

FW: [External Email]Soda Baker Comments

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Fri 9/15/2023 10:26 AM

To: Pruss, Emmet - FS, MT <Emmet.Pruss@usda.gov>; Pliley, Daniel - FS, MT <Daniel.Pliley@usda.gov>

From: Philip Ramsey <philipwramsey@gmail.com>**Sent:** Thursday, September 14, 2023 11:03 PM**To:** Fox, David - FS, MT <david.fox@usda.gov>**Subject:** [External Email]Soda Baker Comments

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Hi David

I thought the comment period ended at midnight, but the link to the comment box seems to have closed. Please enter these comments.

Thanks!

Phil

Philip W. Ramsey, Ph.D.
5668 West Fork Rd.
Darby MT 59829

14 September 2023

I'm attaching a review of the best available science. Please consider it. The plan's details aren't clear, but as written it is threat to human safety that will open the USFS to future liability.

Though there is an exemption for these fuel breaks, as neighbors lets discuss some of the best available information rather than cherry-pick anecdotes. Wildfires burn in many types of conditions. Sometimes they smolder through stands on cold days in a drizzle, sometimes they blow in front of 50 mile an hour winds during a drought. Under ideal conditions, (a cold day with drizzling rain, which does sometimes happen every few summers) the Soda Baker project would allow our firefighters to backburn and extinguish a fire advancing out of the dense fire-suppressed forests surrounding the project area. But could we please get an explanation of what the USFS thinks is going to happen on a hot, windy, day, during a drought? To me it seems like this is the day the Soda Baker plan would kill people. And it's more likely than a cold drizzly July day scenario. You have great studies by scientists supported by the USFS and NSF. Let's look at the science.

The biggest problem with the past century of fire suppression is that fire suppression makes fire suppression harder as we go along. Every fire we put out allows fuels to accumulate. We postpone disasters, not avert them. And wildfires send stuff we need for our economy into the air where it causes more problems. It's a contentious problem. I tend to favor active management, but cutting old fire-resistant trees isn't needed for a fuel break, logging riparian areas and areas with high water tables is counterproductive. We all know this. It's weird to have to make that a public comment. It leads to the point. I don't believe the premise of the Soda Baker Project. This is a commercial cut, not a fire break. It will be a mix of pre-commercial thinning and a commercial harvest. Let's take the blinders off and look at it through the lens of the best available science. Here it is.

Climate change, fire suppression, and forest conversion

Increased temperature will outweigh potential increased total precipitation leading to increased drought stress for forest trees, higher mortality, more extensive fires, and reduced conifer recruitment after fire.

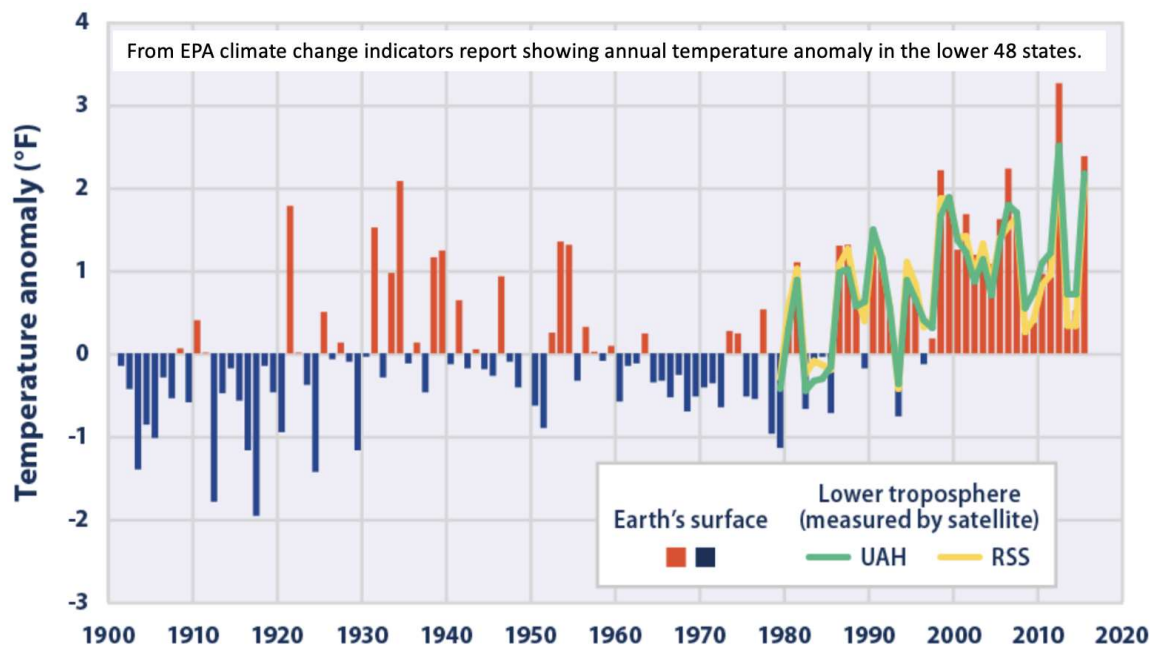
Temperature, Precipitation, and Carbon Dioxide

