose I created on the Bozeman Municipal Watershed Project showing some of the direct impacts of this logging and road building which will be mimicked in the proposed project. While forest fire may in some future time burn the area and spew lots of smoke and CO2 into the atmosphere, these logging and burning projects are guaranteed do that. Each thinned area turns into giant slash piles that are burned on site, generating smoke and CO2 which contributes to globally elevated CO2 concentrations which result in global warming. The smoke from the slash burning adds to regional and local air pollution.

Cutting the large, old commercially valuable trees takes away the shade and cooling effect of these trees. It removes the fire-resistant older trees and destroys old growth forest that is essential for wildlife habitat and for people who enjoy and benefit from these rare forest types. Douglas fir have evolved with thick, fire-resistant bark so they older, more mature trees tend to survive forest fires.

Have you heard of Forest Bathing? It is a Japanese tradition of spending time in quiet forests for the health benefits. I have done it; it works. Indeed, old forests with big trees can be spiritual places; to me they approach the status of a natural cathedral. Here is a photo of a place where I USED TO GO for forest bathing. That is, before it was logged.

Trail on Kirk Hill Ridge before logging. Photo by Phil Knight.

Taking much of the forest biomass via logging disturbs the relationships that exist between trees and other plants and the ecosystem as a whole. The forest is an interconnected whole, communicating via micorrhizal fungi, pheromones and other means. It is a living breathing entity that stores carbon on a vast scale and produces oxygen. Large older trees encourage the growth of new trees and share nutrients with them. Intact forest capture and filter water and snowpack and hold the soil. Intact forests provide habitat for countless birds, mammals, insects, amphibians, soil organisms, plants, microbes and trees. Yet the Forest Service views the forest as "fuel."

For once maybe you could state the obvious and be honest with the public - you want to cut down and sell the big old commercially valuable trees. At least then we could have an honest discussion of the merits or consequences of the project. In the Bozeman Watershed Project area I found stumps of trees I would estimate at 175 years at least (by counting rings).

I tried to reason with the Forest Service to avoid cutting down the trees on Kirk Hill Ridge, above the Kirk Hill Nature Trail. My petition on Change.org against the logging on Kirk Hill

was signed by 2,897 people. Yet the Forest Service ignored any pleas to save these old trees.

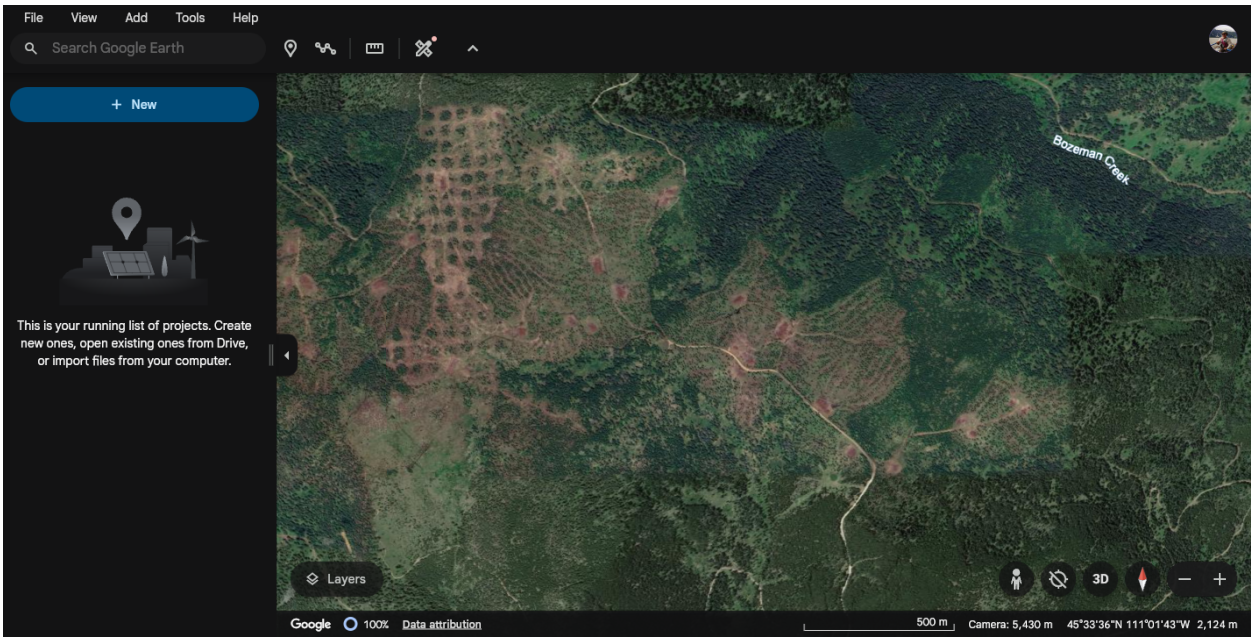
https://www.change.org/p/mary-erickson-supervisor-custer-gallatin-national-forest-don-t-log-kirk-hill/dashboard?source_location=user_profile_started

Now Kirk Hill Ridge is another cut-over, weed-infested, anemic forest with blown-down leave trees, lots of big stumps, haunted by ghosts of the old trees that were stolen. Here is a “leave tree” on Kirk Hill Ridge.

The roads that were cut into those slopes are harsh and destroyed the natural continuity of the forest. The road cut into the steep slope near the top of the cutting units has 15 foot cutbanks and is already showing signs of failing (slumping). These roads were supposed to be removed and recountoured when the logging was finished but there is no sign of that happening.

Higher on the ridges up above,and visible from Bozeman are the hideous “piano-key” cuts with strips of trees bisected by clearcuts. I guess aesthetics does not matter any longer in forest management.

Viewed from Google Earth the Moser Ridge is an ugly hacked-over mess as a result of the Bozeman Municipal Watershed Project. You can see the little patches of forest left in even rows – the ultimate in forest fragmentation. Now you want to spread the devastation via this new proposal.



Now the same sort of damage has been inflicted on Leverich Canyon, along a trail that is extremely popular with mountain bikers. I have ridden the Leverich Trail many times but now must contend with stumps scattered all along the trail where there used to be magnificent Douglas firs. This is vandalism, not forest health management.

Will all this cutting and roading actually save the city watershed? We have no way of knowing unless an actual wildfire occurs. But I do know that the forests of the northern Gallatin Range have been severely disrupted and degraded by all this tinkering. Now you want to extend this mess by nearly 8,000 acres. I say, STOP, enough damage has already been done. You are not "restoring" the health of the forest nor of anything else.

The scoping letter for this project was very thin on details. It does not disclose where new roads would be built, saying only that "fewer than 10 miles" of new roads would need to be built. It's clear from the map there are already a LOT of roads in this area, and roads are the worst impact of all this logging and thinning. Would new roads go into the roadless South Cottonwood Canyon? If so this is a very big deal.

