

Data Submitted (UTC 11): 9/4/2020 6:00:00 AM

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Last name: Wuerthner

Organization:

Title:

Comments: I am objecting to the wilderness recommendations, fire management, wildlife, and livestock management. I previously submitted comments on the Draft EIS.

Dear Supervisor Erickson:

As background, at various times I have lived in a number of communities that are adjacent to the CGNF including Cooke City, Gardiner, Livingston and Bozeman and I've been exploring the CGNF for more than 45 years

I am an ecologist. I have degrees in wildlife biology/zoology, botany, science communication and started, but did not finish a Ph.D. focused fire ecology.

I have also worked as a hunting guide on the Custer Gallatin NF, backcountry ranger for the National Park Service in the Gates of the Arctic NP (AK) as river ranger on several W and S rivers in Alaska (Fortymile and Gulkanna), as a wilderness guide in Alaska, and for many years I held a commercial guiding license to Yellowstone NP.

I also worked for the Challis NF (Recreation) and Nez Perce NF (timber) and as a biologist/botanist for the BLM in Idaho.

For 12 years I worked as Ecological Projects Director for Tompkins Conservation/ Foundation for Deep Ecology, among other things producing books, helping to create national parks in Patagonia, and researching environmental issues.

I also taught field ecology classes for UC Santa Barbara, San Francisco State University, Prescott College, and Environmental Writing at the U of Vermont. I also taught for public school including Earth Science, American History, and Creative writing.

In 2002 I completed a two-year study of the Greater Yellowstone Ecosystem (Noss et al. 2002) which reviewed the biological hot spots in the ecosystem.

I have published 38 books including one on Montana wilderness areas, three on Yellowstone Park and two on fire ecology, among other titles.

This background and on the ground knowledge of the CGNF has given me a broad overview of wilderness, wildlife, and wildfire issues.

The following are my reactions and objection to the Custer Gallatin NF plan.

## WILDLIFE:

**Bison:** Bison should be a Species of Conservation Concern. The bison in Yellowstone are genetically unique and have been influenced primarily by natural processes (most bison herds are managed like livestock). Bison should be encouraged to colonize public lands on the forest. In particular, the areas north of Gardiner, the Taylors Fork, and drainages going into the Yellowstone from the AB Wilderness like Slough Creek, Hellroaring, and others should be a priority recolonization areas for bison.

Bison relocations to the Pryor Mountains could also be considered.

**Bighorn Sheep:** This species should be listed as a Species of Conservation Concern. Bighorn populations have been discriminated by disease, overhunting and habitat losses. At one time there were an estimated 2 million bighorns across the West. Every action to preserve the existing herds on the forest should be a priority and opportunities to expand herds should be regularly reviewed. This includes eliminating any domestic sheep grazing near existing bighorn populations.

**Bison:** This species should be listed as a Species of Conservation Concern. The Desired Condition for Alt D. is that bison are present year-round with sufficient numbers and adequate distribution to provide a self-sustaining population on, and adjacent to, the Custer-Gallatin National Forest. Currently this is not the case; it will take additional time for the west-side population to naturally move to populate a broader landscape. Documentation justifying the absence of SCC recommendation should be provided. The guideline for Alternative D: "[...]to facilitate bison expansion into unoccupied, suitable habitat, management actions should not impede bison movement[...]" is especially noted.

**Grizzly Bear:** This currently threatened species is recognized for a long-term management goal of achieving successful dispersal between ecosystems, and ultimately increasing the genetic diversity and long-term health of grizzly bears inhabiting the CG National Forest. The NW boundary of the Grizzly Bear Recovery Area (of the GYA) incorporates a portion of the CGNF

If this species be removed from the threatened list, it should be determine a Species of Conservation Concern. The Grizzly Bear Recovery Area incorporates a portion the Hyalite Porcupine Buffalo Horn Wilderness Study Area (HPBH WSA); thus, to not recommend wilderness for this area, risks further conflicts with this threatened species. The recent meeting of the Interagency Grizzly Bear Committee emphasized reducing conflicts; yet the Gallatin Forest Partnership Proposal which is contained in Alternative C removes this very area from the Wilderness protection.

The CGNFPlan does invoke Amendment 19 as a basis for monitoring road densities within the PCA, specifically areas impacted by >1 mile/mile<sup>2</sup> and >2 miles/mile<sup>2</sup> of roads, but without offering any authoritative guidance or prescriptive response for when Amendment 19 standards are exceeded. Aside from lacking any substantive guidance, the Plan's disregard for impacts attributable to road densities in excess of 2 or even 1 miles/mile<sup>2</sup> ignores a substantial body of research showing that human impacts on grizzly bears increase exponentially with increases in road densities. This correlation between increasing road densities and increasing harm to bears is not captured in a simple buffering of roads that assumes impacts on bears within a fixed buffer are equal regardless of larger-scale juxtapose with other roads

There is an abundance of evidence that increasing recreation use can displace bears. Trail corridors are similar to roads, putting bears and humans in contact. Increasing recreation use in prime bear habitat (like the Porcupine Buffalohorn) is counter productive. In particular, faster moving humans (i.e. mountain bikes, dirt bikes, etc.) pose a higher risk in part because they can surprise bears, and also due to the distances they can travel in a day, increasing the likelihood of encounters between humans and bears.

A complication is the growing bear mortality attributed to hunters. Many of these do not occur next to roads, but rather in the backcountry. The CGNF needs to address these conflicts which would include mandatory pepper spray, removal of carcasses, and failure to maintain a clean camp. Backcountry food storage as is found in the Teton Wilderness of Wyoming could be provided at major hunting camp locations and campsites.

Traffic on roads like Highway 89, 91, and others can be an effective barrier to the movement of bears. Creation of wildlife crossings on these roads should be a priority.

Grazing allotments pose a problem for bears. Mortality associated with livestock can be very high (see Upper Green River Allotment in Wyoming). To the degree possible the FS should close all vacant allotments in grizzly bear habitat permanently. Opportunities to close grazing allotments through permit buyout should be explored.

#### LIVESTOCK MANAGEMENT:

The plan should have the option for permanent livestock permit retirement on a willing seller basis.

Degradation of riparian areas should be inexcusable. This includes pollution of water by livestock. Keeping cattle and sheep out of waterways and riparian areas should be a number one priority of the Forest Service.

I applaud the Final Plan's decision to not increase the number or acreage of domestic livestock grazing allotments above 1998 levels inside the recovery zone/primary conservation area, we believe that a confluence of other factors makes it necessary for this decision to be extended beyond the recovery zone/primary conservation area. Grizzly bear populations are counted in the demographic monitoring area, but the standards set by the Final Plan are focused on the recovery zone/primary conservation area, which makes up less than half of the grizzly habitat in the DMA. As noted grizzly bear researcher David Mattson points out in his objection, 79 percent of the grazing allotments in the grizzly bear demographic monitoring area are outside of the recovery zone/primary conservation area.

The CGNF should consider phasing out grazing allotments both inside and outside of the recovery zone/primary conservation area in order to help protect grizzly bears that are facing increasing threats from climate change and growing human populations.

#### EXPLODING RECREATION AND POPULATION GROWTH

The Land management Plan does not adequately assess or consider the exploding impacts of recreation and population pressure, combined with a rapidly shifting demographic looking to get away from large population center.

Recreational use of the Custer Gallatin NF has exploded this year. Thus trails and trailheads and campgrounds have been packed with people. Dispersed camping is at epidemic levels.

Here's one from closer to home, more of a critique but with some salient observations about the state of our trailheads. <https://mountainjournal.org/what-does-montana-represent-in-the-covid-world>

#### BACKCOUNTRY AREAS

I find the designation of [ldquo]backcountry areas[rdquo] to be problematic. First, there is no [ldquo]backcountry[rdquo] system, nor is there any consistent regulations that will guide backcountry management. Nearly all of the areas recommended in the forest plan for backcountry are suitable for wilderness. I believe the FS would be better off managing these areas as [ldquo]wilderness[rdquo].

## WILDERNESS AREAS

A recent study conducted by the University of Montana in 2020 found a majority of Montanans (52%) think that wilderness study areas should continue to be protected as they are, while an additional 23% feel protections should be increased for WSAs. All total, that's 75% of Montanans who value the existing protections afforded by WSAs.

Support is even stronger for the Gallatin range, where 77% of Montanans support increasing protections. (2020 Voter Survey on Public Land).

The CGNF does not reflect these public values for greater wildlands protection.

The CGNF has a unique position. As the northern portion of the Greater Yellowstone, there is a special obligation to manage these lands for their wildlands values. The best way to protect these areas is by wilderness designation.

In general, the FS fails to evaluate the ecological values of roadless lands that could be managed as wilderness. Wilderness is the Gold Standard for Conservation. Most of the rationales given for exclusion of areas from wilderness is due to existing recreation uses like mountain biking, snowmobiling, etc. while underplaying or ignoring the ecological values.

For instance, the Deer Creeks support a substantial pure Yellowstone cutthroat trout population that gives this area biological significance. That alone would be reason enough to designate this area as an addition to the AB Wilderness.

I am glad that the CGNF recognized that the Crazies and Gallatin Ranges deserved wilderness, but there is far too little recommended.