Big fires burned in the Bitterroots, and across the west in 1910. Fire suppression started in earnest when the loss of timber and dark smoky days got the attention of the nation and the young National Forest Service. Diaz and Swetnam, 2014, describe the climate then. 1910 and 1911 were anomalously warm and dry for the period. However, the temperature regime that caused the Great Burn isn't anomalous anymore. The trend in western Montana has been towards more prolonged summer droughts and more hot days (EPA 430-F-16-028, first figure below). Warmer winter temperatures decrease snowpack and facilitate the overwintering of forest pests. Hot summer days help fires spread faster.

Western Montana is forecast to receive higher precipitation under some climate change scenarios in the long run, but we have yet to see these wet years. Instead, we have experienced longer growing seasons, longer summer droughts, and decreasing snowpack. Even though our area might trend wetter eventually, rising temperatures will lead to more moisture stress due to a longer growing season. When we think about trends, we should remember that extremes matter far more than averages. Even if we do trend wetter, we will still have droughts years, and those years will be hotter, leading to periods of high stress for the trees.

Under higher carbon dioxide conditions, we may see increased biomass production in rangelands and forests, but that also depends on precipitation. Trees need water and nutrients to take advantage of rising carbon dioxide concentrations. Under water stress, conifers close the stomata on their needles to reduce water loss, reducing carbon dioxide uptake and growth. So, even though carbon dioxide concentrations could facilitate growth, trees outside riparian areas can't take advantage of it (McDowell et al., 2020).

Young and old trees are dying faster in unmanaged forests, most likely due to climate change induced moisture stress. Van Mantgem et al., 2009 (1823 citations as of 2023, co-authored by A. Larson at UM) noted rising tree mortality rates in old forests in the Pacific Northwest, California, and nine interior sites located in northern Idaho, Colorado, and Arizona. Figure s6 (second figure below) shows the rising mortality trend for the interior sites. Tree mortality rose from 0.5% per year to ~0.6% from 1979 to 1998. The increase was less than for sites in California and the Pacific Northwest, which looks like noise, but it is worth further study (discussed in the tree spacing section).