Remove Roads, Don't Build More

Roads are perhaps the biggest problem with this proposal and with logging in general. National forests have been degraded by over 400,000 miles of roads. Every road brings human impacts and disrupts natural systems and wildlife habitat. Many species such as grizzly bears, elk and wolves avoid roads and thus are shut out of yet more suitable habitat as roads are built.

Instead of building yet more "temporary" roads that will disrupt the landscape and later have to be reclaimed, the Forest Service should be ripping and reclaiming existing roads, as

was done very effectively in Moose and Tamphrey creeks in the Gallatin Range thanks to Forest Hydrologist Mark Story. I helped monitor the use of those roads by wildlife after machines were shut out by road ripping, and was astounded at how fast the wildlife came back. On former roads in Moose Creek I maintained a game cameras for Wild Earth Guardians in 2011 and 2012and recorded use of the former road by moose, elk, mule deer, coyotes, a bobcat, 2 black bears and a grizzly bear with 2 cubs!

Grizzly bear photographed on former road (now closed) in Moose Creek, Gallatin Range in 2011. Her two cubs followed close behind.

Moose photographed on former (now closed) road in Moose Creek, Gallatin Range.

Roads are also an obvious vector for human activity. Humans start fires, intentionally and accidentally. Campfires, motor vehicles, firearms, fireworks, even broken glass can cause fires to start. It makes no sense to open a roadless forest with roads with the goal of reducing fire risk.

South Cottonwood History

You may be unaware how important South Cottonwood Canyon is to Bozeman and what the history is there. South Cottonwood Canyon was part of Robert Persig's influential book Zen and the Art of Motorcycle Maintenance. In the book the author treks into South Cottonwood Canyon and meets a mountain lion and has a major wilderness experience. Local heroine Marguerite Bartosch lived at the end of the road in South Cottonwood and prevented the Forest Service from building a road in there, preserving the roadless character of this awesome canyon. Now the DeWeese family lives there. Norm Strung, who lived with Bartosch, organized Concerned Citizens for Cottonwood in the 1980s and further prevented development there. Plum Creek Timber was on the verge of building roads into South Cottonwood in the late 1980s, planning to log their two private sections in Fox Creek. The road they planned to build was already flagged to come in from Fox Creek Meadows over the Langhor divide. Plum Creek Strung worked with locals like Doug Rand and Joe Gutkoski to lobby Plum Creek and Congress to buy out these sections. Eventually Senator Max Baucus facilitated this buyout and saved South Cottonwood once again.

Plum Creek did log many sections they owned in the Gallatin Range, many of them entirely clearcut in Moose Creek, Swan Creek and elsewhere. About 30 years ago they logged and roaded Wheeler Mountain which rises on the west side of South Cottonwood. The logging scars on Wheeler from cable logging on steep slopes and the roads they built and then abandoned are still easily visible from Bozeman. Some of that steep logging was done directly above South Cottonwood. Fox Creek, high up in the drainage, with wet mature old growth forest, would also have been roaded and clearcut but for Concerned Citizens for Cottonwood.

Mature old forests like those in Cottonwood and Fox Creek, and the forests already lost to harsh and destructive logging, will take hundreds of years to grow back if, indeed they ever do. These forests have evolved over many thousands of years, since the glaciers receded, creating a complex interconnected web of life that is easily disrupted but not easily restored.

Personal Experience

I have spent a lot of time in South Cottonwood, skiing and hiking and camping and mountain biking. I've skied Wheeler Mountain from there. My wife and I skied to the Fox Creek Cabin and spent a night. I solo camped at the very head of South Cottonwood in one of the wildest mountain basins you can find in the Gallatin Range. I've camped with friends in Fox Creek Meadows and watched the stars wheel overhead as the owls hooted. I've stood on top of Mount Blackmore many times and gazed down South Cottonwood to the Gallatin Valley, enjoying the wild intact natural landscape. This drainage is extremely important to me and many other people in the Bozeman community. Yet you casually announce you are going to log parts of it. WTF??

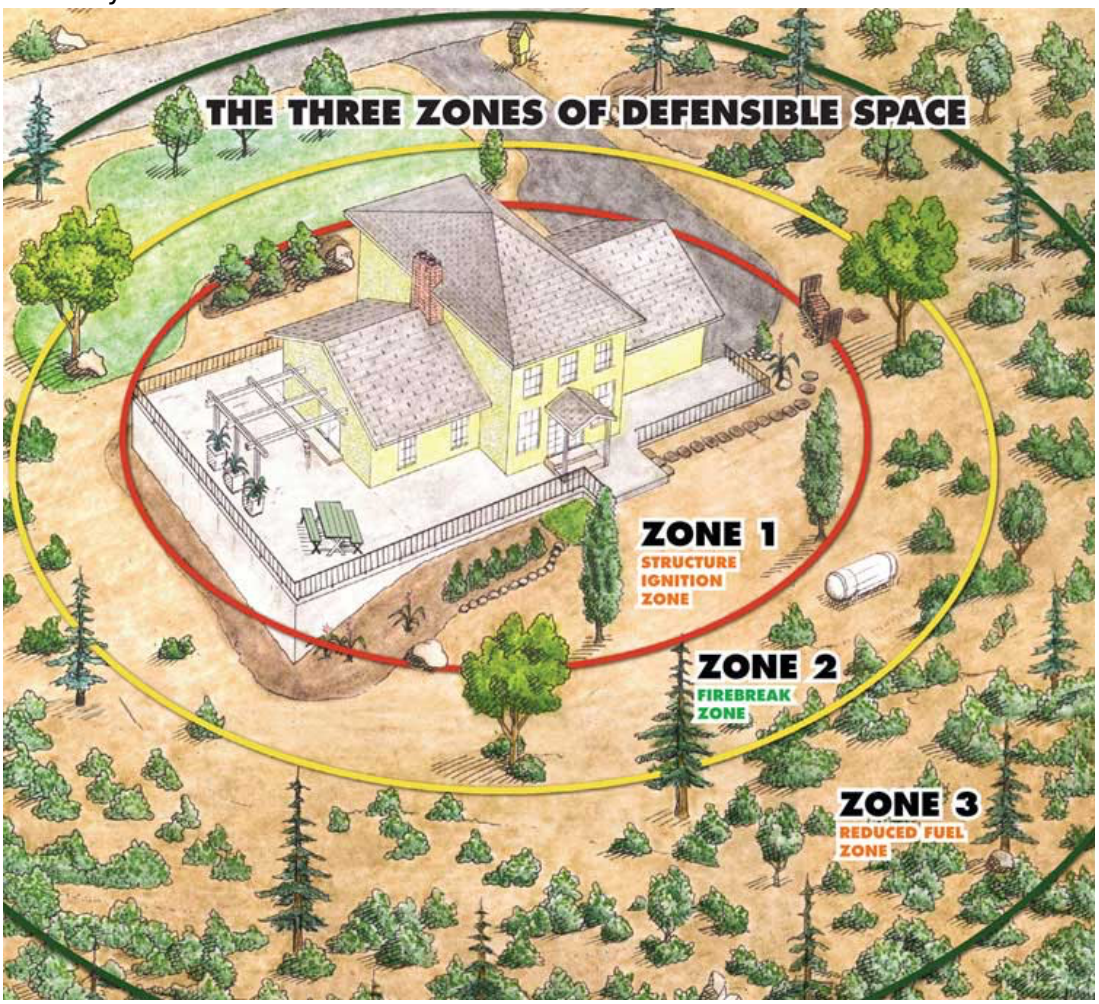
Please keep your chainsaws OUT of South Cottonwood.

