COMMENTS ON SCOPING--LONE PINE VEGETATION MANAGEMENT PROJECT

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I would like to see the EA treat the situation as an ecological emergency for this particular forest, in which the logical focus would be to keep all surviving trees and to enhance natural recovery during the duration of the beetle outbreak. This outbreak can be viewed as potentially one of possibly many disturbances that could potentially ultimately lead to a substantial net decline in ponderosa pine forest area, as has been modeled to be a consequence of global warming if emissions continue at high rates (Rehfeldt et al. 2014). Logging is more detrimental in a beetle outbreak than in a green forest, and also worse with rising temperatures and more drought, likely contributing to forest decline, but if logging is a goal, I suggest how it might be accommodated.

The science presented here suggests the EA be redirected to: (1) plan for the likely trajectory of bark-beetle caused tree mortality, which will most likely limit or prevent most of the proposed project after about seven years, (2) focus on enhancing natural recovery of tree populations from survivors, rather than just regeneration from seed, (3) incorporate the necessity to facilitate a transition to a new forest genetically adapted to a hotter climate in the next few decades by keeping all surviving trees, and (4) if logging is a goal, focus logging on dead trees only. The scientific basis for each of these is provided below. These redirections could be analyzed separately in the EA, but perhaps are best combined as an enhanced natural recovery/partial salvage alternative, since it appears that logging will be a goal.

Discussion in the project proposal about historical fire needs to be brought up to date and linked directly to the best available data. Baker (2018a) updated and synthesized available scientific evidence about historical fire regimes in ponderosa pine forests in the San Juan Mountains. Please quote and use its specific summary statistics on historical fire rotations for both low and moderate- to high-severity fire in ponderosa pine forests in the San Juan Mountains and near the project area. For low-severity fire, source data are in Table 2 on p. 11, last column. The overall estimates for ponderosa pine in the San Juans are in Table 5 (range of 15.9-58.8 years with a median of 31.3 years). Specific estimates for areas near and including the project area are 16-38 years, as shown on Figure 5c. For moderate- to high-severity fire, the best available estimates are in Table 1 last column (185 years on the San Juan N.F.). For high-severity fire, the best available estimates are in Table 1, 3rd-to-last column (358 years on the San Juan N.F.). The fire regime in ponderosa pine forests in the San Juan Mountains is now known to have historically included low, moderate, and high-severity fires. Please look at the full set of evidence in this synthesis paper in formulating prescribed burning plans or other plans that involve fire management.

<u>The project is likely to be largely salvage-logging, as the outbreak expands across the project area</u>
The proposed action would move the forest from "mature closed" to "mature open" with patches of young forest, but bark beetles will likely have accomplished this <u>before</u> proposed silvicultural treatments can have much effect, thus salvage logging is likely to become the main option.

The bark beetle outbreak is expanding exponentially (BOX 1). If it continues on this trend, about 35,000 acres (56%) of the 62,000 acre project area will be affected by the expected start of the project in 2019, and about 63,000 acres, equal to the whole project area, will be affected by 2020, 1 year later (BOX 1). The EA should present this evidence about the expected trajectory.

By 2020, the proposed project is expected to have harvested about 1,000 to 3,000 acres, 2-5% of the project area (p. 9). If so, it seems likely that 95-98% of the proposed action, to move the forest to "mature open" will have already been done by the bark beetles, removing the value and need for logging live trees.

Silvicultural treatments are proposed to be "applied based on the condition of stands at the time of implementation" (p. 7). Since most of the mortality from bark beetles will likely be well underway by 2019 and have affected the whole project area by 2020 (BOX 1), the primary proposed treatment at the time of implementation is likely to be "Sanitation/Salvage (SS)" (p. 8).

