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The Myth of "Overgrown" Forests

Forests today are not "overgrown". In fact, due to logging, which has been removing vast numbers of trees from public and private forests in the U.S. for many decades, we currently have far less biomass, and therefore carbon, in most of our forests than they would otherwise naturally have.[1] In the western U.S., for example, the most current and comprehensive research concludes that, historically (before fire suppression and logging), forest density was highly variable. "Open" forests with relatively low tree densities were a minor portion of the forested landscape, including in ponderosa pine and mixed-conifer forests. The majority of these forest types were moderately to very dense historically, with hundreds of seedlings, saplings and small trees per acre, and several dozen or more mature/old trees per acre, often with dense shrub understories.[2] This variability in density was shaped by mixed-intensity fire, which included both small and very large patches of high-intensity fire. These high-intensity fire patches typically covered between 22% and 39% of the total area burned in wildfires (the remaining 61% to 78% was comprised of low/moderate-intensity fire). Recent studies by U.S. Forest Service scientists, claiming that historical tree densities in western forests were much lower than they are today, left out of their assessments data on small tree density, and density of non-conifer trees like oaks. When this error was corrected by subsequent researchers, and these missing data were included, it was determined that historical tree density was on average 7 times higher than claimed by the Forest Service in ponderosa pine forests, and 17 times higher in mixed-conifer forests.[3]

Dense forests do not burn more intensely. Logging interests claim that dense, mature and old forests will burn more intensely due to "fuel accumulation", often referencing decades of fire suppression to claim that we must log forests that haven't burned in a long time. However, the science tells us a very different story. Denser, mature and old forests have higher canopy cover, which creates a cooler, shadier microclimate, and such forests have more trees, which act as a natural windbreak against the gusts that drive the flames in wildfires. For these reasons, the densest forests do not tend to burn more intensely in wildland fires, and typically burn ***less*** intensely. This includes long-unburned forests, forests with the highest biomass levels and strongest environmental protections from logging, and mature/old forests with higher densities of trees per acre.[4] Nor do forests with high numbers of dead trees, from drought and native bark beetles, burn more intensely than other forests, according to the largest and most comprehensive scientific analyses.[5] In fact, such forests often burn less intensely, and this is true even years after trees die and later fall to the ground.[6] Shortly after trees die, the needles and small twigs fall and decay into soil, after which there is not much material to carry flames and, when dead trees fall, they soak up and retain large amounts of soil moisture on the forest floor, like giant sponges.

Dense forests are not more susceptible to tree mortality from native beetles or drought. In fact, denser, older forests tend to be ***less*** susceptible to such mortality.[7] Forests share information and nutrients from tree to tree through a vast network of mycorrhizal fungi filaments in the soil, and a single teaspoon of soil in a natural forest may contain several dozen miles of such filaments. It benefits trees to be close to one another. Researchers have concluded that thinning, conducted under the guise of preventing tree mortality from native bark beetles, kills far more trees than the drought or beetles otherwise would.[8]

Logging does not curb wildfires—it does the opposite. When logging occurs, such as commercial "thinning", it reduces the cooling shade of the forest canopy, creating a hotter, drier, and windier microclimate, and leaving behind logging "slash debris" made up of the easily combustible tops, branches and needles of the previously standing trees. In addition, logging machinery spreads easily ignitable, highly combustible invasive grasses like cheatgrass. For these reasons, logging tends to increase, not decrease, fire intensity,[9] and this is also true where logging is focused on the removal of dead trees, as in post-fire logging.[10] The fact is that forest fires are driven mainly by weather and climate, but logging can be a significant additive factor, which can make fires more intense.[11] We saw the tragic consequences of this in the fall of 2018 in northern California, as the Camp fire raced through thousands of acres that had been logged in previous years (removal of both dead and live trees, from clearcuts to thinning operations, on private and public lands; see map @ https://johnmuirproject.org/2019/01/logging-didnt-stop-the-camp-fire/) before devastating the town of Paradise.

Not only does logging fail to curb wildfires, where logging is conducted under the guise of "thinning" for fire management or "forest health", the science shows that it causes a large overall net loss of forest carbon and a large net increase in carbon emissions relative to fire alone,[12] especially since most of the carbon in trees removed from the forest through logging ends up in the atmosphere almost immediately, incinerated as "slash" and mill residues, with very little ending up in wood products.[13] Even in a large, intense wildfire, only about 2% to 3% of the carbon in the trees is actually consumed—mostly seedlings and saplings, and some needles and small twigs in some of the mature trees.[14] Most of the carbon removed from the forest in "thinning" logging projects is in the form of mature/old trees. This means that nearly all of the wood, and carbon, killed and removed from forests by thinning for "fuel reduction" is literally non-combustible in a forest fire.