WUI

The Wildland-Urban Interface (WUI) is an ever-expanding problem area as more and more homes are built near and in the forested mountains. Extremely valuable properties are placed smack dab in the flammable forest. For example, one home in the Triple Tree subdivision, right at the foothills of the Gallatin Range and surrounded by forest, lists for over $11 million. https://www.taunyafagan.com/montana-real-estate/Bozeman/317-Limestone-Meadows-Lane/398864/.

I do not believe it is the responsibility of the US Forest Service to protect these private properties from fire. Nor will logging be an effective way to prevent these properties from burning. I believe that instead, **the Forest Service is deceiving landowners by making them think their homes are safe due to "fuels reduction projects" like the one here proposed.**

The only effective measure to protect an existing home from wildlife in the WUI is home-hardening – building a home with fire resistance materials or retrofitting existing homes. The land within 100 feet of the home must also be fire hardened. Montana DNRC lays out the basic work that must be done to mitigate fire risk on your property. https://www.mtfireinfo.org/pages/homepreparedness Cost and responsibility should be borne by the landowner.

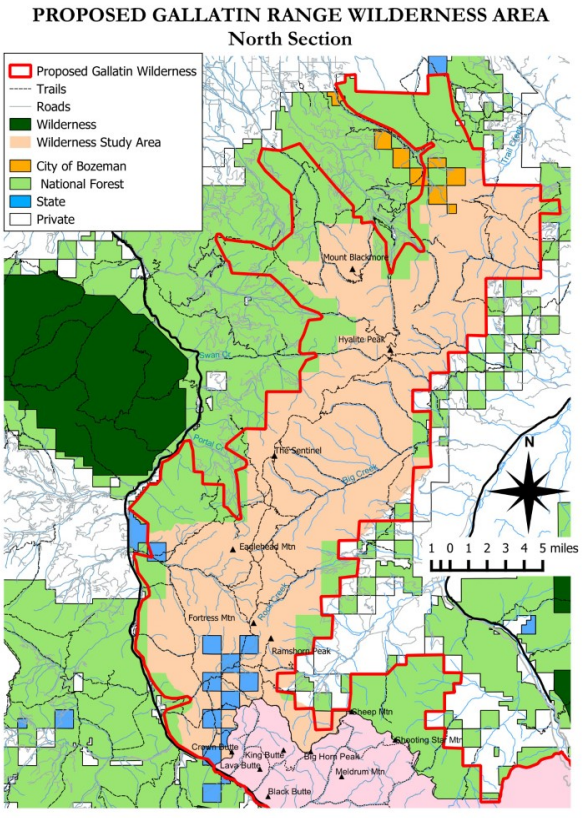


There are a number of homes on the ridge on the northeast side of South Cottonwood, and many on the west side too. These homes are high on ridge accessed by winding roads. A fire in South Cottonwood could certainly be a threat to these homes and escape overland could be difficult. But these homes are put there partly because of the amazing back yard they have, a huge roadless canyon. Many other homes are located along the road to the trailhead in South Cottonwood. People who live here must understand the risks and take responsibility to defend their own property. The DeWeese family is a good example of people who accept the risk of living there and prefer the canyon and forest stay wild and undeveloped. They do not want the disturbance and disruption and degradation of logging.

I see that some of the hand work (thinning with chainsaws) would occur along the Fox Creek Trail. This is hardly what I would categorize as WUI, being several miles from any house. So what is the reason for this? Protect hikers and mountain bikers from fire? You already plan to thin and log along trails on Chestnut Mountain, and you logged along the trails in Leverich Canyon and Kirk Hill. The public deserves better than stumps and slash along our favorite hiking trails – people go to enjoy nature as is, not as it appears after the Forest Service butchers it.

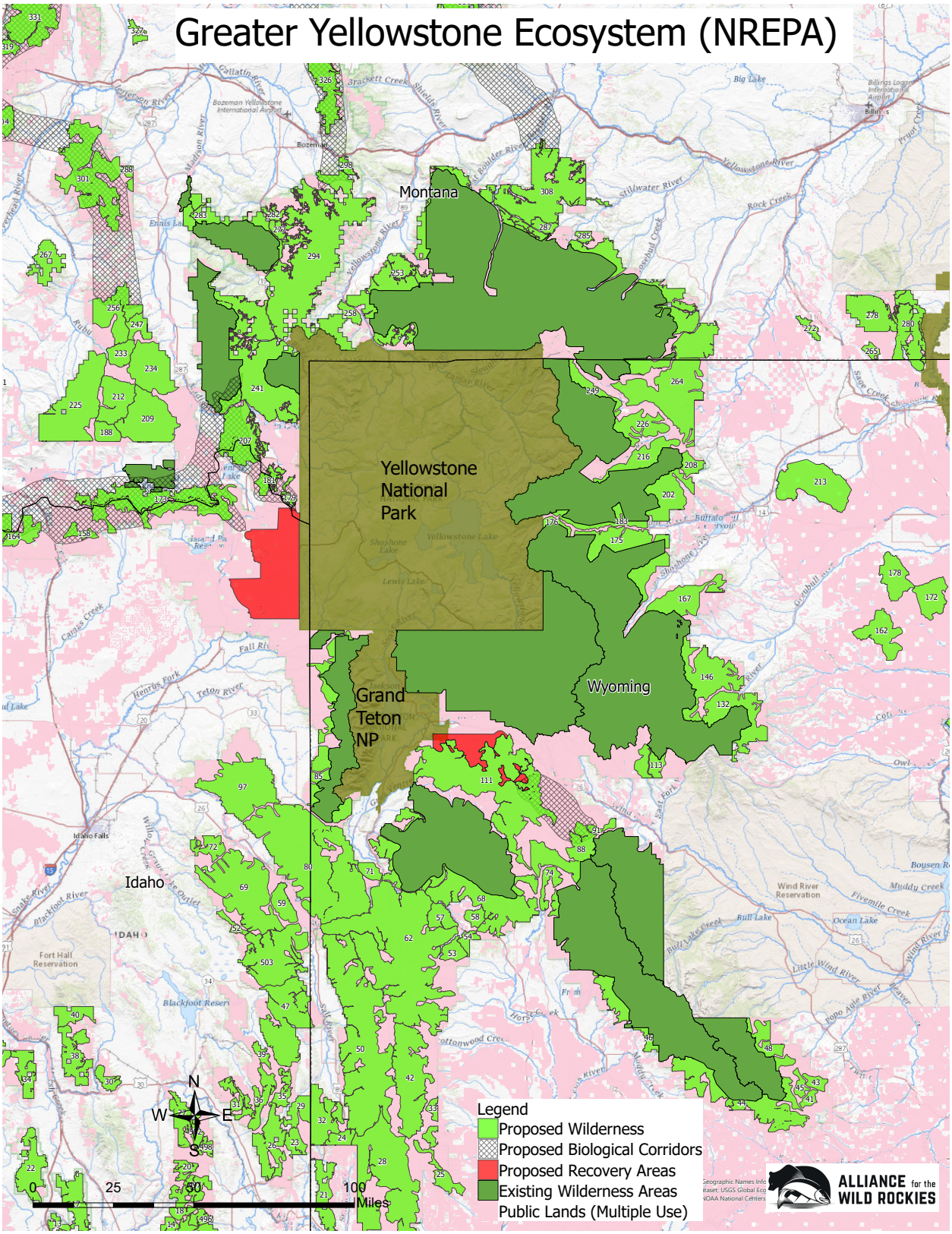
Wildlife depend on the roadless South Cottonwood canyon for survival and habitat. Canada Lynx are endangered and this area is recognized as lynx habitat. Moose, grizzly bear, black bear, wolf, mountain lion, mule deer and a large elk herd all utilize this secure habitat that is free of roads. Endangered wolverines may well travel through South Cottonwood. Wildlife biologist Steve Gehman in 2010 described the Cottonwood Divide (east side of the South Cottonwood drainage) as some of the best habitat for secure north-south wildlife travel in the Hyalite Drainage. He described seeing lots of bear sign, plus sign of moose, elk and deer. Of course this ridge is where most of the logging and thinning activity would happen in the proposed project.