If the goal is to keep the area forested, there is no scientific basis for logging any live trees when a bark beetle outbreak is underway, as are in the proposals for: (1) lightly infested or un-infested stands, (2) commercial thinning, or (3) aspen stands. During a significant beetle outbreak and drought is not the time to adjust stand structure by logging live trees to restore spatial structure, using thinning to increase tree growth or changing succession by removing conifers. Those could be done, if there is any remaining need, after the beetle outbreak has fully run its course. It is too late to have any significant effect on the beetle outbreak by doing them now, and the probability is high that removing trees could actually increase total mortality above levels that occur from just the beetle outbreak alone (Six et al. 2014). Removing live trees while the outbreak is underway also is likely to remove potential survivors that have genetic adaptations that confer resistance to beetles (Six et al. 2014). This could make future outbreaks more likely. Please look closely at this issue, review and disclose the science, and heed it–science shows it is the wrong time to log live trees. There are less adverse ecological impacts, as discussed below, from logging in green forests.

The proposed goal, to use logging or other direct control methods, to reduce the spread of the outbreak has a high probability of failure, but logging could be done just for wood products. The EA should explicitly disclose that sanitation and other direct control methods for bark beetles are usually expensive, ineffective, and have a long history of failure to significantly slow or stop beetles in an outbreak stage. The proposal says (p. 8): "A more aggressive approach to harvest needs to be taken on these stands as this is the source of future beetle populations." However, a review by the USFS's team of senior research entomologists concluded that sanitation is expensive, requires intense effort, and is most likely to be effective only with beetles at endemic, not outbreak levels (Fettig et al. 2014). Another USFS research team recently extensively reviewed the long history of failed attempts to significantly slow or stop bark beetles through sanitation and other direct control methods (Graham et al. 2016). These researchers concluded about efforts to directly control mountain pine beetles (MPBs) and western pine beetles (WPBs):

> "...it was amazing that even though the science and scientists knew that direct control of MPBs was futile, it went on for decades after the knowledge was discovered (≈1920). Moreover, some scientists continued to advocate for the direct control of WPBs and MPBs even though their own and findings of others showed that it was ineffective. For years, beginning with Hopkins in the Black Hills, direct control of MPBs was advocated and for more than 75 years burning, peeling, spraying, and many more methods were used in an effort to kill these insects with

little success" (Graham et al. 2016 p. 168).

Since sanitation or other direct control is likely to be generally ineffective, and likely to be difficult to justify, the proposed action is likely to become largely salvage-logging (p. 8, attachment 3), after the trees are dead.

If the situation is treated as an emergency for this forest, salvage-logging would likely become the only method used to obtain wood products during the duration of the project, with no logging of live trees. If the goal to obtain wood products was redirected to be <u>entirely</u> from dead trees, the project could avoid most adverse impacts on surviving trees, the key source of natural recovery.

The current primary silvicultural objective of salvage logging in the proposal is "to promote regeneration of the 'next generation' of trees" (p. 8). Most of the dead trees would be removed, burning would reduce slash and expose seed beds, and if tree regeneration does not occur, trees would be planted. Oaks would be masticated in a mosaic focusing on smaller stems, with the goal of promoting ponderosa pine regeneration. Mastication/burning might also be used for dead pine if markets are insufficient. The proposal starts with 1,000 to 3,000 acres per year and goes up to 6,000 acres per year. No limit is placed on harvesting, so it appears that it is envisioned that the entire area would be salvage logged.

But, this is not needed, because the beetles will already have accomplished the goal of reducing mature closed to mature open, and the wood will already have become generally unusable well before the end of the proposed project period, most likely within about seven years (BOX1). Mastication would damage structures, such as snags and large dead wood, that are essential to natural recovery and would leave the forest vulnerable to smoldering fires that can damage soils.

If the goal is to best recover the forest, please incorporate the likely reality of the beetle trajectory into the EA, limit the project to seven years, and refocus on using salvage logging or log green forests elsewhere to obtain wood products with the goal of minimizing adverse impacts on surviving trees and natural recovery.

