Data Submitted (UTC 11): 2/25/2025 5:47:30 AM
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Comments: Tongass Forest Plan Revision Draft Assessment Comments
February 24, 2025
I have read or reviewed about a dozen of the chapters of this assessment and have some general comments about the assessment as a whole, as well as comments specific to some individual chapters (below). First though, I think that these chapters represent a huge amount of work, and acknowledge all of the effort put into them by the various authors. Thank you to all the federal employees engaged in this project, you are appreciated!
One comment I have is that there is a wide range in clarity and depth across the chapters, with some far more organized and readable than others. I wish that there was a bit more coherence among the chapters in the way that they are structured. Some chapters nicely lay out the current state of a resource or process, discuss trends and future changes, its importance to people and ecosystems, and then possible actions, all supported by good citations. The Geology and Geohazards and Terrestrial Ecosystems chapters are very good examples of this (in fact the latter actually goes through the eleven identified habitat types and assesses their status and vulnerability!). Other chapters are much less organized and provide less information useful to decision making.
There is also a lack of coherence among chapters in terms of what drivers and stressors are discussed in regards to certain resources. Some chapters reference that a certain stressor is discussed in another chapter, but this is often not true. It would be better to have more overlap between chapters; I think it's useful to have the information repeated than to not find it if one is only reading a couple of chapters. Hopefully, the integrated Final Assessment Report will do a better job of creating a document that is holistic, coherent, and actually serves as a tool for decision making for the new Forest Plan.
Perhaps most importantly, I also feel like many of the chapters pussyfoot around the real ecosystem impacts caused by logging, mining, tourism, etc. For example, the Watershed Condition chapter states that the majority of watersheds are functioning properly, but take a look at the map and you can see that the scale of this metric is huge and so don't take into account smaller, important subwatersheds. Many of the watersheds that are "at risk" are near human communities and the fact that ~40% of stream crossings do not meet juvenile fish passage requirement is startling (and buried in the Restoration section). Another example is the complete lack of any discussion around the impacts of past logging practices on carbon stocks and sequestration rates, or the lack of any real discussion around the impacts of climate change and extreme weather events on the reliability and safety of mining infrastructure like tailings dams. I realize and acknowledge that the Tongass is a very healthy and relatively complete ecosystem compared with many others in the United States; however, it is all the more vital that we recognize the overlapping threats to this place and work to maintain its ecological integrity.
Individual Chapter Comments:
Drivers, Stressors, and Climate Change
This chapter suffers from the fact that the climate change piece is already covered in far more detail in Tongass National Forest Climate Change Vulnerability Assessment by Halofsky et al (unpublished), and many of the drivers and stressors pieces are also mostly covered in other resource specific chapters. This leaves one wondering what the point of this chapter is, and the authors do little to craft a coherent narrative that might remedy that. This could be improved if the drivers of the regional terrestrial and marine ecosystems were better and more fully laid out. For example, current climate certainly is a driver, but so is the past climate, as seen in the legacy of glacially influenced landforms, successional vegetation sequences, and plant distributions. Lithology is a driver of terrestrial plant communities, and glacial runoff is a driver of marine and intertidal communities. As the authors indicate, storms and windthrow are major disturbance mechanisms, but so are avalanches and mass wasting events such as landslides, which are not mentioned at all. Insects and fire are not major drivers in this region and as such should perhaps be mentioned as possible future stressors, but not ones that are currently important.
Similarly, the stressors described do not fully capture the reality of the situation. The coming changes in weather and climate are more complex than annual trends; for example, while the southern panhandle is likely getting

wetter overall on an annual basis, it is likely going to experience most of that precipitation during the fall, winter, and spring, while summers are likely to get much drier. This increasing variability, both within a year and across years, is the kind of stressor that should be highlighted. No mention is made of the increase in numbers and severity of atmospheric rivers projected in coming decades, or how this may in turn lead to an increase in landslides and other mass wasting events and impact ecosystems. Similarly, no mention is made at all of how changes in precipitation patterns may affect hydropower resources or mining infrastructure such as tailings dams. Large-scale logging, while not a current stressor, was certainly one in the recent past and yet no mention of this is made. Tourism is an increasing stressor to ecosystem health, with larger and larger numbers of cruise ships, helicopters, sport fishing boats, and other vessels filling our seas and skies, and more and more people using resources seasonally. Warming ocean temperatures are driving more harmful algal blooms, leading to poisoning events in both people and animals, and impacting harvesting practices. Shellfish (wild and farmed) are subject to multiple stressors including ocean acidification and increasing disease susceptibility (e.g., Vibrio).
It would be helpful if this chapter was more integrated with the other resource assessment chapters, pulling the key elements from each of those together so that the reader could just read this chapter to get a feel for climate and other stressor impacts to the Forest, rather than having to go to each of the chapters individually. But again, maybe this is what the Halofsky document is for, but we don't have access to it now.