South Cottonwood deserves to be preserved as a roadless wilderness. The only incursion it currently suffers is from a lot of mountain bikes. The entire South Cottonwood Canyon was proposed for Wilderness designation as far back as 1988 by Earth First!, and by Montanans for Gallatin Wilderness 15 years ago.



South Cottonwood Canyon is also included as designated Wilderness in current legislation before Congress – S. 1531, the Northern Rockies Ecosystem Protection Act. Here is a map showing the lands in the Greater Yellowstone Ecosystem proposed for Wilderness designation under the 1964 Wilderness Act. South Cottonwood is part of the Gallatin Range roadless area.

Greater Yellowstone Ecosystem (NREPA)



In conclusion, the Hyalite Cottonwood Fuels Reduction Project is based on false premises and should be dropped. Logging, road building and thinning will only add to the long history of abuse heaped on the Gallatin Range and will not prevent wildfire but may actually make it more likely. Let the forests recover on their own, let the wildlife have undisturbed habitat, let the people enjoy their public lands free of chainsaws, bulldozers, skidders, cable yarders, helicopters and log trucks. South Cottonwood Canyon in particular should be left alone and recognized for its special status as the last unlogged canyon in the Northern Gallatin Range.

Our public lands are under siege by the Trump administration that sees land and trees as nothing but money. They want to turn our land into private enclaves for billionaires. It is time Forest Service employees stand up to this assault on our public heritage.

For the Gallatin Range

Phil Knight

Bozeman Municipal Watershed Project logging damages forests and mountainsides near Bozeman

By Phil Knight, 39 year resident of Bozeman

The US Forest Service and the City of Bozeman need to stop cutting down our forests.

The City of Bozeman and the US Forest Service have been logging the forests of the Gallatin Range south of Bozeman for several years as part of the Bozeman Municipal Watershed Project. They claim the logging will help prevent impacts to the city water supply from a wildfire. This may be true, but meanwhile the logging has removed thousands of trees, many of them old growth up to 200 years. Some of the cuts have been along public trails. Much of it has been on high cold ridges. These big old Douglas fir are unlikely to grow back. Beautiful old growth forest has been heavily thinned and opened up to direct sunlight and wind. Weeds and tall grass have grown in.

Whether or not the logging will help prevent a fire is unknown until it happens. But the impacts of the logging are considerable.

I believe this logging has degraded and diminished a beautiful old growth forest. Cutting these big old trees is vandalism. But it's the big trees that are commercially valuable and are being sold to Sun

Mountain Lumber. The smaller trees and branches are piled and burned because they have no commercial value. This burning pollutes the air around Bozeman and adds carbon to an atmosphere already overloaded with it. The EPA considers CO2 to be an atmospheric pollutant that is the main cause of climate change.

The trees that are being cut and hauled off and sold belong to the public, to the Earth and to themselves. They do not belong to the Forest Service not the City of Bozeman.

Roads have been carved into steep slopes in the Gallatin foothills where there were no roads. Supposedly these roads will be removed and recontoured but there has been no such effort thus far. How do you reclaim a road with a 15 foot steep road cut above it? All the fill has been thrown down hill.

In some of the cutting units, large amounts of slash have been left on the ground, where it will dry out and form potential fire fuel. In other units, “leave trees” (ones not cut down) have blown down from increased wind caused by forest thinning. These too are now fire fuel. On ridges where most of the trees have been cut down, tall grass and weeds have grown up, creating fine fuels for a fire.

The big old Douglas fir trees are not generally fire prone and in fact shade and cool the forest and slow the wind on the ridges. They have thick bark to resist burning.

These big old trees, when left alone, provide many services for free: Carbon storage, wildlife habitat, oxygen production, transpiration (cooler wetter climate), shade, beauty, solace for humans, greenery, soil retention, water and snow retention…when cut down they cannot do any of this.


Big Douglas fir trees hacked down along the popular Leverich Canyon Trail

Mountain bikers pass a stump field on Leverich trail. A big tree cut and left to rot on Leverich ridge.

Slash left to dry on the forest floor in Sourdough Canyon

Leave trees blown down on Leverich Ridge

Big Douglas fir butchered on Leverich Ridge

Steep road cut on Kirk Hill Ridge

New road ready to slump on Kirk Hill Ridge

Forest slashed in Sourdough Canyon. All this will be burned or rot and create more CO2 instead of storing it.