<u>Salvage logging can cause more damage than logging in green timber, and is a tax on recovery</u>
In 2004, a group of the world's most well-respected ecological scientists warned of four overlooked but significant ecological impacts of salvage logging: (1) "Major disturbances...can aid ecosystem restoration by recreating some of the structural complexity lost through previous intense management of natural resources...salvage harvesting activities undermine many of the ecosystem benefits of major disturbances"; (2) "...removal of large quantities of biological legacies can have negative impacts on many taxa"; (3) "...salvage logging can impair ecosystem recovery"; (4) "...some taxa may be maladapted to the interactive effects of two disturbance events in rapid succession" (Lindenmayer et al. 2004 p. 1303).

Subsequently, the most extensive scientific review of the ecological impacts of salvage logging (Lindenmayer et al. 2008) concluded: "The ecological impacts of salvage logging have the potential to substantially exceed those of green logging, even traditional high-intensity silvicultural systems such as clearcutting followed by even-aged stand management" (p. 169). Also: "Salvage logging and other post-disturbance practices can have profound negative impacts on ecological processes and biodiversity. Salvage logging will rarely, if ever, contribute in a direct or positive way to ecological recovery; generally it can be viewed as a tax on ecological recovery that can be large or small depending on how it is conducted" (p. 168).

Some of the major adverse ecological impacts of salvage logging, relative to unlogged post-disturbance areas, that were documented in Lindenmayer et al. (2008) included: (1) reduced nesting and foraging habitat for vertebrates, (2) altered bird communities, (3) altered in-stream macroinvertebrate communities, (4) reduced vegetation recovery and altered plant species composition, (5) altered patterns of landscape heterogeneity important to wildlife, (6) "bycatch" or the loss of live, surviving trees due to damage during salvage logging, (7) altered hydrologic regimes, (8) increased sediment flows, (9) reduced soil nutrient levels, (10) disturbed soil layers and increased soil compaction, (11) reduced shading leading to increased soil temperatures, (12) increased edge effects, (13) increased fine fuels adding to fire risk, (14) increased stem density if post-disturbance tree planting occurs, which can increase future risk of fires and beetle outbreaks, (15) increased periods of time over which forests are carbon sources rather than carbon sinks, (16) larger cumulative effects due to the substantially added stress of logging during a period when organisms are already having to cope with the altered conditions after the beetle outbreak itself, and (17) compounded effects from past alterations that left taxa more vulnerable (e.g., past logging reduced standing dead trees important to cavity-nesting mammals and birds, leaving them more vulnerable to salvage logging). Opening the forest canopy, through any logging, during a time of higher temperatures and drought, will likely reduce tree growth and hamper ecosystem recovery.

The EA should cite this book and explain in detail all the known adverse ecological impacts from salvage logging, as documented in this book, then propose actions to reduce these adverse impacts. I suggest the best approach is to log elsewhere in green forests or limit the salvage logging to near existing roads, where there are already impacts, and enhance natural recovery in areas away from roads. The forest can likely slowly recover after a beetle outbreak if all survivors are retained, and could possibly recover, although more slowly, after careful, limited salvage logging, assuming the climate does not greatly worsen. This book does not suggest that no logging be done in naturally disturbed areas, but does make it clear that it is better ecologically to do no logging at all during a time of stress from beetles with added stress from higher temperatures and drought, and to instead monitor tree survival and recovery with the goal of increasing the chances that the forest will recover after the beetle outbreak itself.

<u>Natural recovery after beetle outbreaks is more likely from survivors than from seed regeneration</u>

The project proposal suggests that "few pine seedlings are emerging because the duff layer prevents pine seeds from reaching mineral soil to germinate" and "a majority of the project area lacks the 'next generation' of trees. Future diversity of age classes depends on the establishment of pine seedlings" (p. 1). Since the beetle outbreak is likely to have affected much of the area by the time the project begins, the primary treatment is likely to be in "Heavily Infested Stands." The primary silvicultural objective in these stands is: "...to promote regeneration of the 'next generation' of trees."