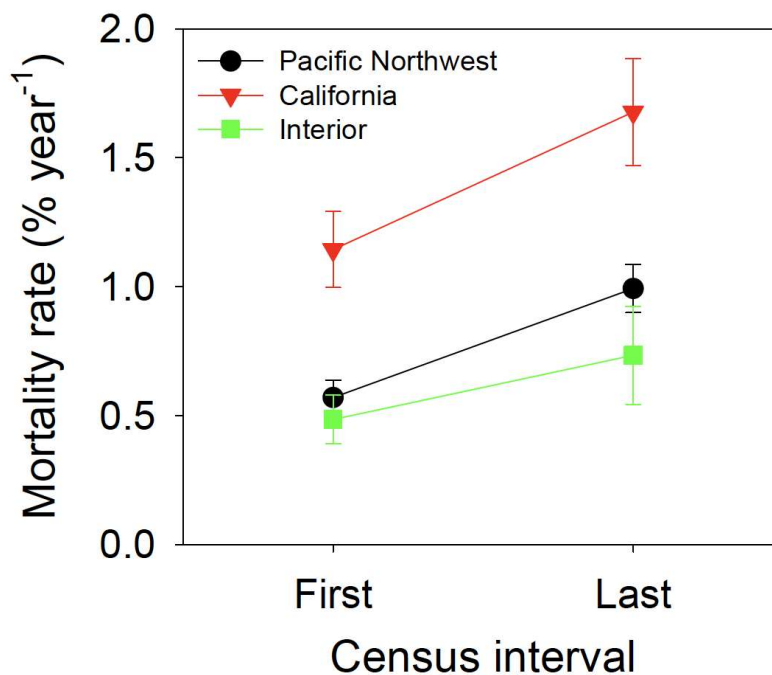


Figure S6. Mean mortality rates (± 1 S.E.) for the first and last census intervals of all plots in each region. For each region, mean mortality rate of the last census interval is significantly higher than that of the first interval (Pacific Northwest, $P < 0.0001$; California, $P < 0.0001$; interior, $P = 0.0078$, paired permutation tests). The calendar years of first and last census intervals, and the number of intervening years between the intervals, vary widely among plots (Table S1, Figs. S3-S5). Thus, the time periods spanned by the lines in this figure are shorter than those spanned by the modeled curves presented in Figs. S3-S5, which begin and end at the first and last censuses occurring in a particular region. Mean census interval midpoints for the first and last censuses in this figure are: Pacific Northwest, 1982-2000; California, 1991-2002; interior, 1979-1998.

Fire suppression and active management

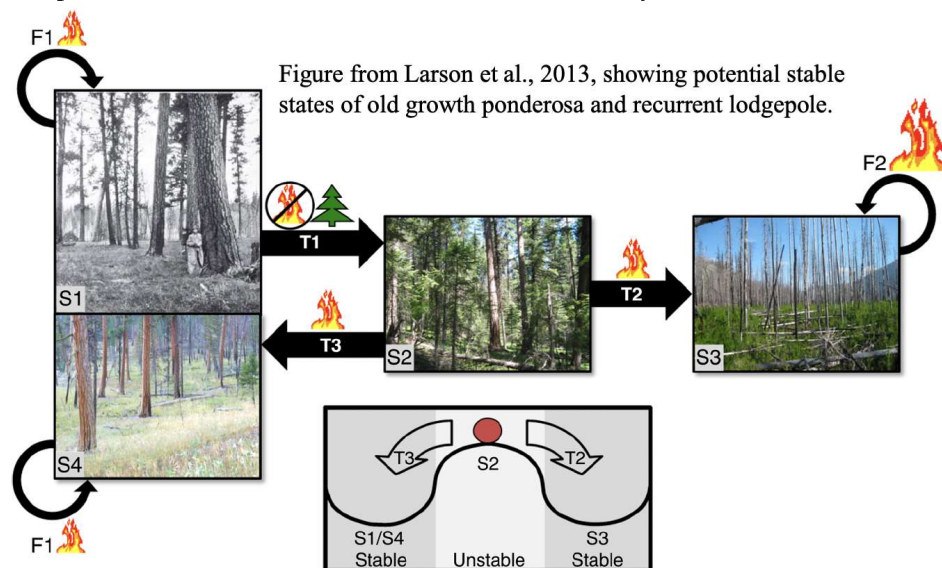
In the mid-1980's, the annual area burned by wildfire in western North America started rising and has continued to rise despite increasing money spent on fire suppression (Westerling 2016; Parks and Abatzoglou 2020). Part of the increase comes from more fires in unpopulated areas being allowed to burn. Fires near the wildland-urban interface (WUI) continue to be fought, but more get out of control.

The Soda Baker Project lies along the edge of a the defined West Fork WUI. Outside the WUI, many fires are still suppressed to keep them from getting to the WUI. Fire suppression doesn't change the fact that biomass growth outpaces decomposition in our area. As a result, we have dry forests that burn periodically. The USFS continues put out fires, yet fire suppression makes future fire suppression harder. This problem is the basis of the case for active management. The do-nothing, "let'er burn" approach seems appealing but will not work. Counter-management will lead to high-severity fires that will burn big old trees we want to protect.