Forest in the Gallatin Fringe Inventoried Roadless Area that the Forest Service plans to heli-log

Forest Harvest Can Increase Subsequent Forest Fire Severity[1]

Carter Stone,[2] Andrew Hudak,[3] Penelope Morgan[4]

Abstract

The USDA Forest Service is progressing from a land management strategy oriented around timber extraction towards one oriented around maintaining healthy forested lands. The healthy Forest Initiative promotes the idea of broadscale forest thinning and fuel treatments as an effective means for mitigating hazardous fuel conditions and, by extension, fire risk. Fuels mitigation is proactive while fire suppression is reactive and expensive. Costs associated with suppressing large wildfires, as occur in the western USA with annual regularity, are astronomical and routinely exceed fire suppression budgets. It is not difficult to demonstrate that treating forest fuels is more cost effective than suppressing forest fires on untreated lands. In addition, forest thinning is potentially profitable, or at least can recoup the cost of thinning, and may also produce safer conditions for those living in the wildland-urban interface zones. Thinning practices also facilitate wildland firefighting efforts for monitoring and controlling future fire incidents as well as for forest health management practices by state and federal forestry agencies. However, forest thinning and other fuel treatment strategies can take many different forms, some of which can do more harm than good when considered with other factors that influence wildfire behavior, such as weather and terrain. One example of this issue can be seen in Montana during the 2003 fires. At the Cooney Ridge fire complex, an extensively and homogeneously logged watershed burned severely and uniformly due to remaining ground slash (which had attained low fuel moisture after overstory removal) and severe fire weather (low relative humidity and strong upslope winds). This contrasted with a mosaic of burn severities in an adjacent watershed with higher fuel loads yet greater heterogeneity in fuel distribution at the stand and landscape levels. Harvesting timber does not translate simply into reducing fire risk. Given the stochastic nature of fire weather events, and the complex terrain of most forested landscapes in the western USA, applying a variety of forest thinning and fuel treatment operations towards the goal of maintaining a diverse forest habitat mosaic, also constitutes a sensible fire risk mitigation strategy.

Introduction

In recent decades, fires have burned an increasingly larger area in the western US. The many large fires experienced in the western US have been variously attributed to effective fire suppression that has allowed fuels to accumulate, to land use including logging that has removed larger trees but not always thinned the smaller tress that remain, and to climate change (Morgan and others 2003). In some drier forest types,

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[1] An abbreviated version of this paper was presented at the second international symposium of fire economics, policy, and planning: a global view, 19–22 April, 2004, Córdoba, Spain.

[2] GIS Analyst, University of Idaho Department of Forest Resources, Moscow, ID, USA.

[3] Research Forester, USDA Forest Service Rocky Mountain Research Station, Moscow, ID, USA.

[4] Professor, University of Idaho Department of Forest Resources, Moscow, ID, USA.

such as the semi-arid ponderosa pine ecosystems, tree density far exceeds historical norms and these can fuel unusually intense fires (Covington and others 2000). Elsewhere, however, many forests, such as sub-alpine forests at high elevations, naturally contain abundant surface and canopy fuels. There, intense and severe fires were the historical norm. The increasing number of people living in and using forests and rangelands have greatly increased both the chances of fires starting and the degree to which fires threaten people and their property when wildfires do occur. Dense thickets of younger trees now abound, and human and ecological communities are increasingly vulnerable to destructive crown fires. A consensus has emerged that it is urgent to restore more natural conditions to these forests (Allen and others 2002). Large, severe fire events account for a majority of the total area burned over time (Strauss and others 1989), as well as threats to people and their property (Maciliwain 1994).

The US responded to increased cost and extent of western wildfires with the National Fire Plan (http://www.fireplan.gov/content/home/) in 2000 and more recently with The Healthy Forest Initiative (http://www.whitehouse.gov/infocus/healthyforests/). Both the National Fire Plan and the Healthy Forest Initiative seek to reduce fire hazard through active fuels management via logging and prescribed burning. Efforts are designed to complement continued fire suppression, assistance to local communities, and rehabilitation. Both efforts build on recent concern over declining forest health in the western US as a result of fire exclusion, land use change, and climate change. Past emphases in fire management have been on wildfire suppression and prescribed fire to reduce hazardous fuels following timber harvest and improve wildlife habitat. On the other hand, lightning fires have been allowed to burn in wilderness areas to restore natural process for over thirty years. It is only in the last five or six years that fire management has extensively used prescribed burning and mechanical fuel treatments to reduce hazardous fuel accumulations in non-wilderness areas (Long 2003). The degree to which mechanical treatments such as thinning will reduce the intensity and severity of subsequent fires is a subject of lively debate (Morrison and others 2000). Relatively few studies exist, and these mostly have focused on dry forests.

Burn Severity

Burn severity is broadly defined as the degree of ecosystem change induced by fire (Ryan and Noste 1985). Severe fires are those that result in great ecological changes (Rowe 1983, Ryan and Noste 1985, Moreno and Oeschel 1989, Schimmel and Granstrom 1996, De Bano and others 1998, Ryan 2002). Compared to low severity fires, vegetation recovery is slower, nutrient cycles are more altered, invasive species are more abundant, tree mortality is higher, and soil erosion is more likely to follow severe fires. Burn severity encompasses fire effects on both vegetation and surface soils (Ryan 2002, Ryan and Noste 1985, Key and Benson 2001).

Burn severity is usually mapped from remote sensing data, to assess ecological effects and the degree to which post-fire rehabilitation is needed to reduce soil erosion and speed vegetation recovery (Parsons and Orlemann 2002). The US Forest Service (USFS) and other land management agencies employ remote sensing tools in an effort to efficiently and effectively manage fire-adapted ecosystems. Fire perimeter data for this paper came from Incident Command Geographic Information Systems (GIS) during and immediately after the fire. Fire severity classes came from

a Burned Area Reflectance Classification (BARC) map provided by the USFS Remote Sensing Applications Center (RSAC).

Cooney Ridge Fire

Cooney Ridge is one of several large wildfire events that occurred during the active 2003 fire season in western Montana (Fig. 1). A prolonged drought of four years preceded a very dry summer, and the weather in late August was hot, dry and windy. On August 8, 2003, lightning ignited a fire on Cooney Ridge, located approximately 18 miles east of Missoula, Montana (Fig. 2). Despite intensive suppression efforts (www.fs.fed.us/r1/fire/2003fires), the Cooney Ridge fire burned 8589 ha before it was contained on October 15, 2003. Many people who lived in small towns and scattered homes in nearby valleys feared that this fire would spread toward them. The fire threatened industrial power lines serving eastern Washington, northern Idaho and western Montana. A world-famous trout fishing stream, Rock Creek, directly to the east (and downwind) of the fire, was another resource fire fighters sought to protect.

Figure 1 — Aerial Photo of the Cooney Ridge Fire.