However, the most likely response of tree populations in stands heavily affected by bark beetles is to leave survivors, particularly smaller trees, but also some medium and large trees, which are the quickest and best source of the next generation of trees. Baker (2018b p. 19) reviewed survival in three recent severe bark beetle outbreaks in ponderosa pine and dry mixed-conifer forests in western North America: "(1) 75% of trees < 20 cm dbh survived (McCambridge et al. 1982), (2) 77% of trees <7.5 cm dbh and 58% of trees 7.5-15 cm dbh survived a severe outbreak (Klenner and Arsenault 2009), and (3) >95% of trees survived in stands with < 18 m^2/ha of basal area, about 170 trees/ha in trees up to 37 cm dbh (Graham et al. 2016). These three bark beetle outbreaks were in the Colorado Front Range, southwestern Canada, and the Black Hills of South Dakota and Wyoming, respectively. See Baker 2018b for references to these three studies. These outbreaks show that survivors are usually sufficient to fully recover the forest. A caveat is that we are now in a severe drought with hotter temperatures at lower latitude than these previous cases. I have not seen evidence that survivors are rare or lacking or are common in the project area at this point. It would be important for the EA to bring forward evidence about mortality and survival at this point, if data have been collected. Data are certainly needed, as the outbreak continues, on rates and patterns of tree survival.

The outbreak itself may stimulate some tree regeneration by seed as the canopy is opened, even though mineral soils are not widely exposed. Sufficient tree regeneration from either seed or survivors did follow a historical bark-beetle outbreak on the Uncompahgre Plateau, just north of the project areas, where the canopy was opened by mortality from beetles, as shown in Baker (2018b Figure 3b). Fire can certainly also stimulate tree regeneration by seed as the project proposal explains, but, unlike a beetle outbreak, fire initially kills some or all existing tree regeneration. Fire must be combined with an extended subsequent period without further fire, to allow trees regenerating from seed to get large enough to survive (Dugan and Baker 2015). The key attributes that led to successful pulses of tree regeneration in ponderosa pine forests on the nearby South Rim of Grand Canyon was a canopy-opening disturbance (e.g., drought, beetles, fire) followed by an extended period without fire or by a wet period (Dugan and Baker 2015). The potential killing of many small, surviving trees means that prescribed burning is better as a last resort, only if survivors and tree regeneration by seed are insufficient or do not persist after the beetle outbreak ends. Only a single fire should be used, to avoid killing new seedlings until they are large enough to survive.

Tree regeneration by seed is also generally chancy as a focus. After the 2002 Missionary Ridge fire, tree regeneration was abundant in the Vallecito area, based on quick observations only, but appears nearly lacking on drier slopes of Missionary Ridge. Tree regeneration was historically limited in ponderosa pine forests on the San Juan National Forest, as reported in both of the early forest-reserve reports, which were government assessments of the ecology and threats to the future national forests. Dubois (1903 p. 7), in the San Juan Forest-Reserve Report, described regeneration in ponderosa pine and dry mixed conifer: "Reproduction of bull pine is poor. In many places groups of seedlings are coming in, but in the large blanks made by cutting, restocking is slow." Bull pine is younger ponderosa pine. Dubois (1904), in the Montezuma Forest-Reserve Report (1904 p. 9) also described tree regeneration: "In the virgin forest and in the poor open stand on thin soil there is practically no reproduction." Tree regeneration in ponderosa pine was historically variable, but often poor in the Southwest (Baker 2018b). It may not be a good gamble to use prescribed fire in a setting with a long history of poor tree regeneration from seed, if there are other options,.

Moreover, regeneration by seed could possibly be further limited, because of higher temperatures now and because temperatures will likely increase further as global warming continues (Baker 2018b). Temperatures have been documented to be increasing in the San Juan Mountains (Rangwala and Miller 2010) at a rate that exceeds global rates. Moreover, tree regeneration after fires in dry forests across the western United States has been shown to have significantly declined with hotter years since 2000 A.D. (Stevens-Rumann et al. 2018). The situation is worsening, particularly on lower elevation, drier sites (Baker 2018b). Added to the problem is that salvage logging will also kill some surviving trees, as documented in Lindemayer et al. (2008).