Specific comments:
*In the last paragraph of the Introduction the authors state that insects and disease are a leading cause of tree mortality. This is not true in southeast Alaska; insects such as Hemlock Sawfly rarely if ever cause widespread tree death although they can seasonally affect foliage of trees across large swaths of the landscape with little long-term effects on tree health. Trees are prone to various types of fungal pathogens, leading to forest canopy complexity and size heterogeneity.
*Under Current Climate as Driver of Vegetation Distribution, while the northern limit of redcedar occurs near Kake, yellow-cedar does extend into northern Southeast (and to Prince William Sound in fact). It would be good to distinguish here the difference between red and yellow-cedar and their respective ranges.
*In the Forest Insect, Disease and Decline section there is mention of yellow-cedar decline but I think this fits much better in the Climate Driver section as the lack of snowpack combined with hard spring frosts are the culprit behind this ongoing and massive tree mortality event. In addition, the citation at the end of the second paragraph should be Krapek et al. 2017.
*In the Wind/Windthrow section it mentions that the connection between storms/wind and climate change remains unresolved; however, we do expect that storms will increase in severity and frequency. See Lader et al. 2022.
*It is surprising that the climate change section within the Stressors discussion (pages 12-22) does not actually mention potential impacts to terrestrial systems at all. We know that temperature and precipitation are driving changes to vegetation (eg. Buma and Barrett 2015). This is all covered in far greater detail in the Terrestrial Ecosystems Resources chapter, but it needs to be at least mentioned in a general way here.
*The section Anticipated Trends in Glaciological Effects and Sea Level Change does not mention downstream effects of glacial melt, including changes to stream ecosystems and capacity to support salmon populations, and impacts to nearshore ecosystems including changes in turbidity, temperature, community composition, and water chemistry. There is a large body of literature from Southeast Alaska on the effects of glaciers on downstream ecosystems - see papers by Eran Hood, Jason Fellman, Rob Spencer, Rick Edwards, Ryan Bellmore, to name a few.
*In the last paragraph under Ocean Chemistry and Sea Surface Temperatures, add "and drive uptake of $CO_2$ from the atmosphere" after "Glacial meltwater can have diluting effects on the nutrient content of downstream marine waters". Also, replace "corrosivity of aragonate, which is the most soluble carbonate biomineral" with "corrosive conditions".
*Also in this section, no mention is made of the increasing incidence of harmful algal blooms, which is related to increasing SST and probably also driven by changes in pH.

Useful citations:

Alaback PB. Comparative ecology of temperate rainforests of the Americas along analogous climatic gradients. Revista Chilena de Historia Natural. 1991 Dec 1;64(3).

Lader R, Walsh JE, Bhatt US, Bieniek PA. Projections of twenty-first-century climate extremes for Alaska via dynamical downscaling and quantile mapping. Journal of Applied Meteorology and Climatology. 2017 Sep;56(9):2393-409.

Lader R, Bhatt US, Walsh JE, Bieniek PA. Projections of hydroclimatic extremes in Southeast Alaska under the RCP8. 5 scenario. Earth Interactions. 2022 Jan;26(1):180-94.

Buma B, Barrett TM. Spatial and topographic trends in forest expansion and biomass change, from regional to local scales. Global Change Biology. 2015 Sep;21(9):3445-54.

Hood E, Berner L. Effects of changing glacial coverage on the physical and biogeochemical properties of coastal streams in southeastern Alaska. Journal of Geophysical Research: Biogeosciences. 2009 Sep;114(G3).

Fellman JB, Nagorski S, Pyare S, Vermilyea AW, Scott D, Hood E. Stream temperature response to variable glacier coverage in coastal watersheds of Southeast Alaska. Hydrological Processes. 2014 Feb 15;28(4):2062-73.

Hood E, Fellman JB, Spencer RG. Glacier loss impacts riverine organic carbon transport to the ocean. Geophysical Research Letters. 2020 Oct 16;47(19):e2020GL089804.

Fellman JB, Bellmore JR, Johnson C, Dunkle MR, Hood E. Glacier runoff influences biogeochemistry and resource availability in coastal temperate rainforest streams: Implications for juvenile salmon growth. Limnology and Oceanography. 2023 Jan;68(1):70-83.

Fellman JB, Spencer RG, Hernes PJ, Edwards RT, D'Amore DV, Hood E. The impact of glacier runoff on the biodegradability and biochemical composition of terrigenous dissolved organic matter in near-shore marine ecosystems. Marine Chemistry. 2010 Aug 20;121(1-4):112-22.

Hood E, Fellman J, Spencer RG, Hernes PJ, Edwards R, D'Amore D, Scott D. Glaciers as a source of ancient and labile organic matter to the marine environment. Nature. 2009 Dec 24;462(7276):1044-7.

McIntyre L, Miller A, Kosatsky T. Changing trends in paralytic shellfish poisonings reflect increasing sea surface temperatures and practices of indigenous and recreational harvesters in British Columbia, Canada. Marine drugs. 2021 Oct 14;19(10):568.