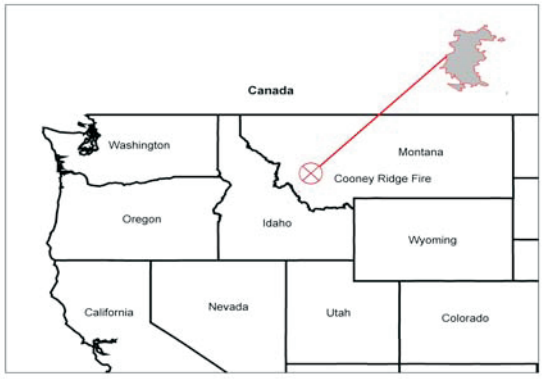

Figure 2—Location of the Cooney Ridge Fire.

The Cooney Ridge fire perimeter (Fig. 3) includes both public (54%) and private (46%) land. Most of the public land is managed by the USFS for multiple uses including timber extraction, recreation, and wildlife habitat, while only 177 ha (4%)

is managed by the Montana Department of Fish and Game. Private land is mostly industrial forestland belonging to Plum Creek Timber Company, while only 48 ha (1%) is under other private ownership.

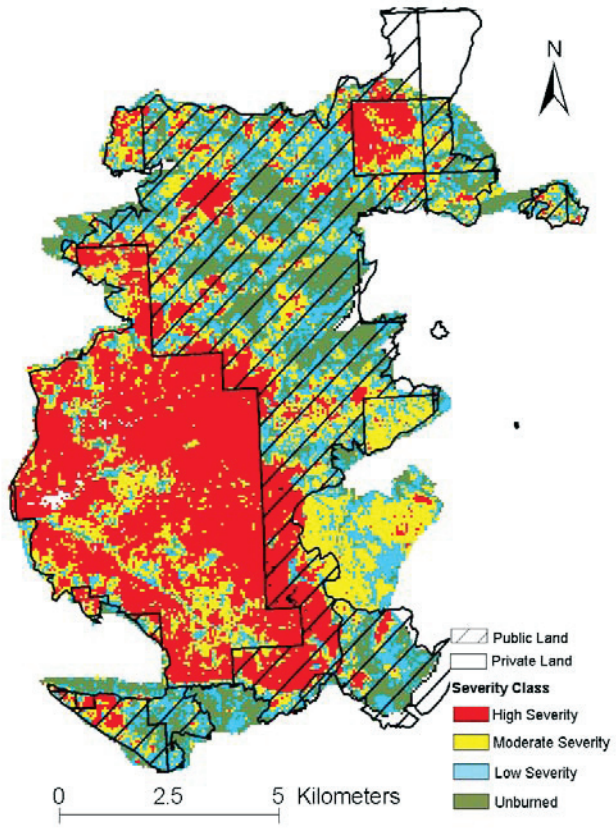

Fig. 3. Burned Area Remote Classification (BARC) Map

Results

Overall, 88% of the area within the final fire perimeter burned. More than 98% of private land burned, while 79% of public land burned. The areas that contain the most unburned vegetation are on the public lands portion (Table 1).

Table 1—*Area Burned on Public and Private Land in the 2003 Cooney Ridge Fire, Montana, USA.*

	Private		Public	
Class	Hectares	Percent (%)	Hectares	Percent (%)
Un-Burned	**83**	**2**	**984**	**21**
Burned	**3899**	**98**	**3622**	**79**
Low	*228*	*6*	*1347*	*29*
Moderate	*1704*	*43*	*1594*	*35*
High	*1967*	*49*	*681*	*15*
Total	**3982**	**100%**	**4607**	**100%**

Much more private land burned severely compared to public land (Fig. 4). Heavily logged areas and tree plantations have been known to burn more extensively than intact forests (Brown 2002). Much of the private land within the fire perimeter had been recently heavily logged for timber extraction, not for the purpose of fire hazard reduction

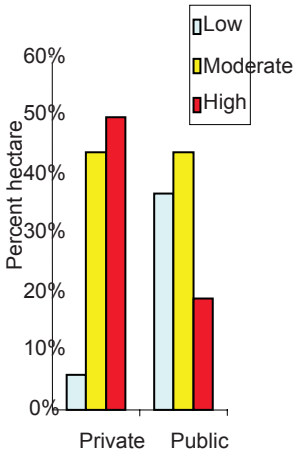

Figure 4—Proportional Area % burned in the Cooney Ridge Fire by ownership. Each column represents the burn severity classes illustrated in Fig. 3.

Daily fire perimeter maps showed that the largest fire expansion at the Cooney Ridge fire occurred between Aug 13 and Aug 17 (Fig. 5). The area burned during this time, and throughout the Cooney Ridge fire, was fairly evenly balanced between public and private lands (Fig. 6).

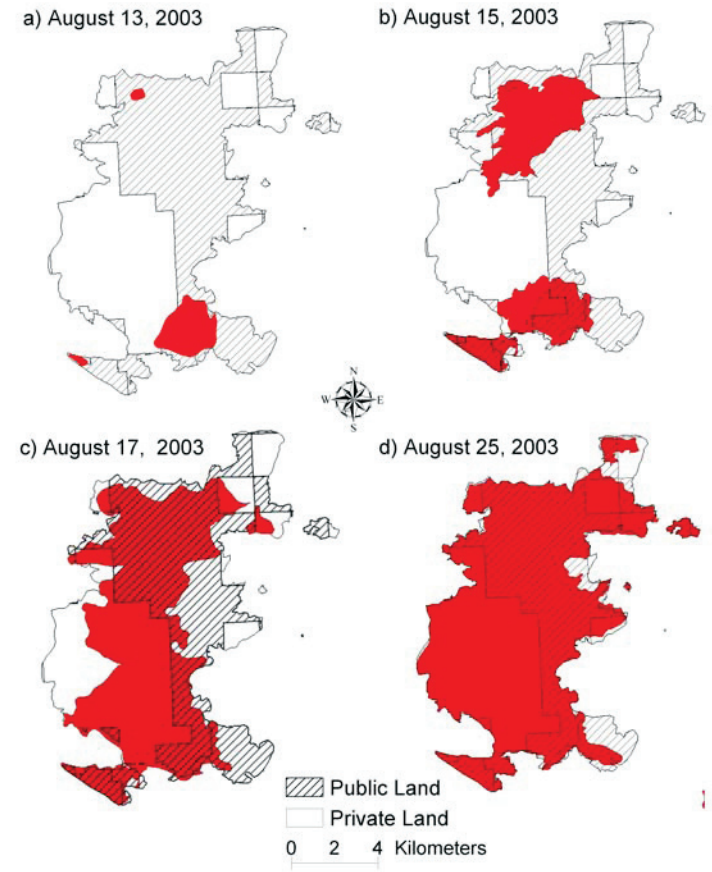

Fig. 5. Cooney Rige Fire Progression by date.