Historically poor tree regeneration in ponderosa pine in the San Juans, likely worsening as temperatures rise, combined with loss of survivors due to damage during salvage harvesting and from prescribed burning, means the project focus on regeneration by seed has potentially quite significant adverse impacts, possibly leading to loss of the forest in some areas.

All these potential impacts need to be disclosed and addressed in the EA. Please cover the details of the science regarding this regeneration issue and make the proposals closely tied to this science, including a review of climate trends in the area and their potential impact.

In my scientific opinion, significant adverse impacts of the proposed project favor reducing salvage logging or doing it elsewhere in green forests if logging is a necessary goal, preserving all survivors, and focusing on survivors as the key source of the next generation of trees. It is reasonable to hope that some regeneration by seed also occurs and to monitor it.
<u>Keeping survivors and not planting will enhance rapid adaptation to an emerging hotter climate</u>
Baker (2018b) reviewed evidence that retaining survivors and post-disturbance natural tree regeneration from seed will further genetic adaptation to the emerging hotter climate and its associated patterns of beetle outbreaks, droughts, and fires. Even long-lived trees can adapt rapidly to changing climate through survivors and seed regeneration. Key to the success of this adaptation approach is to avoid logging survivors or intentionally planting new trees, since those both would reduce selection and genetic adaptation to emerging climate and disturbances. New evidence confirms there is a genetic basis for tree survival after beetle outbreaks (Six et al. 2018).

AN ENHANCED NATURAL RECOVERY/PARTIAL SALVAGE ALTERNATIVE
Because there are significant and well-documented adverse effects of salvage logging after a beetle outbreak, because regeneration from seed has often been poor and is likely declining due to hotter temperatures and drought, and because survivors may have key adaptations to emerging hotter climate, it is ecologically important to not log or destroy surviving trees or plant new trees. Yet, if there is value and need for recovering wood products for local industry, some logging must be accommodated. It would be best elsewhere in green forest, or at least substantially reduced in the outbreak area, so that the forest has a better chance of recovery.

It is not really my usual role as a scientist to propose a land-management alternative, but the fact of the forest emergency as the possible beginning of a worrisome emerging possible transition to warming climate suggests a rather drastic situation that could spread well beyond the project area. This is not a usual situation, and the proposed project did not cover issues raised here.

To address the scientific concerns I have raised, I suggest the EA develop and fully analyze an alternative that enhances natural recovery, but, if logging is deemed necessary in the project area, allows only partial salvage of dead trees while dead wood is usable. Here are some initial ideas for elements of this alternative from a science perspective. I am available for further discussion.

1. Protect and encourage natural recovery by survivors as the focus over about 2/3 of the project area, all the area away from existing roads. Also, no firewood cutting, salvage harvesting, or tree planting would occur in these areas. No prescribed burning would occur in these areas, unless after 2-3 years there is insufficient surviving or regenerating live tree density. Monitor survival and regeneration in a random sample of sites within the area, so this can be determined. Use prescribed burning, avoiding existing regeneration as much as possible, to stimulate regeneration by seed if regeneration is insufficient at this point and there are sufficient live seed trees nearby.

2. Modified salvage harvesting 1,000-3,000 acres/year, as in the original proposal, with the primary goal of supporting a local timber industry, to continue only until wood is no longer usable, or in any case not past 2025 (7 years), within a maximum of 21,000 acres (about 1/3) of the 62,000 acre project area, focused along existing roads. Leave, for wildlife and natural recovery processes, 1/2 or more of dead trees in all areas, spanning all available tree sizes on each site. Harvest using minimum-disturbance methods that retain all surviving live trees, small or large, just remove only dead trees. Monitor surviving and regenerating trees before and after salvage logging at a random sample of sites; if there are insufficient survivors or regenerating trees by 2-3 years after harvesting, then initiate prescribed burning to encourage tree regeneration from seed. Generally avoid tree planting, so that genetic adaptation to beetles and to the emerging hotter climate is enhanced.

