Custer Gallatin National Forest Plan and DEIS

90-day public comment period running **March 1 - June 5, 2019.**
https://cara.ecosystem-management.org/Public/CommentInput?project=50185

My comment is narrowly focused on Custer Gallatin National Forest DEIS assessment's adequacy in covering the implications that a changing climate is and will be imposing for the future of trees on the Custer Gallatin National Forest, specifically including the future of trees on the already affected Ashland. While outcomes for trees have many implications including those related to streamflow, soil moisture, and wildlife, I'll largely leave those implications aside and focus only on trees per se. I will conclude my comment with recommendation that any commitment you make to forest resilience will necessarily have to include commitment to a drought-tolerant and fire-resistant tree which is native to Montana, the Bur Oak <<http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDFAG05190>>.

Because climate and forest are closely coupled systems, I'll open this comment with a highly regarded climate scientist's comment on climate assessments by the Intergovernmental Panel on Climate Change (IPCC):

"The IPCC format, perfected by the late Bert Bolin, is a painstaking self-interrogation process of the pertinent scientific community. In this process, virtually every stone in the cognitive landscape is turned and the findings, however mundane or ugly, are synthesized into encyclopedic accounts. Unfortunately, such an approach is inherently tuned for burying crucial insights under heaps of facts, figures, and error bars. "
Hans Joachim Schellenhuber.
"Global warming: Stop worrying and start panicking?"
Proceedings of the National Academy of Sciences 2008

[open access] https://www.pnas.org/content/105/38/14239

Much the same criticism holds true for the Custer Gallatin National Forest's DEIS on climate; e.g., a search for references finds frequent but passing, fleeting reference to climate on well over 100 widely scattered pages. These widely scattered references do succeed in acknowledging that climate has varied influence, and this acknowledgement is important. However, given the format of the DEIS, it is common to find climate referred to in only fleeting, passing references such as the three examples below:

Example 1 -This assessment uses a set of future scenarios that influence the resource projections, allowing the exploration of a range of possible futures for United States renewable natural resources. Alternative future scenarios were used to analyze the effects of human and environmental influences on U.S. forests and rangelands, including population growth, domestic and global economic growth, land use change, and climate change. Page 15

Example 2 - "The remarkable habitat diversity of the Custer Gallatin National Forest is a function of topography, hydrography soils, climate and disturbance processes. These factors create the vegetation and structural conditions that provide food, water, and shelter for wildlife. In general, areas of high habitat diversity not only provide for greater wildlife species diversity, but also tend to be more resilient to stressors such as fire, floods, insects, disease, drought, and climate change. " Page 316

Example 3 - "Cumulative effects may also occur because of indirect effects of forest planning combined with possible future stressors, such as climate change." Page 330

I'll repeat my earlier remark that these fleeting, passing references to the role of climate do succeed in acknowledging that climate is capable of diverse effects, and that this acknowledgement is important.

However, and it's a big however, the format of widely scattered, fleeting, passing reference to diverse effects for reporting is a piecemeal approach, effectively "burying" crucial insights in similar fashion to climate assessments by IPCC. This format puts undue hobbles on the required candor in disclosure of risks that climate —most notably hotter and drier conditions — impose on the Custer Gallatin National Forest trees, its managers, and its many private and public stakeholders.

All that said, the DEIS, like the IPCC assessments, does include "crucial insights," including, *buried 151 pages deep*, this one; "For example, dry forests that already occur at the edge of their climatic tolerance are increasingly prone to conversion to non-forests after wildfires due to regeneration failure (Stevens-Rumann et al. 2018). This trend is likely to continue in the future across all forest types as large wildfires remove local seed source and suitable climate space for tree regeneration becomes increasingly rare (Bell et al. 2014, Harvey et al. 2016b, Andrus et al. 2018). Page 151