## GALLATIN RANGE

There are approximately 270,000 acres in the Gallatin Range that could be and should be managed as wilderness. As the only large, unprotected link in the northern Greater Yellowstone Ecosystem, protecting the Gallatin Range should be the number one priority. The CGNF appears to use the "purity" argument to disqualify many areas from its recommendations saying there is noise from highway traffic, a municipal watershed, or a few cabins or other structures that do not conform to the Wilderness Act. This argument is used to exclude tens of thousands of acres from its recommendations.

The Gallatin Range higher elevations feature glacially carved cirques, and grassy ridges. There are a lot of open grassy valleys and slopes which are exceptional wildlife habitat, particularly the Porcupine-Buffalo Horn Drainage where thousands of elk winter. Three drainages—Mol Heron, Tom Miner, and Rock Creek-- that flow from the Gallatin Range are considered essential Yellowstone Cutthroat trout habitat by Montana Fish Wildlife and Parks. The Gallatin Range also supports grizzly bear, wolf, mountain goat, wolverine, bighorn sheep, moose, mule deer, and potentially wild bison.

The largest petrified forest in the world is found at the headwaters of Porcupine, Rock, Tom Miner, and Buffalo Horn drainages. Commercial and amateur collectors have ravaged this world-class complex. Wilderness designation would help to halt this tragic damage.

Since 1977 approximately 155,000 acres have been protected as the Hyalite, Porcupine and Buffalo Horn Wilderness Study Area. The Buffalo Horn drainage is the most important wildlife habitat in the entire Gallatin Range— if any area should be wilderness it is this drainage. Also, many roadless drainages in the Gallatin Range were left out of wilderness recommendations including the upper portions of Cottonwood, Sourdough, Trail Creek and others.

In particular, the entire Hyalite Porcupine Buffalohorn drainages should be designated as wilderness, in part, because the 1977 legislation that directed the FS to do so “until such time as Congress determines otherwise.” The FS has not followed the directive of Congress. For instance, mountain bikes regularly ride trails in this area, but in 1977 there were no mountain bikes. How can this be “legal”? Mountain bikes did not even exist then, and certainly are not allowed in wilderness. So by allowing mountain bikes the FS is intentionally helping to create a constituency that will be opposed to wilderness designation.

I do not see how the CGNF can assign Backcountry to a significant portion of the HPBH WSA designated by Congress which directs the FS to maintain wilderness values and potential for inclusion in the wilderness system.

Backcountry designation leaves the Porcupine and Buffalo Horn areas open to increasing mechanized use with no enforceable sideboards to protect the integrity of these special valleys.

THE LAND MANAGEMENT PLAN CANNOT ALLOW INCREASING LEVELS OF MECHANIZED USE IN THE WSA. DOING SO VIOLATES THE LAW. Only Congress can change the status of the WSA to allow more mechanized use than was present in 1977.

In addition, the Land Management Plan failed to add the spectacular Hidden Lakes Area as a Recommended Wilderness and in fact gave it no designation at all.

#### Resolution

The entire Hyalite Porcupine Buffalo Horn WSA, at a minimum, should be a Recommended Wilderness Area. Ideally, the entire 230,000 roadless area in the Gallatin Range should be a Recommended Wilderness Area.

In addition, the FS should include South Cottonwood, Mount Blackmore, Chestnut Mountain, West Pine, and Yankee Jim Lake (roadless) in the Gallatin Wilderness.

#### CRAZY MOUNTAINS

Regards the Crazy Mountains, the reason given for not advocating for more wilderness here is due to the checkerboard ownership. However, in several wilderness bills in the 1980s and 1990s, significantly larger wilderness areas were proposed for the Crazies— despite the inholdings. I believe the FS should manage the entire area 90,000 plus acres as wilderness to maintain the option of future wilderness designation.

Resolving access and ownership issues in the Crazies should be a priority. Ideally private inholdings could be purchased as was done in the Gallatin Range in the 1990s.

#### MADISON RANGE

A significant portion of the Madison Range is protected within the Lee Metcalf Wilderness. However, 111,000 acres in the Cabin Creek Recreation and Wildlife Management Area lies between the Taylor Fork and Hebgen

Lake and is sandwiched between the Monument Peak area and the main crest of the Madison Range. This exceptional wildlands is without wilderness protection. It is critical grizzly bear habitat, and also could support wild bison herds. Nearly 50 miles of stream support West Slope Cutthroat trout.

The FS does not recommend wilderness here because of on-going biking and ORV/snowmobile use, but that is no excuse. The FS regularly closes roads and trails to motorized access and should consider doing so in this area. The area easily qualifies for wilderness based on its essential character and should be added on to the Lee Metcalf Wilderness.

Another significant 43,000 acre roadless area lies between Big Sky and the Taylor Fork. This area of rolling hills, open meadows, and scenic view is also critical wildlife habitat. It includes Buck Ridge. The area should be added to the Lee Metcalf Wilderness. Grizzly bear are utilizing this area.

A third 17,000 acre roadless portion of the Madison Range north of the Spanish Peaks that includes the upper Cherry Creek and Spanish Creek drainages would connect the Madison Canyon and Spanish Peaks as a continuous unit. Known as Cowboy's Heaven, it is part of a 26,000 acre roadless area that is split between the CGNF and BDNF;. It should be added to the existing Spanish Peak unit of the Lee Metcalf Wilderness. It contains some of the best lower elevation big game habitat, and is used by several thousand elk.

#### LIONHEAD

The Lionhead Area was previously managed as wilderness in past forest plans. There is no reason not to do so now. The area is an important linkage between the areas west of Targhee and Reynolds Pass. Increasingly there are denning grizzlies located in this area. Some 43,000 acres in the Lionhead should be managed as wilderness.

#### AB WILDERNESS ADDITIONS

There are a number of important potential additions to the AB Wilderness, including Dome Mountain-Chico Peak, Paradise Face, Tie Creek, West Rock Creek, Line Creek Plateau, and the Upper and Lower Deer Creeks to name a few of these areas. All would add immensely to the ultimate protection of the AB Wilderness especially its wildlife which by necessity is not depended on the high alpine areas, but requires the lower slopes and lower elevation areas that have been left out of the wilderness.

In particular, the Dome Mountain to Chico is a critical elk migration corridor and heavily used by wolves and grizzlies. Wilderness designation would significantly improve the overall protection for this linkage.

Along the north face of the AB Wilderness are any number of roadless lands that should be added to the list of recommended wildernesses, including the 129,000 Deer Creek drainage lying between the Boulder River and Stillwater River, and includes lands surrounding the East Boulder, Lower Deer Creek, Upper Deer Creek and Bridger Creek. This area, which is mostly foothill terrain, is largely missing from the AB Wilderness. It is important elk and deer habitat, not to mention genetically pure Yellowstone cutthroat trout in the upper Deer Creek drainages. At least half of this area could be managed reasonably well as wilderness.

#### BRIDGER RANGE

The dramatic face of the Bridger Range walls in the eastern side of the Gallatin Valley. The Bridger Bowl Ski area is located on its eastern flank. The Bridger Range is an important corridor between the Greater Yellowstone Ecosystem and Central Montana. The range supports important winter deer habitat at lower elevations and its streams hold genetically pure West Slope Cutthroat trout and Yellowstone Cutthroat trout. Approximately 45,000

acres of the Bridger Range is roadless and surprisingly the FS did not recommend a single acre for wilderness. The area around Blacktail Peak in the northern Bridger Range has about a third of this roadless component and should be recommended for wilderness.

The idea that close proximity to heavy recreation areas like Bridger Bowl is not a reason to discredit or demean potential wilderness designation for this area.

## PRYOR MOUNTAINS

The Pryor Mountains are an isolated island range ecologically, geologically, and climactically very different from the nearby Beartooth Mountains and all other wildlands in western Montana. There are no similar landscapes in the National Wilderness Preservation System (NWPS) or proposed for inclusion. This alone is sufficient reason that the Pryors need to be preserved as Wilderness to enrich the NWPS.

The Pryor Mountains have four roadless areas that should all be designated as wilderness. The Pryors are unique in Montana for having rare plants and the northern distribution range for a number of other species like the white-tailed prairie dog and Utah juniper.

Forest Service Wilderness in the Pryors

I supports the following four Wilderness Areas:

(In addition to the BLM and BCNRA proposed Wilderness Areas)

Lost Water / Crooked Creek Canyon Recommended Wilderness Area (13,000 + 1,000 acres):

The 1986 Custer National Forest Management Plan designated a minimalist 6,800 acre Lost Water Canyon Recommended Wilderness Area (RWA). But there seems no reason for the arbitrary boundaries chosen for this tiny RWA. We propose expanding this to 13,000 acres. ALL of this area passed the U.S. house in Pat Williams's Wilderness bill in 1994. In addition to the spectacular Lost Water and Crooked Creek Canyons (some of the most wild and scenic features of the Pryor Mountains), this would include Cave Ridge, Island Ridge and Commissary Ridge and the intervening canyons. Both Crooked Creek and Lost Water Creeks have been found to be eligible for Wild and Scenic designation.