Geology and Geologic Hazards

This chapter is very well written and does a nice job of laying out the various geologic settings, their ecological and human importance, and management considerations. The authors also do a similarly good job describing the various geohazards present in the region, their histories, trends, and possible mitigation actions. Unlike some other chapters I don't have that many comments to provide beyond the specific edits below.

Specific comments:

*In the first paragraph under Ecological Drivers on Page 6, please provide a citation for "landslides cause the largest area of disturbance of any natural phenomena on the Tongass National Forest."

*On the first line of page 13, replace "plan" with "plane."

*Under General Description of Volcanic Ash Soils, page 13, replace "create" with "creating."

*Under Snow Avalanche and Risks, page 15, the Climate Adaptation Science Center citation is not in the list of

references.
*The second sentence of the second paragraph under When Landslides Happen, page 19, does not make sense.
*On page 23 under Landslide Mitigation, it would be worth mentioning that perhaps we should not be rehabilitating and reseeding landslide paths with invasive grasses, as is generally done now (and invasive species are one stressor mentioned in a different chapter). At the end of this same paragraph, do you mean Kutí, not Kaadí? The Landslide working group is an offshoot of the NSF-funded Kutí project.
*The Glacial Lake outburst flood discussion should also probably mention threats to the Situk River and Yakutat from the Hubbard Glacier.
*At the end of the last paragraph on page 24 it states "In 2023, in addition to flooding parts of Juneau, extreme bank erosion occurred, with 20 to 150 feet of bank being eroded in just a few days." It also resulted in several buildings being heavily damaged or lost completely.

Carbon Stocks
I find it interesting and bit frustrating that this chapter doesn't discuss the legacy of logging and the estimated overall impact of that to carbon stocks and sequestration rates at all. I think it would be interesting to understand this better as it gives context to the current status. Also, I'm curious where many of the figures come from, or were they specially created for this chapter? If not, please provide citations. And is the scale for Figure 9 correct? A soil carbon value of 100,000 gC/m2 doesn't seem at all realistic, unless it's to a five meter depth, and even then it seems questionable.

Energy and Minerals
This is a good chapter. It covers the topic nicely, mentioning climate change and other stressors and uncertainties, and providing a good assessment of current status and proposed actions. I do wish it discussed some things in greater detail, particularly around extreme weather events causing flooding and landslides and severely affecting tailing facilities, and around changing precipitation patterns and impacts to hydropower. I also wish that it addressed the past impacts of mining (like the flooding of a valley for the Kensington mine tailings pond) and potential impacts of new mining developments, since this is a huge topic right now, especially in Klukwan and Haines around the Palmer project, and to a lesser extent in Juneau around the potential expansion of Greens Creek and development of a mine up the Herbert River. Not only are the mines themselves a potential impact, but all the infrastructure associated with them, including roads, docks, greenhouse gas pollution, etc.

Aquatic Ecosystems
I found this chapter to be pretty weak, and it seems like it was written in haste. After reading it, I don't feel like I have learned much about the current status of aquatic resources on the Tongass. There's little or no discussion of impaired streams, all the restoration work being done (and why), or the downstream impacts of glacier melt. Amazingly, the Nearshore and Marine sections make no mention of ocean acidification, harmful algal blooms, reduction in size and populations of salmon, or increasing tourism and pollution. The whole thing needs copyediting and more citations throughout.

Specific comments:
*In the Glaciers section the paragraph on page 6 that describes ice worms (while charming) is irrelevant.
*The description starting on page 7 of several glaciers is not useful; there are many other glaciers within the Tongass that could just as equally have been described here.
*As in the Drivers, Stressors and Climate Change chapter, there is no mention of all the glacier work in southeast Alaska by Hood, Fellman, Spencer, Edwards, etc (see comments and citations under that chapter above).
*In the Rivers and Streams section are Glacial Outwash streams a separate type of watershed or a subset of Floodplain?
*What is the point of listing and describing the watershed types if you don't break down the status, trends and stressors for each? The Terrestrial Ecosystems chapter provides a nice example of this. (Note: the Watershed Condition chapter has these descriptions also, and also doesn't use them to discuss their status).

*The first paragraph under Rivers and Streams Drivers and Stressors (page 14) is not complete.
*The third paragraph under this same section (page 14) should reference Ryan Bellmore's stream portfolio work:

Bellmore JR, Fellman JB, Hood E, Dunkle MR, Edwards RT. A melting cryosphere constrains fish growth by synchronizing the seasonal phenology of river food webs. Global Change Biology. 2022 Aug;28(16):4807-18.

Fellman JB, Bellmore JR, Johnson C, Dunkle MR, Hood E. Glacier runoff influences biogeochemistry and resource availability in coastal temperate rainforest streams: Implications for juvenile salmon growth. Limnology and Oceanography. 2023 Jan;68(1):70-83.

*The next paragraph in this section should mention the downstream glacier literature (as above)
*Under Lakes and Ponds it would be helpful if there was a synopsis of the 2017 ADEC lake condition survey (top of page 21).
*The Lake Ecosystem Services (page 21) paragraph is incomplete; Status and Trends needs citations
*Define PMH (page 24)