Now we begin to see some needed meat on the bones of an otherwise skeletal, scattered coverage of climate influence on trees. Better yet, the DEIS assessment of this obviously crucial insight continues: "Indeed, the ponderosa pine systems of the pine savanna ecosystems have experienced high rates of cover type conversion due to recent fires. In Ashland, for example, in the 1990s approximately 219,214 acres were classified with forest cover, in 2012 approximately 116,708 acres were classified as forested. The net change is an almost 50 percent reduction of the forest cover from what occurred in the 1990s (U.S. Department of Agriculture 2014)." Page 151

Conversion to non-forest is a most-crucial insight. It points to a significant risk for the future of trees, in this case the future of ponderosa pines. Specifically, it identifies a risk that ponderosa pines may not or simply can not be resilient after disturbance *such as* fire.

This disclosure puts some needed meat on the bones of an otherwise skeletal collection of fleeting references to the effects of climate change. It also raises a question of, if the ponderosa won't be resilient, what tree will?

Apparently not the Douglas fir. Confirming a trend already cited with the DEIS above reference to Stevens-Rumann et al, a recent 2019 PNAS study (Davis et al, "Wildfires and climate change push low-elevation
forests across a critical climate threshold for tree regeneration." pdf attached) found that, basically, *the same hot, dry conditions favorable to fire are unfavorable to post-fire survival of Ponderosa pine and Douglas fir seedlings alike.*

This leaves the question of what tree species might be resilient in the hot dry conditions where the two conifers aren't. It's important to have answers to this question because, as the DEIS plainly states, "*Resilience* is defined as the degree to which forests and ecosystems can recover from one or more disturbances without a major shift in composition or function …." Page 151

This is the Forest Service definition of resilience. To give that topic more clarity, compare the agency's definition to these three others:

2018 — "Resilience is a popular narrative for conservation and provides an opportunity to communicate optimism that ecosystems can recover and rebound from disturbances." (Emily S. Darling *and* Isabelle M. Côté, Science, March 2, 2018).

2014 — "Emerging from a wide range of disciplines, resilience in policy-making has often been based on the ability of systems to bounce back to normality, drawing on engineering concepts. This implies the return of the functions of an individual, household, community or ecosystem to previous conditions, with as little damage and disruption as possible following shocks and stresses"

(Tanner et al, Nature Climate Change, December 18, 2014).

1938 — Resilience**.** 1- The act or power of springing back to a former position or shape. 2. The quantity of work given back by a body that is compressed to a certain limit and then allowed to recover itself, as a spring under pressure suddenly relaxed." (Funk & Wagnall's New Standard Dictionary of the English Language, vol.2, M-Z 1938)

By any definition, resilience is clearly not evident on the Ashland, which has already lost 50% of its tree cover. This already evident conversion to non-forest, especially in light of findings by Stevens-Rumann et al (2018) and Davis et (2019 pdf attached), raises a tightly related management question that is nicely spelled out in the DEIS:"Approaches to address forest and ecosystem management in the face of an uncertain and variable future s**hould be flexible**, emphasize ecological processes; **and have the capacity to change,** and to adapt, to new information as it becomes available (Millar et al. 2007).

At this point, where resilience of Ponderosa pine and Douglas fir may well be a lost cause, **management flexibility** and **capacity to change** must move beyond the conifers at risk.

For example, in the case of the Ashland, the DEIS would have us believe that, "While most of this area will likely regenerate naturally or with planting efforts, …"

Given the information recently available, natural regeneration is likely wishful thinking, and planting of seedlings is likely an exercise in futility. And, moreover, in direct contradiction to above claims for natural regeneration and planting, the DEIS immediately follows those claims by adding that, "it is likely that a significant portion will remain unforested for **at least the next few decades** due to a lack of seed source. " [bold emphasis added] Page 151

Well, yes, but given the information recently available, it is also

likely that the affected acreage will remain unforested if the Custer Gallatin National Forest pins its hopes for the Ashland on seeding of Ponderosa pine and/or Douglas fir. Again, the likely and even expected future of hot, dry conditions favorable to fire are also unfavorable for seedling survival in these needleleaf trees. This expected future , as you likely know, has been documented; e.g.,"Increasing air temperature, through its influence on soil moisture, is expected to cause gradual changes in the abundance and distribution of tree, shrub, and grass species throughout the Northern Rockies, with drought tolerant species becoming more competitive." (Keane et al, pdf attached)

Management change and flexibility thus requires planning for trees capable of resilience under the expected hot, dry climate conditions where the conifers are likely to fail.