On its southern boundary this RWA would be contiguous with the BLM Burnt Timber Canyon Wilderness Study Area (WSA). The eastern boundary of this RWA is the Burnt Timber Ridge 4WD trail. Just east of this 4WD trail is another 1,000 acres of [Idquo]orphaned[rdquo] FS land embedded within the BLM Pryor Mountain WSA. It should also be designated RWA by the FS. Then the 4WD trail would be a narrow corridor between two proposed Wildernesses.

Bear Canyon Recommended Wilderness Area (10,300 acres):

The Bear Canyon road-free area encompasses most of the Bear Creek watershed on the south facing slope of Big Pryor and Red Pryor Mountains. Several forks of rugged limestone-cliffed Bear Canyon are included. Partly due to the elevation, climbing from just over 5,000 feet to 8,600 feet in about 7 miles, this small area exhibits a wide range of ecological habitats ranging from arid semi-desert, with rare riparian areas in the canyons, to dense Douglas fir forest, and the sub-alpine plateau near the top of Big Pryor Mountain.

The near complete watershed within this Bear Canyon road-free area is particularly significant.

The Bear Canyon RWA would include much of the Montana Audubon IPA. An interesting recent study shows that Sage Grouse annually migrate up through the Bear Canyon watershed from nesting areas just to the south to summer range at the high elevations of the Bear Canyon and Big Pryor RWAs. It is reported that these migrations happen before the chicks are old enough to fly.

Bear Creek and its spectacular canyon should be designated as a Wild and Scenic River. The FS has proposed finding a short section eligible for Wild and Scenic designation, but the whole thing should be.

If the FS designates the Bear Canyon RWA, then the BLM can and should designate another 1,800 acres of contiguous wildland on the south as Land with Wilderness Character. That will make a 12,100 acre [Idquo]Wilderness in Waiting[rdquo] for Congress to designate as the Bear Canyon Wilderness.

Big Pryor Recommended Wilderness Area (12,800 acres):

The crown jewel of the proposed Big Pryor RWA is the expansive, sub-alpine Big Pryor Plateau. It is several thousand acres of gently rolling [Idquo]prairie in the sky[rdquo] [ndash] but with very different plant communities than the [Idquo]real[rdquo] prairie some 4,000 feet below. Rising from 8,400 feet to top of the Pryors at 8,786 feet elevation this plateau seems another world from the arid desert to the south. Steep north-facing slopes of dense Douglas fir help isolate the Big Pryor Plateau from the Sage Creek area to the north.

In July the plateau is ablaze with wildflowers of innumerable colors. Including: phlox, minuartia, common yarrow, nodding onion, pasque flowers, wyoming kittentails, shooting stars, Howard[rsquo]s alpine forget-me-not, mat buckwheat and sword townsendia and many more.

From high points on the plateau there are expansive views of the Beartooths to the west, Wyoming and the Wind River Mountains to the south, East Pryor Mountain and the Bighorn Mountains to the east, and the Crow part of the Pryors and the Montana prairie to the north.



Sage grouse from nesting areas in the desert to the south are sometimes seen on the plateau. Deer and bear are often seen on Big Pryor. The plateau is good elk habitat, but they have rarely been reported. Wilderness designation would be a step to restoration of resident elk.

#### Punch Bowl Recommended Wilderness Area (8,700 acres):

The Punch Bowl area is unlike any other area in the Pryors. It is north of and below Dryhead Overlook, the high northeast [ldquo]corner[rdquo] of East Pryor Mountain. This incredibly wild country includes both Punch Bowl Creek and Dryhead Creek Canyons. This area in the shadow of East Pryor Mountain has a very different climate (sun, wind, temperature and precipitation) than the southern and western slopes of the Pryors. It has the highest precipitation in the Pryors. The plant diversity here is even greater than elsewhere in the Pryors with many species that grow nowhere else in the Pryors. There are beautiful aspen stands, with an understory of native shrubs and forbs, bordering sagebrush meadows with a backdrop of the limestone cliffs of the north face of East Pryor Mountain. This is historic elk habitat. In recent years elk have increasingly been seen in the area. Designation of the Punch Bowl RWA would be a step toward increasing elk security in the Pryors.

#### FIRE AND FUEL MANAGEMENT:

I could see little differences in the draft and final plans regards wildfire and fuel management.

This section of the plan demonstrates the FS bias against wildfire. There are some inconsistent discussion. For instance, the plan says [ldquo]The absence of fire in many areas of the Custer Gallatin over the last century, mainly due to fire suppression, has led to a fire deficit. This fire exclusion has altered natural fire regimes and has been detrimental to native vegetation, fauna and ecosystem processes.[rdquo]

[ldquo]Another factor in many areas of the Custer Gallatin is the risk of uncharacteristic high severity wildfire as a result of high fuel loads which has resulted from various causes, such as fire suppression and the recent outbreak of bark beetles.[rdquo]

The CGNF again mischaracterizes the fire regimes of the region by implying that large high severity fires are unnatural. [ldquo]Threats currently exist from uncharacteristic large, high severity fire[hellip][rdquo]

There are many similar comments throughout the document which misrepresents the [ldquo]normal[rdquo] fire regime for most of the forest. All of the higher elevation forests including lodgepole, spruce, fir, whitebark pine, and aspen tend to be characterized by high severity fires at long fire rotations.

Such statements ignore the fact that most of the forest consists of higher elevation forests that naturally have long intervals between wildfire. For instance, 100-400 years for lodgepole pine. As a consequence, [ldquo]fire suppression[rdquo] has not influenced these forests at all. And when these forests burn, they tend to burn at high severity.

In addition, there is an abundance of papers that find that bark beetles do not increase fire hazard, indeed, there is even evidence that bark beetles infected areas are less likely to burn. Here[rsquo]s one of several: Do Bark Beetle Outbreaks Increase Wildfire Risks in the Central U.S. Rocky Mountains? Implications from Recent Research Scott H. Black, Dominik Kulakowski, Barry R. Noon, Dominick A. DellaSala. Recent mountain pine

beetle outbreaks, wildfire severity, and postfire tree regeneration in the US Northern Rockies Brian J. Harvey, Daniel C. Donato, and Monica G. Turner and EFFECT OF PRIOR DISTURBANCES ON THE EXTENT AND SEVERITY OF WILDFIRE IN COLORADO SUBALPINE FORESTS Dominik Kulakowski Thomas T. Veblen.

Furthermore, it is questionable that fire suppression was as successful as suggested. The period between 1940-1980 it was moister and cooler than now. Under moister and cooler conditions, there are fewer ignitions and the few that do occur go out without burning a lot of terrain. The CGNF more or less acknowledge the effect of climate on wildfire on page 159.

Research in Yellowstone Park between 1972 and 1987 approximately 235 fires occurred in Yellowstone. None were suppressed, and yet 222 of them burned less than 5 acres. And all 235 fires went out without suppression.

What this suggests is that most fires burn almost nothing. Even if fire suppression were effective, the majority of all acreage burns under extreme fire weather conditions (think of the 1988 fires) where tens of thousands of acres will burn in a short time. In-between these weather driven events, there are few fires and little acreage burned.

The clear majority of all acreage burned annually is the result of a few wildfires. These large high-severity wildfires burn under [ldquo]extreme[rdquo] fire weather conditions of high temperatures, low humidity, drought, and high winds. Without those ingredients, fires remain small and easily controlled.

For instance, a total of 56,320 fires burned over 9 million acres in the Rocky Mountains between 1980-2003. 98% of these fires (55,220) burned less than 500 acres and accounted for 4% of the area burned. By contrast, Only, 2% of all fires accounted for 96% the acreage burned. And 0.1% (50) of blazes were responsible for half of the acres charred. (Baker 2009 Fire Ecology in Rocky Mountain Landscapes).

Thus, the wildfires thinning operations are seeking to modify are those burning under extreme fire weather conditions. These are fires which thinning fuel reductions are unlikely to significantly influence. More and more studies are coming to such conclusions.

Furthermore, the probability of a wildfire encountering a fuel reduction is very small, even if they did work as some suggest, making most fuel reductions essentially useless, but still leaving behind the negative impacts of logging on soils, watersheds, nutrients, carbon storage, wildlife habitat losses, and consequences like spread of weeds, sedimentation from roads into streams and so on.

Plus there is evidence that timber management (i.e. logging) can actually increase fire severity.

In addition, there is a growing question about the research methods for determining fire history. Most fire scar studies merely count the fires. But this tells you nothing about the geographical extent of the fire. As already pointed out most fires are small and are insignificant in terms of their influence on the landscape. To read a critique of fire scar methods see William Baker[rsquo]s work. (See Baker Fire Ecology in Rocky Mountain Ecosystems)

To give you a hypothetical example, one can have a 1000 acre study area. Based on fire scars one could document a fire someplace in that 1000 acres every year in a hundred-year period. Using the typical fire scar methods, that means the fire return interval is 1 year. However, if each fire burned only 1 acre then only 10% of the 1000 acres would be burned. The time or fire rotation to burn the acreage of the entire study area would be 1000 years.

[ldquo]Typical fire behavior in the ponderosa pine woodland and savanna landscapes on the east side of the Custer Gallatin includes low intensity, fast-spreading surface fires with occasional uncharacteristic large stand-

replacing fires.[rdquo] There are new studies including some on the Front Range of Colorado (see Velben), as well as elsewhere (Eastern Cascades[mdash]Hessburg, Baker, and others) where research suggests that high severity stand replacing fires are not outside of historic conditions.