Larson et al., 2013 (figure copied below), documented what happened when fire suppression was lifted on a forest with big old ponderosas in the Bob. Fire returned to the forest in 2003 and burned off lodgepoles without killing most of the ponderosas. The fire stimulated dense re-growth of lodgepole that looked to take the forest toward a different state than before fire suppression began. If the lodgepole matured and started producing serotinous cones, it would have created a different and self-perpetuating lodgepole forest. However, a second fire burned through in 2011 and wiped out the lodgepole and some Doug-firs. After the second fire, the forest regained the open look of a frequent fire system. This is a hopeful finding and a reminder that fire effects vary based on stand characteristics and are often controlled by the weather. We should also keep in mind when discussing restoration that we need fires, not one fire.

Forest reestablishment after fires gets chancy with climate change (Rodman et al., 2020). Severe burns may become more frequent, leading to limitations on dispersal, not just trees but also of symbiotic animals and fungi (Gill et al., 2022). If the forest burns after a prolonged drought-induced period of poor cone production, symbionts may take a long time to disperse into a burned area.

Drought stress may also reduce cone production before a fire. Old time loggers left scars on trees to stimulate cone production on seed trees. We also watched a white pine at MPG North for many years that was infested with beetles, leaning, and cankerous. It was going all-out on cone production. Drought stress may differ from other physical stress because wet years may be needed to initiate cone production and because without water, the cones cannot mature (Lauder et al., 2019). Water stress in conifers comes from competition or actual drought. Reducing competition should reduce water stress either way. But it would be good to know more about the relationship between tree mortality, water stress, and cone production. It would also be good to know more about the competition for water between trees and the understory.



Part 2 – How do natural forests look?

Without fire suppression and logging, the trees would occur as individuals and clumps with openings. We should manage toward that while maintaining grasslands, shrublands, and riparian areas, and protecting big old trees.

Soda Baker Project Area Forests

We have a mosaic of habitats in the Soda Baker project area, defined by forests, shrublands, grasslands, and riparian corridors. We expect the boundaries between ecotones to be flexible if maintained by fire. For example, firs and pines can establish in the grasslands that fires of various intensities and frequencies have historically maintained. However, in our current climate, a fire during a drought might push the south and west aspect forest stands beyond their limits to recover as forests (Allen and Breshears, 1998; Parks et al., 2019).

The most common forest trees are ponderosa and Doug-fir. Doug fir and Ponderosas can establish without fire, but wet years are needed for both species to establish after a fire. For ponderosas, cone maturation takes two years, and more cones initiate in cool, wet years. So, a couple of cool, wet years before a fire allows a pulse of ponderosa seedlings to establish after a fire (Hankin et al., 2019). Doug fir needs wet years following fires to establish in scorched hot landscapes as their seedlings are most sensitive to drying out in the two years after establishment (Rother et al. 2015).

Ponderosa can survive a fire sooner than Doug fir, but firs produce cones sooner than ponderosas and under dryer conditions (higher actual evapotranspiration: Rodman et al., 2019). It doesn't seem easy to predict whether Doug-fir or Ponderosa will do better under future climate scenarios. Both species range far north and south of MPG (Canada to Mexico). Currently, fir is expanding faster than ponderosa in grasslands. Our pine-fir forests are seasonally dry and don't require exceptional droughts to carry fire (Hessberg et al., 2019). Based on LANDFIRE maps, most pine-fir stands would vary in fire severity and return interval (Jager et al., 2021).

Cottonwood and aspen occur almost exclusively in riparian areas. Abella and Springer (2015) mention that aspen recruitment is especially sensitive to the relationship between treatment and herbivore density, but this is a topic in need of research, especially in light of the high elk numbers in areas around irrigated agriculture, especially the Triple Creek Ranch.

Tree spacing: What would the Soda Bakert Project Area look like without fire suppression and logging?

This question comes down to tree spacing. Arno et al., 1995 and 1997, searched for unlogged stands of ponderosa pine in the Bitterroot and Lolo National Forests. They found a few remnants in the West Fork of the Bitterroot and a few other drainages in Western Montana. These studies and the rest of Arno's work are where we get our knowledge of historic fire intervals. The stands burned several times per century, and the old trees were well-spaced. Larson and Churchill, 2012, carried this work further by looking at tree spatial patterns in frequently burned stands around the west. They concluded that old trees in forests frequently visited by fire would contain tree spacings characterized by individual trees spaced far apart, clumps of trees with crowns that touch, and openings with no trees. The authors proposed that thinning and fuel treatments should create individuals, clumps, and openings (ICO) in this paper and the following paper (Churchill et al., 2013).