More specifically, management change and flexibility requires the Custer Gallatin National Forest to consider the bur oak, a native Montana tree.

The DEIS makes no mention of the bur oak. None. Not one. This is a major hole in the DEIS assessment, because the documented characteristics — fire resistance, drought tolerance — of this native Montana tree make it a prominent candidate for hope of resilience on the Ashland.

Bur oak

3 factoids

1- Bur Oak is a native Montana tree <<http://fieldguide.mt.gov/speciesDetail.aspx?elcode=PDFAG05190>>

2- Its current Montana native range is in the southeast of the state, as is the Ashland

3- The Montana Champion bur oak is in a Missoula, Montana schoolyard.

The fine print

Bur oak forests may be bur oak savannahs.They closely resemble the with ponderosa pine savanna formerly common to the Ashland.

Representative photo accompanies some basic information here:
https://www.fs.fed.us/database/feis/plants/tree/quemac/all.html

Bur oak have a reputation for drought tolerance; e.g., Montana's state nursery describes them that way, and sells a quick-maturing cultivar with a life span estimated at 85 years.

Wild population lifespans are estimated as 300-400 years old
https://www.fs.fed.us/database/feis/plants/tree/quemac/all.html#BotanicalAndEcologicalCharacteristics

Wild bur oak longevity of 300+ years makes it a long term asset in carbon capture.

Bur oak have a known fire history. Forest Service information its fire history is available to the public here:
https://www.fs.fed.us/database/feis/plants/tree/quemac/all.html#FireEffectsAndManagement

Excerpts from the above feis:

Immediate fire effect on plant: Mature bur oak trees are not typically damaged by fire, and bur oak trees only 3 feet

(1 m) tall may survive fire [53,55,120]. Bur oak seedling establishment varies on burned sites and is limited on repeatedly burned sites [3,5,30,139]. Survival of bur oak acorns on burned sites and heat tolerance of acorns were not reported in the literature. Generally, acorns produced by the white oak group have little to no dormancy and typically germinate or are removed by predators soon after falling, so establishment from soil-stored seeds on burned sites is unlikely (see Seed banking, Germination, and Seed predation).

Fire adaptations and plant response to fire: Based on prescribed fire studies in the Cedar Creek Natural Area and a review of other fire studies, Peterson and Reich [190] reported that bur oak is a fire "resister". Bur oak typically survives low-severity fire. It is long-lived and persistent at maturity. Bur oak maintains the potential for population growth when spatial or temporal variability in fire allows for seedling establishment or release of grubs [190].

Fire adaptations: Bur oak is well adapted to survive fire, and frequent fires are necessary for bur oak persistence in many habitats. Because the thick bark of mature bur oak trees insulates their cambium from high temperatures [8,239], mature trees rarely suffer any fire damage [5,30]. Young bur oak trees are typically only top-killed by fire [66,219,221]. Once bur oak trees reach 12 to 15 years old, they can survive repeated burning [53].

Like the whitbark pine, the bur oak has a history of periodic support of bird, squirrel and bear populations, with the pine occasionally casting off pine nuts, and the oak occasionally casting off acorns. Anectodal accounts describe bears breaking bur oak branches in pulling them down to get acorns that hadn't fallen yet. In the wrong places, bur oak will likely get bears in trouble. Placed well, it has some potential for bears' benefit.