Further on the plan suggests it want to reduce fire intensity and crown fires. Yet crown fires are the [ldquo]natural[rdquo] way that many of the forest and plant community types on the forest burn. This includes lodgepole pine, aspen, spruce, fir, and sagebrush ecosystems.

As the following reference suggests, climate change is likely to increase the conditions that favor more wildfire in the ecosystem. Continued warming could transform Greater Yellowstone fire regimes by mid-21st century <https://www.pnas.org/content/pnas/108/32/13165.full.pdf>

The FS claims that high severity fires that [ldquo]consumes much of the existing organic matter at the soil surface and in surface soil horizons. This creates hydrophobic surface soil conditions that limits the infiltration of water into the soil for an extended period.[rdquo] The FS goes on to say [ldquo]Prescribed burning, hazardous fuels treatments, and pre-commercial thinning are all designed reduce the likelihood of high severity burning due to wildfires while enhancing rather than damaging soil productivity.[rdquo]

I am head this assertion all the time that high severity blazes create hydrophobic conditions, but I am unaware of very few examples of this occurring except in chaparral ecosystems where the coatings sometimes do create water resistant layers. However, even in chaparral, this typically breaks down in a year.

Can the FS provide recent examples on the CGNF of this being a wide-spread problem on the forest?

Also as argued above the idea that hazardous fuel treatments and thinning reduce high severity fires is not supported by the science. High severity fires are the result of specific climate/weather conditions typically referred to as [ldquo]extreme fire weather.[rdquo] And many studies as well as many anecdotal examples dispute the idea that thinning forests will reduce these blazes. For instance, the ponderosa pine savanna along Bridger Creek burned in the Derby Fire even though the natural timber distribution is less dense than most [ldquo]thinned[rdquo] forests. This, as well as many other examples, including many clear cut and logged areas around Montana demonstrate that logging does not preclude large fires (go look at the Jocko Lakes Fire and the Rice Ridge Fires by Seeley Lake that burned through heavily logged landscapes, or even Mill Creek on the CGNF which burned despite the abundance of logged areas.

Of course, collateral damage that results from logging includes logging roads and sedimentation. Logging roads impact on the streams and aquatic ecosystems. Not to mention help to spread weeds.

#### CLIMATE/WEATHER, NOT FUELS, DRIVES LARGE WILDFIRES

One mistaken assumption that underlies thinning programs is that a reduction of fuels will result in a significant decrease in acreage burned, fire-fighting costs, and the amount of high severity fires (notwithstanding the fact that high-severity blazes and the dead snags and down wood they produce are necessary for healthy forest ecosystems).

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Thus, the wildfires thinning operations are seeking to modify are those burning under extreme fire weather conditions. These are fires which thinning fuel reductions are unlikely to significantly influence. More and more studies are coming to such conclusions.

The FS also is using out of date ideas on fire frequency. For instance, the Table 33 on page 160 suggests that wildfire burned in big sagebrush 0-35 years. That fire rotation is totally out of date. You need to read more recent sagebrush ecology material. Fire and Restoration of Sagebrush Ecosystems William L. Baker Wildlife Society Bulletin (1973-2006) Vol. 34, No. 1 (2006), pp. 177-185.

Similar mischaracterization of fire regimes in juniper occurs on page 162 using the old argument that juniper is [ldquo]invading[rdquo] due to fire suppression. Yet more recent studies (try googling and you might learn some new material) has found that juniper typically experiences stand replacement fires at 400-600 year intervals. What is characterized as [ldquo]invasion[rdquo] is likely a response to recovery after large fires or due to changing climate. Do Mechanical Vegetation Treatments of Pinyon-Juniper and Sagebrush Communities Work? A Review of the Literature Technical Report (PDF Available) [middot] February 2019[ensp]with[ensp]148 Reads DOI: 10.13140/RG.2.2.12538.13760

Furthermore, the probability of a wildfire encountering a fuel reduction is very small, even if they did work as some suggest, making most fuel reductions essentially useless, but still leaving behind the negative impacts of logging on soils, watersheds, nutrients, carbon storage, wildlife habitat losses, and consequences like spread of weeds, sedimentation from roads into streams and so on.

Plus there is evidence that timber management (i.e. logging) can actually increase fire severity.

HOW EFFECTIVE IS THINNING FORESTS AT REDUCING LARGE HIGH SEVERITY FIRES?

EFFECTS OF SALVAGE LOGGING ON FIRE

RISKS AFTER BARK BEETLE OUTBREAKS IN

Collins et al. 2012

Fuel Dynamics in Harvested and

Untreated Beetle-Killed Stands

Salvage logging increased the total

mass of woody surface fuels 2.7

times compared with untreated

stands following salvage logging

(17.6 versus 47.8 Mg ha<sup>-1</sup>).

Harvesting increased the mass of

fine (i.e., less than 7.6 cm in diameter)

and sound (coarse 7.6 cm in

diameter or greater) fuels 3.3- and

3.5-fold compared with untreated

stands, respectively.

Following the

loss of foliage in dead trees (i.e.,

gray-stage), a lack of canopy fuels

will result in similar fire behavior

in untreated and harvested areas.

Recently more than 200 preeminent scientists signed a letter to Congress finding that proposed solutions to wildfire like thinning forests are ineffective and short-lived. [https://www.forestlegacies.org/images/scientist-letters/scientist-letter-wildfire-signers-2018-08-27\\_1.pdf](https://www.forestlegacies.org/images/scientist-letters/scientist-letter-wildfire-signers-2018-08-27_1.pdf)

To quote from the scientists's letter: "Thinning is most often proposed to reduce fire risk and lower fire intensity. 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."

The letter goes on to say: "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.”]

And Michael Brune, ED of the Sierra Club, said in the NYT editorial and other papers:

For example, it is highly misleading to say that our forests are “overgrown” or overly dense. The truth is we currently have slightly more small trees, but fewer mature trees, in California’s forests, compared to a century ago. Overall, our forests are actually less dense now, since so many have been removed by intensive logging.

Evaluating spatiotemporal tradeoffs under alternative fuel management and suppression policies: measuring returns on investment.

Matthew P. Thompson,

U.S. Forest Service, Rocky Mountain Research Station Karin L. Riley, Co-PI

U.S. Forest Service, Rocky Mountain Research Station

Dan Loeffler, Analyst University of Montana, College of Forestry and Conservation

Jessica R. Haas, Analyst

Two key conclusions were: 1) to account for the inherent uncertainty of when and where wildfires will occur, evaluations of return on fuel treatment investments must use a spatial, risk-based framework; and 2) the relative rarity of large wildfire on any given point on the landscape and the commensurate low likelihood of any given area burning in any given year suggest a need for large-scale fuel treatments if they are to have an impact on risk.

Adapt to more wildfire in western North American forests as climate changes

Tania Schoennagel, Jennifer K. Balch,, Hannah Brenkert-Smith Philip E. Dennison, Brian J. Harvey, Meg A. Krawchuk, Nathan Mietkiewicz, Penelope Morgan, Max A. Moritz, Ray Rasker, Monica G. Turner, and Cathy Whitlock,

Limiting Reliance on Fuels Treatments to Alter Regional Fire

Trends. Managing forest fuels is often invoked in policy discussions as

a means of minimizing the growing threat of wildfire to ecosystems and

WUI communities across the West. However, the effectiveness of this approach at broad scales is limited. Mechanical fuels treatments on US federal lands over the last 15 y (2001[ndash]2015) totaled almost 7 million ha (Forests and Rangelands, <https://www.forestsandrangelands.gov/>), but the annual area burned has continued to set records. Regionally, the area treated has little relationship to trends in the area burned, which is influenced primarily by patterns of drought and warming (2, 3, 20). Forested areas considerably exceed the area treated, so it is relatively rare that treatments encounter wildfire (73). For example, in agreement with other analyses (74), 10% of the total number of US Forest Service forest fuels treatments completed 2004[ndash]2013 in the western United States subsequently burned in the 2005[ndash]2014 period (Fig. 6). Therefore, roughly 1% of US Forest Service forest treatments experience wildfire each year, on average. The effectiveness of forest treatments lasts about 10[ndash]20 y (75), suggesting that most treatments have little influence on wildfire. Implementing fuels treatments is challenging and costly (7, 13, 76, 77); funding for US Forest Service hazardous fuels treatments totaled \$3.2 billion over the 2006[ndash]2015 period

#### Wildfire Cast Management

[ldquo]Finally, by current standards, even our best fuel reduction do not appear to be adequate to provide much assistance in the control of high intensity wind-driven fires. If fuel treatment is the answer, it will need to be done on a level that is far more extensive (area) and intensive (fuel reduction than we are now accomplishing[mdash]even on our best fuel breaks.[rdquo]

Objectives and considerations for wildland fuel treatment in forested

ecosystems of the interior western United States. Reinhardt et al. 2008

[ldquo]It may not be necessary or effective to treat fuels in adjacent areas in order to suppress fires before they reach homes; rather, it is the treatment of the fuels immediately proximate to the residences, and the degree to which the residential structures themselves can ignite that determine if the residences are vulnerable.[rdquo]

Gedalof, Z., D. L. Peterson, and N. J. Mantua. 2005. Atmospheric, climatic, and ecological controls on v  
www.esajournals.org 21 November 2012 v Volume 3(11) v Article 103 HOLZ ET AL. extreme wildfire years in the  
northwestern United States. Ecological Applications 15:154[ndash]174

[ldquo]fuel treatments [hellip].cannot realistically be expected to eliminate large area burned in severe fire  
weather years. [ldquo]

Objectives and considerations for wildland fuel treatment in forested

ecosystems of the interior western United States Reinhardt et al. 2008

[ldquo]Extreme environmental conditions . .overwhelmed most fuel treatment effects. . . This included almost all  
treatment methods including prescribed burning and thinning. . . . Suppression efforts had little benefit from fuel  
modifications.[rdquo] [lsquo]

Everett, Richard L. Ph.D. 1995. [ldquo]Historical and current forest landscapes in eastern Oregon and  
Washington. Part II: Linking vegetation characteristics to potential fire behavior and related smoke  
production[rdquo] Gen. Tech. Rep. PNW-GTR-355. USDA Forest Service, Pacific Northwest Research Station.  
Huff, Mark H. Ph.D.; Ottmar, Roger D.; Alvarado, Ernesto Ph.D.