Clyatt, Larson, et al., 2016, re-visited Arno's plots for further spatial analysis in relation to tree survival. They found a wide range of spaces between trees, from widely spaced individuals, to clumps, and openings. Annual mortality rates in the plots were lowest in one plot that burned three times in the past century, a fire regime similar to the expected historic fire return interval. Overall, ponderosa mortality was 0.8% per year, and fir mortality was higher at 2.1% per year. These percentages align with the extrapolation of previous estimates of increasing tree mortality, but they are still not high compared to other forests in the west (Van Mantgem et al., 2009). The authors suggest that the overall trend toward higher tree mortality may not affect old dry pine-fir forests as much as other old forest types. This makes sense given our intermediate position in the wide longitudinal range of these two species.

Pre-commercial thinning (PCT, somewhat analogous to the poorly described plan for the Soda Baker Project)

The controversies over PCT aren't about whether it grows bigger, healthier trees faster. It does. It's the side effects of the treatment that worry us. It doesn't fire-proof a forest, causes weed problems, and makes a forest look like a tree farm. The next sections cover recent literature on various aspects of PCT.

Growth and beetles

PCT releases ponderosas from competition leading to increased growth and resistance to bark beetle attack (Fiedler et al., 2010; Hood et al., 2016). PCT treatments also reduce tree mortality during drought (Knapp et al., 2021). For example, in UM's experimental forest in the Blackfoot, PCT reduced pine beetle mortality from 50% in un-thinned ponderosas to 1% in adjacent thinned stands (Hood et al., 2016). In addition, trees released from competition in the thinned forest put on trunk wood 3 times faster (fig. 6A, basal area increase) and had much bigger resin ducts for spitting out beetles (fig. 6b) (below).

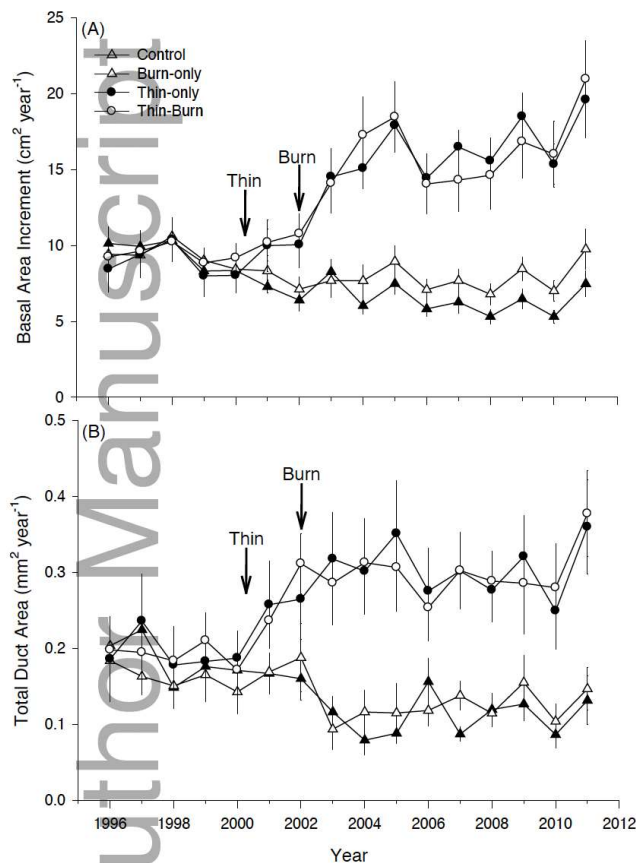


Figure 6

Fire

PCT often increases fire severity. PCT reduces canopy density and ladder fuels, which makes it tougher for fires to get up into the crowns of trees and kill them, but stands burn like furnaces when the crowns do catch (Banerjee 2020; reviewed by Prichard et al. 2021). Crown spacing allows wind to move fire through a thinned stand quickly. The fast spread of a fire isn't necessarily a bad thing when the fire isn't in the crowns. Fires flash through open old-growth ponderosa stands without getting hot enough or high enough to hurt the big trees. In the case of the Soda Baker Project, the fires will flash through into the WUI. I actually don't like this idea, but maybe its better to have a wind break of dense overgrown unhealthy stunted firs as a buffer on the edge of the WUI than a PCT forest.