Literature Cited

Most of the literature cited is available online and can be downloaded for use. I am happy to send pdfs of citations that you cannot access, if you contact me.

Baker, W. L. 2018a. Historical fire regimes in ponderosa pine and mixed-conifer landscapes of the San Juan Mountains, Colorado, USA, from multiple sources. *Fire* 1: article 1020023. Online at: https://www.mdpi.com/2571-6255/1/2/23

Baker, W. L. 2018b. Transitioning western U.S. dry forests to limited committed warming with bet-hedging and natural disturbances. *Ecosphere* 9: article 302288. Online at: https://esajournals.onlinelibrary.wiley.com/doi/epdf/10.1002/ecs2.2288

Dubois, C. 1903. Report on the Proposed San Juan Forest Reserve, Colorado; Unpublished Report on file at the San Juan National Forest, Supervisor's Office; San Juan National Forest: Durango, CO.

Dubois, C. 1904. The Proposed Montezuma Forest Reserve, Colorado; Original document is in the National Archives and Records Administration; U.S. Department of Agriculture, Bureau of Forestry: Broomfield, CO. A Typed Facsimile Version is available online: www.fs.usda.gov/detail/gmug/landmanagement/resourcemanagement/?cid=stelprdb5378367

Dugan, A. J., and W. L. Baker. 2015. Sequentially contingent fires, droughts and pluvials structured a historical dry forest landscape and suggest future contingencies. Journal of Vegetation Science 26: 697-710.

Fettig, C. J., K. E. Gibson, A. S. Munson, and J. F. Negrón. 2014. Cultural practices for prevention and mitigation of mountain pine beetle infestations. *Forest Science* 60: 450-463.

Graham, R. T., L. A. Asherin, M. A. Battaglia, T. B. Jain, and S. Mata. 2016. Mountain pine beetles: a century of knowledge, control attempts, and impacts central to the Black Hills. USDA Forest Service General Technical Report RMRS-GTR-353, Rocky Mountain Research Station, Fort Collins, Colorado, USA. Online at: https://www.fs.usda.gov/treesearch/pubs/52308

Lindenmayer, D. B., P. J. Burton, and J.F. Franklin. 2008. Salvage logging and its ecological consequences. Island Press, Washington, D.C.

Lindenmayer, D. B. D. R. Foster, J. F. Franklin, M. L. Hunter, R. F. Noss, F. A. Schmiegelow, and D. Perry. 2004. Salvage harvesting policies after natural disturbance. *Science* 303: 1303. Online at: https://harvardforest.fas.harvard.edu/sites/harvardforest.fas.harvard.edu/files/publications/pdfs/Lindenmayer_Science_2004.pdf

Rangwala, I., and J. R. Miller. 2010. Twentieth century temperature trends in Colorado's San Juan Mountains. *Arctic, Antarctic, and Alpine Research* 42: 89-97.

Rehfeldt, G. E., B. C. Jaquish, C. Sáenz-Romero, D. G. Joyce, L. P. Leites, J. B. St Clair, and J.

López-Upton. 2014. Comparative genetic responses to climate in the varieties of *Pinus ponderosa* and *Pseudotsuga menziesii*: Reforestation. *Forest Ecology and Management* 324:147-157.