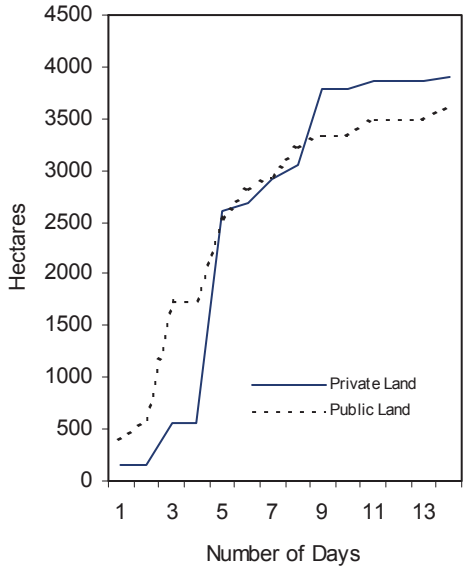

Fig. 6. Number of hectares burned per day of the Cooney Ridge Fire between the dates of August 13 to August 26, 2003.

Discussion

Private lands in this area were recently harvested with large clear cuts. Remaining vegetation and slash debris burned in the Cooney Ridge Fire. A much lower proportion of the public land had been recently harvested. Cut patches on the private land were much smaller, reflecting restrictions on the size of clear cuts and other harvesting units on public lands. The USFS manages federal lands for multiple uses besides timber production: wildlife habitat, recreation, and protecting water quality. As timber supply from federal lands has fallen over the last three decades, harvesting rates on private timberlands have increased to meet demand.

Pollet and Omi (2002), mention that fire severity refers to fire effects on the ecosystem and is directly related to post-fire vegetation survival. Their findings indicate that fuel treatments do mitigate fire severity. Fuel treatments provide a window of opportunity for effective fire suppression and protecting high-value areas. They go on to state that topography and weather may play more important roles than fuels in governing fire behavior. Of course, topography and weather cannot realistically be manipulated to reduce fire severity.

Hot, dry and windy weather made fire suppression efforts difficult, despite the many roads providing access for fire fighting crews. Daily fire perimeter maps showed that the largest blowup at the Cooney Ridge fire occurred between Aug 13 and Aug 17 (Fig. 5). The area burned during this time, and throughout the Cooney Ridge fire, was fairly evenly balanced between public and private lands (Fig. 6). Although local weather conditions may have differed slightly when public and private lands burned, these similar fire progression trajectories suggest more similarity than difference.

The Healthy Forest Initiative promotes the idea of broadscale forest thinning and fuel treatments as an effective means for mitigating hazardous fuel conditions. This is based on the sensible assumption that treating forest fuels is more cost effective than suppressing forest fires on untreated lands. In addition, forest thinning is potentially profitable, or at least can recoup the cost of thinning, and may also produce safer conditions for those living in the wildland-urban interface zones. However, as the Cooney Ridge fire suggests, timber harvesting does not always reduce the intensity or severity of subsequent fires. At Cooney Ridge, much of the extensively and homogeneously logged private lands burned with uniform high severity (Figs. 3-4, Table 1). Presumably, this is due to residual fuel, which had dried to very low fuel moisture.

The western United States is a fire environment (Morgan and others 2003). Fires will occur in the future, and some will occur when weather conditions are very dry, hot and windy. Given this ecological reality, the stochastic nature of fire weather events and the complex terrain of most forested landscapes in the western USA, applying a variety of forest thinning and fuel treatment operations towards the goal of maintaining a diverse forest habitat mosaic constitutes a sensible fire hazard mitigation strategy. An understanding of where fires are more likely to be severe would help to strategically locate and design fuel management treatments where they will be most effective. Such an understanding would also be helpful in fire suppression, fire mitigation and post-fire rehabilitation decisions.

Several challenges exist for fuels management. First, there is no single prescription that will be appropriate to all the conditions possible in diverse ecosystems. Second, thinning has very different economic and ecological effects depending on whether large trees are removed or remain behind. Third, the effects of logging include roads and sometimes, the damage to residual trees. Lastly, the costs of treatments must include long-term maintenance and monitoring. If practical alternatives to prescribed fire for reducing hazardous fuels can be found, resource managers will have a wider choice of methods to reduce risk of damaging wildfires at the urban interface (Brose and Wade, 2002).

In extreme years, especially after prolonged drought (Swetnam and Betancourt 1990, 1998), extensive areas burn across the western US. Such years account for the majority of the area burned (Strauss and others 1989) and the greatest threats to people and property (Maciliwain 1994). Thus fuels management through logging or other means will be less effective when weather conditions are extreme. Pollet and Omi (2002) suggest that funding for fuels management be directed towards the urban interface, tree plantations, critical watersheds, and habitat for threatened and endangered species.

Conclusion

One the clearest lesson from history is that fires have always occurred and that they will continue to occur despite our efforts to detect and suppress them (Morgan, 2003). In many forest ecosystems biomass production exceeds decomposition; this accumulated biomass fuels fires when lightning or people ignite fires in hot, dry, windy conditions. Fire and other disturbances have played important ecological roles in these ecosystems, thus complicating management decisions.

More research is needed to understand the relationship between ownership practices and severity. At the Cooney Ridge fire, patches of unburned vegetation and low severity remained after the fire, while much more of the private land burned uniformly with high severity. These results indicate that more diversified public lands management helped produce a much more diverse fire mosaic, thus better protecting this forested landscape. By comparison most private forested land burned with moderate to high severity, under likely similar weather conditions as on the public land.

Our results show that, perhaps counter intuitively, heavy harvest can increase subsequent fire severity. Costs associated with wildfire suppression far outweigh the costs of fuel treatment. Given the damages in both dollar and acreage, it would seem to be in the best interest of timber companies to implement thinning treatments and/or prescribed burning programs, rather than clear cutting. While there is much to be learned about the current status of forested ecosystems on the national Forest Lands, and about efficacy of thinning and prescribed fire to make these forests more sustainable, it appears clear that action must be taken to reverse trends of degradation. Since 1) thinning is a form of logging, and 2) prescribed fire can produce excessive smoke, runs the risk of escape, and appears to contradict decades of misinformation about the evils of forest fire, both techniques will be controversial among some portions of the public. Every effort should be made to apply these tools in manners that reduce the possibility of unintended consequences (Brown, 2002).

Cooney Ridge is not unique. Extensive amounts of untreated logging slash contributed to the devastating fires during the late 1800s and 1900s in inland Pacific

Northwest forests (Graham and others 1999). Logging doesn't always result in severe fires; it depends on which trees are harvested and the fuels left behind (Graham et al 1997, Pollet and Omi 2002.) Logging at Cooney Ridge was not designed to reduce hazard, and clearly it did not. Carefully designed harvesting practices, including those that retain smaller trees and/or thin dense stands, can reduce fire hazard (Pollet and Omi 2002, Graham et al 1999). Logging geared only towards large tree removal, since it does not manage surface fuels, will increase fire hazard and subsequent fire severity (Morgan and others 2003).