PCT generally increases fire severity when slash is left on the ground. However, it also impedes elk travel in the short term which could be used to enhance recruitment of understory species that would benefit elk and other wildlife in the long term.

The extra light dries out the understory and slash (Stephens et al., 2020). However, Cansler et al., 2022, studied how fire behaved in northeastern Washington forests that were long-unburned and treated with prescribed fire or PCT. They found that treatments, especially prescribed fire under moderate weather, worked to decrease fire severity (also studied by DellaSala et al., 2004).

Weeds

Cheatgrass and knapweed spread after disturbance from thinning, prescribed fire, fuel reduction, and especially wildfire (Jang et al., 2021; Kerns et al., 2020, Abella and Springer, 2015). Where treatments disturb the soil and lead to drying and increased wind, weeds will spread in the Soda Baker Project Area. Cheatgrass invasion into thinned areas invasion will change fire characteristics, making fires flashier and likely to get through to the WUI (Balch et al., 2013). While changes in forest fire regime due to cheatgrass invasion haven't been well studied, the fine fuels produced by cheatgrass will probably make future fires flashier, perpetuating cheatgrass.

Willms et al., 2017 used meta-analysis to test how well thinning mimics burning. They used percent cover and species richness as response variables. They separated the response variables into native and non-native categories. Most of the 32 studies used in the analysis came from western states, with just a few from the east and south. The main finding of the meta-analysis was that all treatments increase non-native species cover. Invaders knock on the door of forest ecosystems, and disturbance lets them in.

The regrowth of native understory plants after a fire is sometimes less than expected because soil seed banks are short on seeds or fire toasts the seeds in the ground. Where seed banks are not sufficient to allow natives to re-establish, there will be openings for faster-spreading weeds (Willms et al., 2017).

Jang et al., 1997, working in the Lick Creek experimental forest in the southern Bitterroot, found that initial weed cover declined from 15 to 23 years after PCT, but that was because the closing canopy shaded knapweed out. Effective fuel control would have us re-burn areas around the time the weeds start declining. That will start the cycle over and amplify it.

The Soda Baker Project runs a high risk of weed invasion following treatment. This problem is difficult to overstate. Knapweed, and cheatgrass are widespread. Blueweed is expanding wherever the Triple Creek Horses ride. The treatments will release weeds. An unplanned fire will release weeds. Our quandary is to reconcile this against the problems created by too many trees. Un-roaded and undisturbed grasslands in the project area are fairly weed-free. Forested areas are also pretty clean. Roads carry invasions. Please enforce mandatory and frequent equipment cleaning procedures.

Big old trees

Regrowth in old cutting units in the Soda Baker area occurred under artificial conditions due to fire suppression. A lot of the project area is a weird forest, but there are some big pickles out there that previous actions left as seed trees. Let's take care of these old survivors. It looks like 10 seed trees per acre were left in many stands.

These tough survivors add beauty to the forest, are less sensitive to climate change, and will serve as the backbone of the resilient forest and healthy ecosystem we hope to protect (Spies 2019; Davis et al., 2020). So let's not cut any ever. Ladder fuels around big old trees pose a special problem here. When stand-replacing fires kill the oldest and biggest trees, it might catalyze a shift from a forest to a non-forest, especially under scenarios of a hotter climate (Davis et al., 2020; Stevens-Rumann et al., 2022).

Prescribed burns will kill some big old trees. Old trees die in prescribed burns when accumulations of bark flakes and needles at their bases smolder (Kolb et al., 2009). Raking fuel away from the base of trees stops this from happening. Therefore, when we daylight big old trees, we should also rake fuel away from the trunks.

Drought mortality

Furniss et al., 2021, studied tree mortality in the Sierras in 18 mapped-stem plots. Over 23 years, 8 of the plots burned. Mortality increased over the short term (up to about 7 years) when PCT was followed by prescribed burning and then followed by drought. Mortality decreased after 7 years (Furniss et al., 2021). The message is that prescribed burns will cause short-term stress to trees before providing increased drought tolerance. As the stated goal is to reduce fire risk rather than to get out the cut, we should consider that some trees will die as a result of the thinning. Anyone can see this happening in Piquette Creek. Leave a some more trees on the landscape to account for this.