Vihnanek, Robert E.; Lehmkuhl, John F.; Hessburg, Paul F. Ph.D.

[ldquo]In general, rate of spread and flame length were positively correlated with the proportion of area logged  
(hereafter, area logged) for the sample watersheds. Correlation coefficients of area logged with rate of spread  
were > 0.57 for five of the six river basins (table 5). Rate of spread for the Pend Oreille and Wenatchee River  
basins was strongly associated (r=0.89) with area logged. Correlation of area logged with flame length were >  
0.42 for four of six river basins (table 5). The Deschutes and Methow River basins showed the strongest  
relations. All harvest techniques were associated with increasing rate of spread and flame length, but strength of  
the associations differed greatly among river basins and harvesting methods.[rdquo] (pg.9)

[ldquo]As a by-product of clearcutting, thinning, and other tree-removal activities, activity fuels create both short-  
and long-term fire hazards to ecosystems. The potential rate of spread and intensity of fires associated with  
recently cut logging residues is high, especially the first year or two as the material decays. High fire-behavior  
hazards associated with the residues can extend, however, for many years depending on the tree. Even though  
these hazards diminish, their influence on fire Page 3

<https://ir.library.oregonstate.edu/dspace/bitstream/1957/4706/1/PB96155213.pdf>

University of California; SNEP Science Team and Special Consultants



[ldquo]Sierra Nevada Ecosystem Project: Final Report to Congress

"Timber harvest, through its effects on forest structure, local microclimate, and fuels accumulation, has increased fire severity more than any other recent human activity."(pg.62)

The Congressional Research Service (CRS) :.

[ldquo] From a quantitative perspective, the CRS study indicates a very weak relationship between acres logged and the extent and severity of forest fires. [hellip] the data indicate that fewer acres burned in areas where logging activity was limited.[rdquo]

Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western United States?

Curtis M. Bradley, Chad T. Hanson, Dominick A. DellaSala Ecosphere 2016.

[ldquo]We investigated the relationship between protected status and fire severity applied to 1500 fires affecting 9.5 million hectares between 1984 and 2014 in pine (*Pinus ponderosa*, *Pinus jeffreyi*) and mixed-conifer forests of western United States[hellip] We found forests with higher levels of protection had lower severity values even though they are generally identified as having the highest overall levels of biomass and fuel.[rdquo]

Lyle Laverty, USDA Forest Service and Tim Hartzell U.S. Department of the Interior

[ldquo]A Report to the President in Response to the Wildfires of 2000[rdquo], September 8, 2000.

<http://www.fs.fed.us/emc/hfi/president.pdf>

[ldquo]Qualitative analysis by CRS supports the same conclusion. The CRS stated: "[T]imber harvesting removes the relatively large diameter wood that can be converted into wood products, but leaves behind the small material, especially twigs and needles. The concentration of these fine fuels on the forest floor increases the rate of spread of wildfires." Similarly, the National Research Council found that logging and clearcutting can cause rapid regeneration of shrubs and trees that can create highly flammable fuel conditions within a few years of cutting. Without adequate treatment of small woody material, logging may exacerbate fire risk rather than lower it.[rdquo]

Testimony of Norman L. Christensen, Jr., Ph.D., Before

the Senate Committee on Agriculture, Nutrition and Forestry

regarding H.R. 1904—the Healthy Forests Restoration Act of 2003

June 26, 2003

[http://www.paztcn.wr.usgs.gov/fire/hr\\_1904\\_testimony\\_christensen.pdf](http://www.paztcn.wr.usgs.gov/fire/hr_1904_testimony_christensen.pdf)

--[ldquo]Why isn[rsquo]t it true that [lsquo]the more wood removed the better[rsquo]? Why should [lsquo]big, old[rsquo] trees be retained? First, larger-diameter woody materials do not pose a significant threat for wildfire ignition or spread. It is largely the finer fuels (a few inches and less in diameter) that carry fire. More important, large, old trees actually provide protection from fire spread because they are resistant to fire and their shade maintains favorable moisture conditions in the understory fuels. Too much thinning of the forest canopy can produce more rapid drying of such fuels and, thereby, more frequent and severe wildfire risk. Furthermore, big, old trees provide critical habitat and maintain key ecosystem functions.[rdquo]

#### Fuel Treatment Effectiveness in the United States

Mark A. Cochrane et al.

[ldquo]The net effect of all treatments for the 56 wildfires with statistically significant changes in treatment-related fire extents averaged a 7% reduction in burned area.... In wildfires that had significantly reduced burned area, the average decrease in size was 25%, while wildfires that were significantly increased expanded by an average of 28%.[rdquo]

FIRE WEATHER . . . A Guide For Application Of Meteorological Information To Forest Fire Control Operations,

[ldquo]dense timber stands shades the ground and the forest fuels from elevated temperatures from solar radiation. The forest canopy radiates out the heat accumulated from solar radiation. The forest canopy provides moisture by transpiration through the leaves to the air and forest fuels, which decreases the possibility of forest fires. Transpiration from an area of dense vegetation can contribute up to eight times as much moisture to the atmosphere as can an equal area of bare ground. The forest canopy slows down wind movement and fire progress, due to its large friction area. A forest with a dense understory is an effective barrier to down slope winds.[rdquo]

recently treated forests can experience a stand-replacing crown fire when wind speeds exceed 30 km h<sup>-1</sup> and when

Fire Probability, Fuel Treatment Effectiveness and Ecological Tradeoffs in Western U.S. Public Forests Jonathan J. Rhodes<sup>1</sup> and William L. Baker<sup>\*</sup>,

[ldquo]When the probability of fire occurring in a particular area is relatively low, the odds of a fuel treatment influencing the behaviour of a wildfire there, within the time frame that treatments are effective, is also low.[rdquo]

Beyond Fuel Treatment Effectiveness: Characterizing Interactions between Fire and Treatments in the US Kevin Barnett <sup>1,\*</sup>, Sean A. Parks <sup>2</sup>, Carol Miller <sup>2</sup> and Helen T. Naughton <sup>1</sup>

[ldquo]Myriad economic and operational constraints to fuel treatment implementation on federal lands in the United States make it unlikely that treatments alone can achieve forest restoration goals at landscape scales [16] [hellip]. suppressing wildland fire within a matrix of previously treated areas, especially during moderate weather conditions, forgoes a low-risk opportunity to capture the fuel treatment benefits provided and maintained by wildland fire. [ldquo]

Forest fuel reduction alters fire severity and long-term carbon storage. in three Pacific Northwest ecosystems STEPHEN R. MITCHELL, MARK E. HARMON, AND KAR, E. B. O'CONNELL Department of Forest Science, Oregon State University. Corvallis, Oregon 97331 USA

[ldquo]Wildfire occurrence in a given area is uncertain and may never interact with treated stands with reduced fire hazard, ostensibly negating expected C benefits from fuel treatments. Burn probabilities in treated stands in southern Oregon are less than 2%, so the probability that a treated stand encounters wildfire and creates C benefits is low.[rdquo]

Wildfire and fuel treatment effects on forest carbon dynamics in the western United States (j) Cross Mark joseph C. Restaino a.\*. David L. Peterson b

Studies at large spatial and temporal scales suggest that there is a low likelihood of high-severity wildfire events interacting with treated forests negating any expected C benefit from fuels reduction.