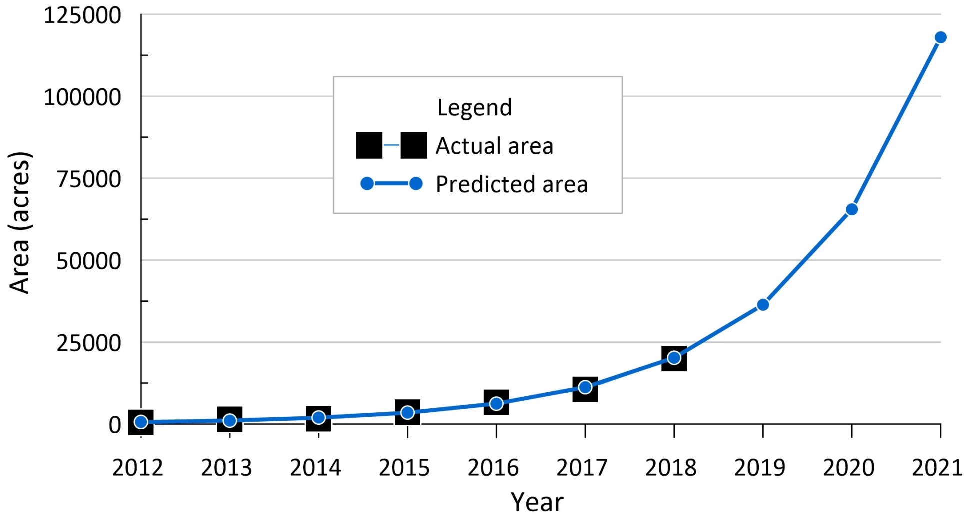
Six, D. L., E. Biber, and E. Long. 2014. Management for mountain pine beetle outbreak suppression: does relevant science support current policy? *Forests* 5: 103-133. Online at: https://www.mdpi.com/1999-4907/5/1/103.

Six, D. L., C. Vergobbi, and M. Cutter. 2018. Are survivors different? Genetic-based selection of trees by mountain pine beetle during a climate change-driven outbreak in a high-elevation pine forest. *Frontiers in Plant Science* 9: 993. Online at: https://www.frontiersin.org/articles/10.3389/fpls.2018.00993/full

Stevens-Rumann, C. S., K. B. Kemp, P. E. Higuera, B. J. Harvey, M. T. Rother, D. C. Donato, P. Morgan, and T. T. Veblen. 2018. Evidence for declining forest resilience to wildfires under climate change. *Ecology Letters* 21: 243-252. Online at: https://www.researchgate.net/profile/Monica_Rother/publication/321753770_Evidence_for_declining_forest_resilience_to_wildfires_under_climate_change/links/5a315ae90f7e9b2a284cea8f/Evidence-for-declining-forest-resilience-to-wildfires-under-climate-change.pdf

BOX 1. Beetle area now affected (actual area) and prediction of future area affected
The area of forest affected by bark beetles has increased exponentially since 2012 and is projected here to reach about 35,000 acres by the beginning of the project in 2019 and 63,000 acres by the following year, in 2020. This assumes the exponential trend observed since 2012 continues as it has up to 2018 (Figure 1, Table 1) into subsequent years. The predicted 63,000 acres in 2020 is about equal to the 62,000 acre project area–an area equal to the entire project area could have already been affected by bark beetles by the second year of the project.

Figure 1. Actual and predicted area affected by beetles



Prediction Equation fitted from data in Table 1 using Minitab 18:

Area-predicted = Exp (-1176.3 + 0.5878 X Year), $R^2_{pred} = 96.1\%$

Table 1. Actual and predicted area affected by bark beetles in the project area

Year	Area (acres)-actual[1]	Area (acres)-predicted
2012	492	575
2013	1478	1034
2014	1628	1862
2015	3620	3351
2016	6643	6032
2017	10584	10857
2018	20000	19544
2019		35179
2020		63323
2021		113982
2022		205171

[1]Sources are 2012-2017: from Colorado State Forest Service (2017) 2017 report on the health of Colorado's forests, CSFS, Fort Collins, CO; 2018: from Lone Pine Vegetation Management Project - Scoping Package p. 1: "20,000 acres are either dead or currently infested with bark beetles."