Slash

Slash from overstory removal influences understory regrowth and fire. Studies report that leaving slash reduces understory vegetation for 7 to 15 years after treatment (Abella and Springer, 2015). On the other hand, slash heights over 1.5 impede herbivore movement (Lyon 1985), which should increase recruitment of aspen and berry bushes. The options for dealing with slash after thinning are to leave it, leave it and then burn it later, or pile it and burn it. Our current plan is to leave most of it and try to burn it in the prescribed burns.

Piled slash tends to be weedy around the edges, but burnt slash piles are often weed-fests. Slash piles are great incubators for mullein infestations. Infestations along the lower Clark Fork cover hundreds of acres. There are whole south-facing slopes covered in mullein down there. Fiedler et al., 2013, found that mullein doesn't often persist after forest disturbances, but cheatgrass does. It seems to us that both persist long enough to create problems. On the other hand, stand-replacing wildfires also create weed problems. Cutting and fire together create the most weed problems (Jang et al., 2021).

Another option for dealing with slash is mastication. Masticators chew the trees in a thinning operation, distributing slash as chips across the forest floor. In 2014, we used a "Green Machine" masticator to thin 80 acres in Section 22, which we bought from the State in 2012 (photos below). It worked great for the understory and

solved the problem of slash height. However, the fuel is still there. When it dries out, it can sometimes burn for a long time, heating deep soils and likely greatly reducing microbial inoculum potential (Kreye et al. 2014).

Understory shrubs

Thinning treatments don't usually stimulate understory shrubs unless more than 50% of the overstory is removed (Abella and Springer, 2015). Tree canopy cover needs to be reduced to 11% to 40% to see big changes in the understory (Wilms et al., 2017). Several studies have recorded understory responses in different forest types. The overall trend was a strong inverse relationship between understory and overstory cover between 10 and 50% overstory cover. Where the overstory cover exceeds 50% there won't be much understory vegetation. Thinning to 25 to 50% cover allows a crown fire to really torch through a thinned stand (Banerjee 2020). Combined, to favor browsers and bears we thin to less than 25% overstory.

Elk

The Montana Elk-Logging project was a joint effort between UM, BLM, USFS, MTFWP, and Plum Creek Timber Company. The studies were conducted in the Sapphires from 1970 to 1985, produced 24 peer-reviewed publications, and were synthesized into a set of recommendations. The recommendations allow managers to consider elk security during forest planning. Decisions to close many logging roads to protect elk winter range, calving areas, and travel corridors are based on these recommendations. Lyon's final report and the cited literature provide a guide to how the Soda Baker Project will affect elk.

Elk home range size and seasonal use pattern vary from place to place, but individual elk and individual herds use the same places from year to year (Lyon 1983). Logging and road building displace elk from that part of their range, sometimes by as much as 5 miles (Marcum 1975; Edge 1982; Lyon 1979b). How long they stay away depends on how far the activity displaces them. Operations in a focused area will displace elk from the drainage where the activity occurs, but they come back soon afterward. Dispersed and season-long activity displaces elk far longer.

Elk use cut areas, but not those with high slash, near open roads, and far from security cover (Lyon and Jensen 1980). It could be a good thing that elk avoid clear-cuts with high slash. High slash may be a fire hazard, but it could also promote vegetation diversity when used to deter elk from some areas. We don't know how long it will take for the slash to settle in some of the proposed harvest units, 5 to 10 years seems likely.

Food isn't the most important selection criterion for elk habitat. Shelter for temperature regulation and security from bullets are as or more important. Cutting security habitat to increase elk food isn't justified. However, cutting could be more easily justified to help other species, such as moose, mulies, or some birds. Likewise, keeping grasslands clear of firs in a fire-suppressed system seems reasonable.