Objectives and considerations for wildland fuel treatment in forested

ecosystems of the interior western United States Reinhardt et al. 2008

[ldquo]The majority of acreage burned by wildfire in the US occurs in a very few wildfires under extreme conditions (Strauss et al., 1989; Brookings Institution, 2005). Under these extreme conditions suppression efforts are largely ineffective.[rdquo]

[ldquo]Wildland fuel reduction may be inefficient and ineffective for reducing home losses, for extensive wildland fuel reduction on public lands does not effectively reduce home ignitability on private lands.[rdquo] Jack Cohen  
Missoula Fire Lab Specialist

Objectives and considerations for wildland fuel treatment in forested

ecosystems of the interior western United States Reinhardt et al. 2008

[ldquo][hellip]it is the treatment of the fuels immediately proximate to the residences, and the degree to which the residential structures themselves can ignite that determine if the residences are vulnerable.[rdquo]

## FIRE SUPPRESSION OR CLIMATE?

We hear all the time that [ldquo]fire suppression[rdquo] has created abnormal fuel loads. However, climate plays a large role in fire ignitions and fire spread. During the period when fire suppression was [ldquo]effective[rdquo] the climate was not conducive to fire spread.

If you don[rsquo]t have the right conditions for large fires[mdash]namely extended drought, high temperatures, low humidity, and high winds--you will not get large fires. So climate/weather is the driver of large fires that burn significant acreage.

Furthermore, cool, moist weather contributes to higher seedling establishment, hence denser forests. As a result, much of the so-called [ldquo]unhealthy forests[rdquo] are a natural and normal consequence of climate. As the climate, has dried, and drought become more extreme we are now experiencing larger wildfires[mdash]again another natural consequence of climate/weather[mdash]which is thinning the forest and reducing their density.

To suggest this requires [ldquo]restoration[rdquo] is to ignore ecological values and the contribution that dead trees from drought, wildfire, beetles, mistletoe, and other processes contributes to healthy forest ecosystems.

The following graph of the acreage burned annually and the influence of the Pacific Decadal Oscillation which influences the off-shore ocean currents, which in turn, influences climate over decades. The graph shows that between the 1940s and 1980s, was moister and cooler than prior decades or more recent decades. Your graph on page 250 demonstrates this trend. You need to make sure you are using a significant temporal and spatial scale. If one reviews fires over hundreds of years, than the recent uptick in fires is still not significant in terms of historic fires.

## DO DEAD TREES PROMOTE LARGER FIRES?

Fire severity unaffected by spruce beetle outbreak in spruce-fir Forests in southwestern Colorado

Robert A. Andrus,<sup>1,3</sup> Thomas T. Veblen,<sup>1</sup> Brian J. Harvey,<sup>2</sup> and Sarah J. Hart<sup>1</sup>

Contrary to the expectation that bark beetle infestation alters subsequent fire severity, correlation and multivariate generalized linear regression analysis revealed no influence of pre-fire spruce beetle severity on nearly all field or remotely sensed measurements of fire severity.

In comparison to severity of the pre-fire beetle outbreak, we found that topography, pre-outbreak basal area, and weather conditions exerted a stronger effect on fire severity.

Do mountain pine beetle outbreaks change the probability of active crown fire in lodgepole pine forests?

MARTIN SIMARD,<sup>1,3</sup> WILLIAM H. ROMME,<sup>2</sup> JACOB M. GRIFFIN,<sup>1</sup>

AND MONICA G. TURNER

Although it is often presumed that bark beetle outbreaks increase probability of active crown fire by producing high loads of surface and canopy dead fuels, empirical data are scarce and results are ambivalent[ellip]. Modeling results suggested that undisturbed, red, and gray-stage stands were unlikely to exhibit transition of surface fires to tree crowns (torching), and that the likelihood of sustaining an active crown fire (crowning) decreased from undisturbed to gray-stage stands.

Does wildfire likelihood increase following insect outbreaks in conifer forests?

Here[rsquo]s something we have used re CA:

There are three empirical studies that have investigated the effects of actual fires in areas with known pre-fire snag levels from recent drought and bark beetles, and which pertained to ponderosa pine and mixed-conifer forests.

The first, Bond et al. (2009)[1], was conducted in mixed-conifer and ponderosa/Jeffrey-pine forests of the San Bernardino National Forest in southern California, where fires occurred immediately after a large pulse of snag recruitment from drought/beetles. Bond et al. (2009) [ldquo]found no evidence that pre-fire tree mortality influenced fire severity.[rdquo]

The second, Hart et al. (2015)[2], investigated whether there is a relationship between snag levels from drought/beetles and the rate of fire spread in conifer forests across the western U.S., including ponderosa pine-

dominated forests of California. Hart et al. (2015) found the following:

[ldquo]Contrary to the expectation of increased wildfire activity in recently infested red-stage stands, we found no difference between observed area and expected area burned in red-stage or subsequent gray-stage stands during three peak years of wildfire activity, which account for 46% of area burned during the 2002[ndash]2013 period.[rdquo]

In other words, in both the initial stage of snag recruitment, when dead needles are still on the trees ([ldquo]red-stage[rdquo]), and in the later stage, years later, after needles and some snags have fallen ([ldquo]gray-stage[rdquo]), fire did not spread faster or burn more area in forests with high levels of snags from drought and native beetles. This was also true specifically in ponderosa pine forests, where there was no significant effect on fire spread of tree mortality from drought/beetles, and where fire spread was nearly identical regardless of snag levels (see Hart et al. 2015, Figure 3D).

The third study, Meigs et al. (2016)[3], was conducted in mostly mixed-conifer and ponderosa pine forests of the Pacific Northwest (south to the California border), and found the following:

[ldquo]In contrast to common assumptions of positive feedbacks, we find that insects generally reduce the severity of subsequent wildfires. Specific effects vary with insect type and timing, but both insects decrease the abundance of live vegetation susceptible to wildfire at multiple time lags. By dampening subsequent burn severity, native insects could buffer rather than exacerbate fire regime changes expected due to land use and climate change.[rdquo]

Specifically with regard to the mountain pine beetle, a native species associated with the current snag recruitment in California[rsquo]s ponderosa pine and mixed-conifer forests, Meigs et al. (2016) found that fire severity was the same between stands with high levels of snags from drought/beetles and unaffected forests, when fires occurred during or immediately after the pulse of snag recruitment, and then fire severity consistently declined in the stands with high snag levels in the following decades (see Meigs et al. 2016, Figure 3a).

GARRETT W. MEIGS,<sup>1,3</sup>JOHN L. CAMPBELL,<sup>1</sup> HAROLD S. J. ZALD,<sup>1</sup> JOHN D. BAILEY,<sup>1</sup>

DAVID C. SHAW,<sup>1</sup> AND ROBERT E. KENNEDY

Specifically, in most cases following MPB activity, fire likelihood is neither higher nor lower than in non-MPB-affected forests. In contrast, fire likelihood is lower following WSB activity across multiple ecoregions and time lags. In addition, insect-fire likelihood is not consistently associated with interannual fire extent, suggesting that other factors (e.g., climate) control the disproportionately large fire years accounting for regional fire dynamics. Thus, although both barkbeetles and defoliators alter fuels and associated fire potential, the windows of opportunity for increased or decreased fire likelihood are too narrow[mdash]or the phenomena themselves too rare[mdash]for a consistent signal to emerge across PNW conifer forests.

## Wildland fire as a self-regulating mechanism: the role of previous burns and weather in limiting fire progression

Sean A. Parks<sup>1\*,2</sup>, Lisa M. Holsinger<sup>1</sup>, Carol Miller<sup>1</sup>, Cara R. Nelson<sup>2</sup>

daily weather. Results indicate that wildland fire does limit subsequent fire spread in all four study areas, but this effect decays over time; wildland fire no longer limits subsequent fire spread 6-18 years after fire, depending on the study area. We also found that the ability of fire to regulate subsequent fire progression was substantially reduced under extreme compared to moderate weather conditions in all four study areas.

## Patterns of Fire Severity and Forest Conditions in the Western Klamath Mountains, California

Article in Conservation Biology 18(4):927 - 936 [midot] August 2004

We found (1) a trend of increasing fire size in recent decades; (2) that overall fire-severity proportions were 59% low, 29% moderate, and 12% high, which is comparable to both contemporary and historic fires in the region; (3) that multiaged, closed forests, the predominant vegetation, burned with much lower severity than did open forest and shrubby nonforest vegetation; (4) that considerably less high-severity fire occurred where fire had previously been absent since 1920 in closed forests compared to where the forests had burned since 1920 (7% vs. 16%); (5) that nonforest vegetation burned with greater severity where there was a history of fire since 1920 and in roaded areas; and (6) that tree plantations experienced twice as much severe fire as multi-aged forests. We concluded that fuel buildup in the absence of fire did not cause increased fire severity as hypothesized. Instead, fuel that is receptive to combustion may decrease in the long absence of fire in the closed forests of our study area, which will favor the fire regime that has maintained these forests. However, plantations are now found in one-third of the roaded landscape

Studies empirically investigating the question of time-since-fire and fire severity have consistently found that forest areas that have missed the largest number of fire return intervals in California's forests are burning predominantly at low/moderate-severity levels, and are not experiencing higher fire severity than areas that have missed fewer fire return intervals:

Miller JD, Skinner CN, Safford HD, Knapp EE, Ramirez CM. 2012a. Trends and causes of severity, size, and number of fires in northwestern California, USA. *Ecological Applications* 22, 184-203.

Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. DellaSala, and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the Klamath Mountains, northwestern California. *Conservation Biology* 18: 927-936.

Odion, D.C., and C.T. Hanson. 2006. Fire severity in conifer forests of the Sierra Nevada, California. *Ecosystems* 9: 1177-1189.