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Open Letter to Decision Makers Concerning Wildfires in the West

As scientists with backgrounds in ecological sciences and natural resources management, we are greatly concerned about proposals to speed up and expand logging on public lands in response to recent increases in wildfires in the West – proposals such as the House version of the 2018 Farm Bill. There are pragmatic, science-based solutions that can maintain biologically diverse fire-dependent ecosystems while reducing risks to communities and firefighters facing some of the most active fire seasons in recent memory. Unfortunately, such solutions are getting lost in the endless rhetoric and blaming that has characterized wildfires in the media, Congress, and the Trump administration. We the undersigned are calling on decision makers to facilitate a civil dialogue and careful consideration of the science to ensure that any policy changes will result in communities being protected while safeguarding essential ecosystem processes.

Why Is the West Burning and Is This Unnatural?

Wildfires have shaped the ecology of western ecosystems for millennia, whether lit by lightning or managed by American Indian tribes for cultural benefits. Wildfires vary in intensity and occurrence, across regions and vegetation types, elevation and climatic gradients, so there is no one-size-fits all strategy. The West has always burned and will always burn, and it needs to in order to maintain ecosystems and the myriad services they provide to the public in the form of carbon sequestration, clean water, abundant wildlife, and outdoor amenities. Attempting to suppress fires that are not a risk to communities is impractical, costly, risky to firefighters, and ecologically damaging. Also, forests are not the majority of the area burned annually on average in the United States; grasslands and shrublands are a large component of area burned annually that is unaffected by any forest management.

What is different today about wildfires is they are now burning over larger landscapes (more acres) since the 1980s, although overall fewer acres are burning today compared to that estimated in early decades and historical timelines.[1] Wildfire season in the West recently has lengthened from an average of five to seven months, and the number of large wildfires (>1,000 acres) has increased from 140 to 250 per year.[2] This is occurring as average annual temperature in the West has risen by nearly 2 degrees Fahrenheit since 1970s and winter snow pack has declined.[3] Increases in acres burning can now be attributed, in part, to climate change[4] and the

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[3]Union of Concerned Scientists (UCS). 2017. Western wildfires and climate change. http://www.ucsusa.org/global_warming/science_and_impacts/impacts/infographicwildfires-climate-change.html#.WcBXE5OGNTb
[4]Abatzoglou, J.T., and A.P. Williams. 2017. Impact of anthropogenic climate change on wildfire across western US forests. PNAS 113:11770-11775.

increase is expected to continue in many areas with additional warming, leading to even greater suppression costs and loss of life.[5]

In addition to climate change, more than 80 percent of fires nationwide have been caused by people,[6] and millions of homes are now in harm's way,[7] resulting in skyrocketing costs. Putting more money into fire suppression will not reduce homeowner losses as long as homes continue to be built next to fire-adapted ecosystems, lack defensible space[8] and/or fire-proofing, and measures are not taken to reduce human-caused wildfire ignitions.[6]

What Is Active Management and Does It Work to Reduce Fire Activity?

Active management has many forms and needs to be clearly defined in order to understand whether it is effective at influencing fire behavior. Management can either increase or decrease flammable vegetation, is effective or ineffective in dampening fire effects depending on many factors, especially fire weather, and has significant limitations and substantial ecological tradeoffs.

Thinning Is Ineffective in Extreme Fire Weather – Thinning is most often proposed to reduce fire risk and lower fire intensity. When fire weather is not extreme,[9] thinning-from-below of small diameter trees followed by prescribed fire, and in some cases prescribed fire alone,[10] can reduce fire severity in certain forest types for a limited period of time[11]. However, as the climate changes, most of our fires will occur during extreme fire-weather (high winds and temperatures, low humidity, low vegetation moisture). These fires, like the ones burning in the West this summer, will affect large landscapes, regardless of thinning, and, in some cases, burn hundreds or thousands of acres in just a few days.[12] Thinning large trees, including overstory trees in a stand, can increase the rate of fire spread by opening up the forest to increased wind velocity, damage soils, introduce invasive species that increase flammable understory vegetation, and impact wildlife habitat.[9] Thinning also requires an extensive and expensive roads network that degrades water quality by altering hydrological functions, including chronic sediment loads.

Post-disturbance Salvage Logging Reduces Forest Resilience and Can Raise Fire Hazards – Commonly practiced after natural disturbances (such as fire or beetle activity), post-disturbance clearcut logging hinders forest resilience by compacting soils, killing natural regeneration of

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conifer seedlings and shrubs associated with forest renewal, increases fine fuels from slash left on the ground that aids the spread of fire, removes the most fire-resistant large live and dead trees, and degrades fish and wildlife habitat.[13] Roads, even "temporary ones," trigger widespread water quality problems from sediment loading. Forests that have received this type of active management typically burn more severely in forest fires.[13]

Wilderness and Other Protected Areas Are Not Especially Fire Prone – Proposals to remove environmental protections to increase logging for wildfire concerns are misinformed. For instance, scientists[14] recently examined the severity of 1,500 forest fires affecting over 23 million acres during the past four decades in 11 western states. They found fires burned more severely in previously logged areas, while fires burned in natural fire mosaic patterns of low, moderate and high severity, in wilderness, parks, and roadless areas, thereby, maintaining resilient forests. Consequently, there is no legitimate reason for weakening environmental safeguards to curtail fires nor will such measures protect communities.

Closing Remarks and Need for Science-based Solutions

The recent increase in wildfire acres burning is due to a complex interplay involving human-caused climate change coupled with expansion of homes and roads into fire-adapted ecosystems and decades of industrial-scale logging practices. Policies should be examined that discourage continued residential growth in ecosystems that evolved with fire. The most effective way to protect existing homes is to ensure that they are as insusceptible to burning as possible (e.g., fire resistant building materials, spark arresting vents and rain-gutter guards) and to create defensible space within a 100-foot radius of a structure. Wildland fire policy should fund defensible space, home retrofitting measures and ensure ample personnel are available to discourage and prevent human-caused wildfire ignitions. Ultimately, in order to stabilize and ideally slow global temperature rise, which will increasingly affect how wildfires burn in the future, we also need a comprehensive response to climate change that is based on clean renewable energy and storing more carbon in ecosystems.

Public lands were established for the public good and include most of the nation's remaining examples of intact ecosystems that provide clean water for millions of Americans, essential wildlife habitat, recreation and economic benefits to rural communities, as well as sequestering vast quantities of carbon. When a fire burns down a home it is tragic; when fire burns in a forest it is natural and essential to the integrity of the ecosystem, while also providing the most cost-effective means of reducing fuels over large areas. Though it may seem to laypersons that a post-fire landscape is a catastrophe, numerous studies tell us that even in the patches where fires burn most intensely, the resulting wildlife habitats are among the most biologically diverse in the West.[15] For these reasons, we urge you to reject misplaced logging proposals that will damage

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our environment, hinder climate mitigation goals and will fail to protect communities from wildfire.

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