Recommendations on elk security during logging

- Don't disturb all of an elk herd's winter range at once.
- Give elk places where they can feel secure during logging and road building.
- Concentrate logging activity in space and time; do one part of this project at a time.
- Pair areas of activity with adjoining areas of no activity.
- Keep the density of open roads as low as possible (Lyon 1979a, Marcum 1975).
- Don't disturb moist sites. Wetter areas are the most important and least available habitat (Marcum 1975; Lonner 1976).
- Where the goal is not to impede elk movement, keep slash depths less than 1.5 feet high (Lyon 1985). (Inversely, use high slash heights to encourage shrub recruitment).
- Maintain dense cover near winter feeding areas and work outside the period elk are on winter range. This conflicts with winter logging, which reduces weed invasions.

Adaptive Complexity Thinning (ACT)

Individuals Clumps and Openings (ICO) is an approach for restoring stands with big old trees to a condition similar to before the start of fire suppression. Adaptive complexity thinning (ACT) is the equivalent approach that grew out of ICO for re-establishing an adaptive forest in previously logged or severely burned areas (Larson et al., 2022). Figure 2 from Larson et al., 2022 (below), shows a conceptual diagram of ACT compared to standard PCT.

A closed canopy intercepts rain and snow. Some evaporates before reaching the ground. The ACT method aims to foster drought tolerance by allowing more water to reach the soil through canopy openings. A second goal is to slow or stop crown fires. This is accomplished by creating openings while preserving dense forest patches to slow the wind and moderate temperature and humidity (Larson and Churchill 2012, Churchill et al. 2017). A third goal is maintaining some of the shrub understory needed to maintain snowshoe hares, and the critters that eat them (Larson et al., 2022).

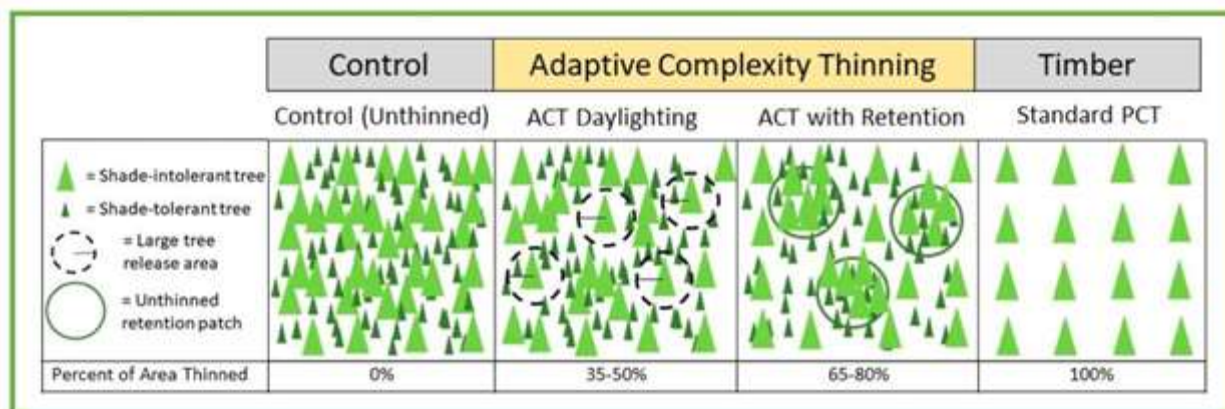


Figure 2—Conceptual diagram of the Adaptive Complexity Thinning (center two panels) methods being implemented using active adaptive management experimental treatments on Forest Service, Bureau of Land Management, and The Nature Conservancy lands.

Forestry

How to restore uniformly cut and fire-suppressed forests has received much academic attention (Fahey et al., 2018). However, responses to alternative treatments have received much less (Larson et al., 2022). There is still work on tree mortality rates, recruitment, cone production, drought stress, and mycorrhizal colonization to do.

Long-term monitoring

Longer-term studies find different results than short-term studies. For instance, only 7 studies in Abella and Springer, 2015, recorded results for longer than 5 years. Understory plant abundance and species richness increased in all studies. Short-term declines in shrub understory were followed by longer term-increases after 4 years. 5 of the longer-term studies used cutting treatments, and 2 used prescribed fire. In Webster and Halpern (2010), prescribed burns did not differ from controls at 2 and 4 years but did after 10 years. The message is that responses occur after funding ends and students graduate. Any way this project proceeds there would be great opportunities for the USFS to learn from what it is doing through monitoring.

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