Odion, D.C., and C.T. Hanson. 2008. Fire severity in the Sierra Nevada revisited: conclusions robust to further analysis. *Ecosystems* 11: 12-15.

Odion, D. C., M. A. Moritz, and D. A. DellaSala. 2010. Alternative community states maintained by fire in the Klamath Mountains, USA. *Journal of Ecology*, doi: 10.1111/j.1365-2745.2009.01597.x.

van Wagtendonk, J.W., K.A. van Wagtendonk, and A.E. Thode. 2012. Factors associated with the severity of intersecting fires in Yosemite National Park, California, USA. *Fire Ecology* 8: 11-32.

Below is a more detailed discussion of these studies:

Six empirical studies have been conducted in California's forests to assess the longstanding forest management assumption that the most fire-suppressed forests (i.e., the forests that have missed the largest number of fire return intervals) burn [ldquo]almost exclusively high-severity[rdquo], as the 2004 Sierra Nevada Forest Plan Amendment Final EIS (Vol. 1, p. 124) presumed. These studies found that the most long-unburned (most fire-suppressed) forests burned mostly at low/moderate-severity, and did not have higher proportions of high-severity fire than less fire-suppressed forests. Forests that were not fire suppressed (those that had not missed fire cycles, i.e., Condition Class 1, or [ldquo]Fire Return Interval Departure[rdquo] class 1) generally had levels of high-severity fire similar to, or higher than, those in the most fire-suppressed forests.

1)

Figure 5 from Odion and Hanson (2006) (*Ecosystems*), based upon the three largest fires 1999-2005, which comprised most of the total acres of wildland fire in the Sierra Nevada during that time period (using fire severity data from Burned Area Emergency Rehabilitation (BAER) aerial overflight mapping), showing that the most long-



unburned, fire-suppressed forests (Condition [ldquo]Class 3+[rdquo], corresponding to areas that had missed more than 5 fire return intervals, and generally had not previously burned for about a century or more) experienced predominantly low/moderate-severity fire.

2)

Figure 1 from Odion and Hanson (2008) (Ecosystems) (using fire severity data from satellite imagery for the same three fires analyzed in Odion and Hanson 2006), showing that the most long-unburned, fire-suppressed forests (no fire for a century or more) burned mostly at low/moderate-severity, and had levels of high-severity fire similar to less fire-suppressed forests (in one case, even less than Condition Class 1).

3) van Wagtendonk et al. (2012) (Fire Ecology), analyzing 28 fires from 1973-2011 in Yosemite National Park, found the following:

[ldquo]The proportion burned in each fire severity class was not significantly associated with fire return interval departure class[hellip][L]ow severity made up the greatest proportion within all three de[not]parture classes, while high severity was the least in each departure class (Figure 4).[rdquo]

The most long-unburned, fire-suppressed forests[mdash]those that had missed 4 or more fire return intervals (in most cases, areas that had not burned since at least 1930)[mdash]had only about 10% high-severity fire (Fig. 4 of van Wagtendonk et al. 2012).

4) Odion et al. (2004) (Conservation Biology), conducted in a 98,814-hectare area burned in 1987 in the California Klamath region, found that the most fire-suppressed forests in this area (areas that had not burned since at least 1920) burned at significantly lower severity levels, likely due to a reduction in combustible native shrubs as forests mature and canopy cover increases:

[ldquo]The hypothesis that fire severity is greater where previous fire has been long absent was refuted by our study[hellip]The amount of high-severity fire in long-unburned closed forests was the lowest of any proportion of the landscape and differed from that in the landscape as a whole ( $Z = -2.62$ ,  $n = 66$ ,  $p = 0.004$ ).[rdquo]

5) Odion et al. (2010) (*Journal of Ecology*), empirically tested the hypothesis articulated in Odion et al. (2004)[mdash]i.e., that the reduction in fire severity with increasing time-since-fire was due to a reduction in combustible native shrubs as forests mature and canopy cover increases[mdash]and found the data to be consistent with this hypothesis.

6) Miller et al. (2012a) (*Ecological Applications*), analyzing all fires over 400 hectares 1987-2008 in the California Klamath region, found low proportions of high-severity fire (generally 5-13%) in long-unburned forests, and the proportion of high-severity fire effects in long-unburned forests was either the same as, or lower than, the high-severity fire proportion in more recently burned forests (see Table 3 of Miller et al. 2012a).

Recently, Steel et al. (2015) (*Ecosphere* 6: Article 8) reported modeling results that predicted a modest increase in fire severity with increasing time since fire (e.g., 12% high-severity fire at 10 years after fire up to 20% high-severity fire at 75 years post-fire). Thus, even the most long-unburned forests (>75 years since the last fire) were predicted to have mostly low/moderate-severity fire effects, contrary to the assumption upon which the 2004 Framework was based. Moreover, even the modest predicted increase in fire severity reported by Steel et al. (2015) must be viewed with great caution in light of the fact that it was based upon almost no data for mixed-conifer stands that had experienced fire less than 75 years previously (see Fig. 4 of Steel et al. 2015).

#### Studies and articles

[mdash]Does increased forest protection correspond to higher fire severity in frequent -fire forests of the western United States?

This study concludes that Western frequent-fire forests, including Southwestern forests, with the highest levels of protection from logging tend to burn least severely[mdash]logging defined to include the removal of small trees for fuel reduction.

[onlinelibrary.wiley.com/doi/10.1002/ecs2.1492/full](https://onlinelibrary.wiley.com/doi/10.1002/ecs2.1492/full);jsessionid=46823985F7C07820C90590F976BABF83.f01t[helli p]

[mdash]Evaluating spatiotemporal tradeoffs under alternative fuel management and suppression policies: measuring returns on investment. USFS,Thompson, Riley, Loeffler and Hass.

Modeling results in this study confirmed that fire-fuel treatment encounters are rare, such that median fire

suppression cost savings are zero. Sierra National Forest was used as study site to reflect a microcosm of many of the challenges surrounding contemporary fire and fuels management in the western U.S.

[https://www.firescience.gov/projects/13-1-03-12/project/13-1-03-12\\_final\\_report.pdf](https://www.firescience.gov/projects/13-1-03-12/project/13-1-03-12_final_report.pdf)

[mdash][ldquo]Fire Probability, Fuel Treatment Effectiveness and Ecological Tradeoffs in Western U.S. Public Forests" Rhodes and Baker

Study concludes there is a very low probability of a thinned site actually encountering a fire during the narrow window when tree density is lowest.

<https://benthamopen.com/contents/pdf/TOFSCIJ/TOFSCIJ-1-1.pdf>

[mdash][ldquo]Exploring Solutions to Reduce Risks of Catastrophic Wildfire and Improve Resilience of National Forests[rldquo] Testimony of Dr. Dominick DellaSala, Chief Scientist, Geos Institute, Before the U.S. House of Representatives Natural Resources Committee, Subcommittee on Oversight and Investigations, September 27, 2017

Dr. DellaSala discusses how proposals that call for increased logging and other forest fuel treatments and decreased environmental review in response to wildfires and insect outbreaks are not science driven, in many cases may make problems worse, and will not stem rising wildfire suppression costs.

[forestlegacies.org/images/projects/fire-testimony-housesubcommittee-20170927.pdf](http://forestlegacies.org/images/projects/fire-testimony-housesubcommittee-20170927.pdf)

[mdash]Are High-Severity Fires Burning at a Much Higher Rates Recently Than Historically in Dry-Forest Landscapes?

Dry forests at low elevations in temperate-zone mountains are commonly hypothesized to be at risk of exceptional rates of severe fire from climatic change and land-use. Increased fire could also be hypothesized as restorative of historical fire.

Are High-Severity Fires Burning at Much Higher Rates Recently than Historically in Dry-Forest Landsc[hellip]

Revisiting Fire History Studies[mdash]George Wuerthner

Describes methodological flaws that can occur in fire scar studies and contribute to a shorter fire rotation bias.

Revisiting Fire History Studies [ndash] New West

Preventing Disaster Home Ignitability in the Wildland-Urban Interface. USFS Jack D. Cohen

WUI fire loss problem can be defined as a home ignitability issue largely independent of wildland fuel management issues. The home and its surrounding 40 meters determine home ignitability.

[https://www.fs.fed.us/rm/pubs\\_other/rmrs\\_2000\\_cohen\\_j002.pdf](https://www.fs.fed.us/rm/pubs_other/rmrs_2000_cohen_j002.pdf)

[mdash]It Takes A Microclimate to Raise A Pinyon Tree

Researchers identify factors that determine the potential for pinon pine populations to recover after a drought including tree canopy cover providing shaded microsite conditions.

It Takes a Microclimate to Raise a Pinyon Tree - Science Newsline

Your Home Can Survive a Wildfire. USFS Jack Cohen

Great video for WUI residents on what it takes to really fire proof their homes and surroundings.

(2) Your Home Can Survive a Wildfire [ndash] YouTube

Harold S. J. Zald, Christopher J. Dunn. Severe fire weather and intensive forest management increase fire severity in a multi-ownership landscape. Ecological Applications, 2018; DOI: 10.1002/eap.1710

Wildfires show no respect for property lines, but a new analysis of the 2013 Douglas Complex fire in southwestern Oregon concludes that young plantation forests managed by industrial owners experienced higher severity fire than did nearby public forests

While daily weather was the most significant driver of fire severity, the researchers found that other factors such as ownership, forest age and topography were also critical. Intensively managed private forestlands tended to burn with greater severity than older state and federal forests.

However, even after accounting for the age of forested stands, industrial forest management resulted in higher fire severity for reasons that are not entirely clear. One explanation may be that industrial forests have much more homogenous forests, both horizontally and vertically, at spatial scales that influence fire behavior, Zald and Dunn wrote.

## CARBON STORAGE

In this section, the FS makes another inaccurate assertion. There is a considerable amount of new research that shows that thinning or logging trees emits far more CO<sub>2</sub> than even wildfires. So the idea that one must "manage" forests to sequester more carbon is inaccurate. The best way to sequester carbon is to do no logging. And even large fires release very little carbon compared to logging/thinning. The very important point is that while a logged or thinned area might sequester carbon, this will take many decades. Even a stand replacement fire saves a lot of carbon. The stems, roots, etc. typically do not burn and remain on site. Plus any charcoal produced is a very good long term storage mechanism for carbon. Finally after a fire new growth quickly captures even more carbon. So the cumulative effect of a fire is overall more carbon sequestration than any amount of thinning and/or logging.

Hudiburget al. 2013 and 2009; Law & Harmon 2011; Mitchell et al. 2009, Meigset al. 2009; Campbell et al. 2011)

Amount of biomass combusted in high-severity crown fire is greater than low-severity surface fire, but difference is small.

Low likelihood treated forests will be exposed to fire while effective (~20 yrs)

Thinning larger area to decrease probability of high-severity fire ensures decreased carbon stock and net carbon balance over treated area.

Law, B. & M.E. Harmon 2011. Forest sector carbon management, measurement and verification, and discussion of policy related to mitigation and adaptation of forests to climate change. Carbon Management 2011

"Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO<sub>2</sub> to the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment."

Chiono, Lindsay 2011. Balancing the Carbon Costs and Benefits of Fuels Management. Research Synthesis for Resource Managers. Joint Fire Science Program Knowledge

"The net carbon impact of fuel treatments is further complicated by the probabilistic nature of wildfire occurrence and the impermanence of post-treatment stand conditions [...] Treatment activities produce an immediate carbon emission while future wildfire emissions are uncertain [...]"

Carbon implications of current and future effects of drought, fire and management on Pacific Northwest forests q. B.E. Law. \*, R.H. Waring. Department of Forest Ecosystems & Society, Oregon State University, Corvallis, OR 97331, USA

B.E. Law [uArr], R.H. Waring

"By accounting for more of the benefits and costs involved in reducing the risk of crown fires, modifying

storage in long- and short-term products, and in substituting wood products for fossil fuel (biomass), we find that thinning existing forests to reduce crown-fire risk increases net carbon emissions to the atmosphere for many decades[hellip] [ldquo]

Mitchell, Harmon, O'Connell. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems. *Ecological Applications*. 19(3), 2009, pp. 643[ndash]

[ldquo]Reducing the fraction by which C is lost in a wildfire requires the removal of a much greater amount of C, since most of the C stored in forest biomass (stem wood, branches, coarse woody debris) remains unconsumed even by high-severity wildfires. For this reason, all of the fuel reduction treatments simulated for the west Cascades and Coast Range ecosystems as well as most of the treatments simulated for the east Cascades resulted in a reduced mean stand C storage. [ldquo]

John L Campbell, Mark E Harmon, and Stephen R Mitchell. 2011. Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions? *Front Ecol Environ* 2011

[ldquo]Results suggest that the protection of one unit of C from wildfire combustion comes at the cost of removing three units of C in fuel treatments.[rdquo]

Reinhardt, Elizabeth, and Lisa Holsinger 2010. Effects of fuel treatments on carbon-disturbance relationships in forests of the northern Rocky Mountains. *Forest Ecology and Management* 259 (2010) 1427[ndash]

[ldquo]Although wildfire emissions were reduced by fuel treatment, the fuel treatments themselves produced [carbon] emissions, and the untreated stands stored more carbon than the treated stands even after wildfire. [hellip] Our results show generally long recovery times.[rdquo]

Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions? John L Campbell<sup>1\*</sup>, Mark E Harmon<sup>1</sup>, and Stephen R Mitchell<sup>2</sup>

[ldquo]Our review reveals high C losses associated with fuel treatment, only modest differences in the combustive losses associated with high-severity fire and the low-severity fire that fuel treatment is meant to encourage, and a low likelihood that treated forests will be exposed to fire. Although fuel-reduction treatments may be necessary to restore historical functionality to fire suppressed ecosystems, we found little credible evidence that such efforts have the added benefit of increasing terrestrial C stocks.[rdquo]

## CARBON SEQUESTRATION AND CLIMATE CHANGE

Climate Change may well be the biggest influence on the CGNF in the future. Yet little attention has been paid to this by the CGNF. In particular, keeping carbon in the soil and in the forest is overlooked as a management strategy. It is not an exaggeration to suggest that carbon storage is the most valuable use of all trees on the forest, and protecting trees from logging is the best management strategy.

The FS shows its timber industry bias. While extolling the benefits of carbon sequestration into furniture or wooden homes, and regrowth after timber harvest, you are either unfamiliar or unaware that many new studies have found that logging releases far more emissions than a wildfire or other disturbance like bark beetles. Only about 15% of the carbon in the original wood log winds up stored in things like wooden homes. The rest is lost. Far less is lost in fires with the majority of all carbon remaining on site as snags, roots, charcoal, etc. which, along with regrowth after a fire, in combination keeps far more carbon sequestered.

Furthermore, using wood for energy is even worse. This results in the complete combustion and release of all carbon.

Though regrowth of trees after logging does store carbon, this requires decades to hundreds of years.

Many scientists suggest that we need to reduce carbon now, not in 100 years.

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Accounting for Climate-Related Risks In Federal Forest-Management Decision

The value of carbon storage in uncut forests [ldquo]Outweigh the additional timber-related benefits by more than 30-to-1. The value of this carbon storage is equal \$1.6 million per additional timber-related job.

Chiono, Lindsay 2011. Balancing the Carbon Costs and Benefits of Fuels Management. Research Synthesis for Resource Managers. Joint Fire Science Program Knowledge

[ldquo]The net carbon impact of fuel treatments is further complicated by the probabilistic nature of wildfire occurrence and the impermanence of post-treatment stand conditions [hellip] Treatment activities produce an immediate carbon emission while future wildfire emissions are uncertain [hellip] [ldquo]

Carbon implications of current and future effects of drought, fire and management on Pacific Northwest forestsq.  
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How State and private forest practices are subverting Oregon[rsquo]s climate agenda By John Talberth,<sup>2</sup>  
Dominick DellaSala,<sup>3</sup> and Erik Fernandez<sup>4</sup>

These emissions have averaged between 9.75 and 19.35 million metric tons carbon dioxide equivalent (MMT CO<sub>2</sub>-e) per year since 2000 on State and private forestlands in western Oregon. This represents between 16% and 32% of the 60.8 million MMT CO<sub>2</sub>- e [ldquo]in-boundary[rdquo] emissions estimated for the State by the



latest (2012) GHG inventory. These emissions are four to seven times higher than those associated with coal combustion by the Boardman coal-fired plant in 2012, are equivalent to 2-4 million new cars on the road, and make logging on State and private lands one of Oregon's biggest GHG polluters and a major impediment to Oregon's ambitious GHG reduction targets.

Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions? John L Campbell<sup>1\*</sup>, Mark E Harmon<sup>1</sup>, and Stephen R Mitchell<sup>2</sup>

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Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems  
STEPHEN R. MITCHELL, MARK E. HARMON, AND KAR, E. B. O'CONNELL  
Department of Forest Science,  
Oregon State University, Corvallis, Oregon 97331 USA

C costs associated with fuel treatments have can exceed the magnitude of C reduction in wildfire emissions, because a large percentage of biomass stored in forests (i.e., stem wood, branches, coarse woody debris) remains unconsumed, even in high-severity fires (Campbell et al., 2007; Mitchell et al., 2009)

Recent Oregon State University Economic study found that subsidies are necessary:

The use of residual forest biomass for rural development faces significant economic hurdles that make it unlikely to be a source of jobs in the near future, according to an analysis by economists at Oregon State University.

the future feasibility of such development may depend on public investments and the creation of new markets. And while the study considered the possibility of generating biomass from restoration or thinning operations on federal forestlands, it concluded that the additional supply does little to change the economic

feasibility of processing facilities. <http://www.cabi.org/ForestScience/news/25387>

Assessing Wildfire Risks and Management Effects on Forests of the West Coast Beverly E. Law Professor of  
Global Change Biology & Terrestrial Systems Science Oregon State University

Thinning reduces carbon stocks and sequestration, 100+ years to recoup carbon loss

No guarantees fire will occur during period of thinning effectiveness

High severity fires < 20% of burn area

Social risks: Most ignitions human-caused, near housing and roads -> loss of property

Economic risks: Thinning can be costly in carbon loss and \$\$ compared to fire suppression.