Protecting forests, and allowing them to increase their biomass and carbon, is essential to climate change mitigation. Because U.S. forests currently have much less carbon/biomass than they did historically, due to many decades of logging, our forests have enormous climate change mitigation potential to draw down atmospheric carbon as they grow, but only if we protect public forestlands from logging and increase protections on current private forests.[15] Increasing the amount of carbon stored in our forests, by keeping them standing and letting them grow, will also help prevent extinction of many imperiled forest species.[16]

Endnotes

[1] (a) Depro, B.M., et al. 2008. Public land, timber harvests, and climate mitigation: Quantifying carbon sequestration potential on U.S. public timberlands. Forest Ecology and Management 255: 1122-1134; (b) Law, B.E., et al. 2018. Land use strategies to mitigate climate change in carbon dense temperate forests. Proceedings of the National Academy of Sciences of the United States of America 115: 3663-3668; (c) Strassburg, B.B.N., et al. 2020. Global priority areas for ecosystem restoration. Nature 586: 724-729.

[2] (a) Williams, M.A., and W.L. Baker. 2012. Spatially extensive reconstructions show variable-severity fire and heterogeneous structure in historical western United States dry forests. Global Ecology and Biogeography 21: 1042–1052; (b) Baker, W.L. 2014. Historical forest structure and fire in Sierran mixed-conifer forests reconstructed from General Land Office survey data. Ecosphere 5: article 79; (c) Hanson, C.T., and D.C. Odion. 2016a. Historical forest conditions within the range of the Pacific Fisher and Spotted Owl in the central and southern Sierra Nevada, California, USA. Natural Areas Journal 36: 8-19; (d) Hanson, C.T., and D.C. Odion. 2016b. A response to Collins, Miller, and Stephens. Natural Areas Journal 36: 229-233; and (e) Baker, W.L., and C.T. Hanson. 2017. Improving the use of early timber inventories in reconstructing historical dry forests and fire in the western United States. Ecosphere 8: Article e01935.

[3] Baker, W.L., C.T. Hanson, and M.A. Williams. 2018. Improving the use of early timber inventories in reconstructing historical dry forests and fire in the western United States: reply. Ecosphere 9: Article e02325.

[4] (a) Odion, D.C., et al. 2004. Patterns of fire severity and forest conditions in the Klamath Mountains, northwestern California. Conservation Biology 18: 927-936; (b) Odion, D.C., and C.T. Hanson. 2006. Fire severity in conifer forests of the Sierra Nevada, California. Ecosystems 9: 1177-1189; (c) Campbell, J., D. Donato, D. Azuma, and B. Law. 2007. Pyrogenic carbon emission from a large wildfire in Oregon, United States. Journal of Geophysical Research Biogeosciences 112: Article G04014; (d) Odion, D.C., and C.T. Hanson. 2008. Fire severity in the Sierra Nevada revisited: conclusions robust to further analysis. Ecosystems 11: 12-15; (e) 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 98: 96-105; (f) 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; (g) Bradley, C.M. C.T. Hanson, and D.A. DellaSala. 2016. Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western USA? Ecosphere 7: article e01492; (h) Dunn, C.J., et al. 2020. How does tree regeneration respond to mixed-severity fire in the western Oregon Cascades, USA? Ecosphere 11: Article e03003; (i) Meigs, G.W., et al. 2020. Influence of topography and fuels on fire refugia probability under varying fire weather in forests of the US Pacific Northwest. Canadian Journal of Forest Research early online 1-30. doi: 10.1139/cjfr-2019-0406; (j) Lesmeister, D.B., Sovern, S.G., Davis, R.J., Bell, D.M., Gregory, M.J., and Vogeler, J.C. 2019. Mixed-severity wildfire and habitat of an old-forest obligate. Ecosphere10: Article e02696.

[5] (a) Hart, S.J., et al. 2015. Area burned in the western United States is unaffected by recent mountain pine beetle outbreaks. Proceedings of the National Academy of Sciences of the USA 112: 4375−4380; (b) Hart, S.J., and D.L. Preston. 2020. Fire weather drives daily area burned and observations of fire behavior in mountain pine beetle affected landscapes. Environmental Research Letters 15: Article 054007.

[6] Meigs, G.W., et al. 2016. Do insect outbreaks reduce the severity of subsequent forest fires? Environmental Research Letters 11: Article 045008.

[7] (a) Cochran, P.H., and J.W. Barrett. 1999. U.S. Forest Service Res. Pap. PNW-RP-508. Portland, OR; and (b) Oliver, W.W. 2005. Pages 71-79 *in* U.S. Forest Service, Gen. Tech. Report PSW-GTR-198.

[8] Six, D.L. 2014. Management for mountain pine beetle outbreak suppression: Does relevant science support current policy? Forests 5: 103-133.

[9] (a) Cruz, M.G., M.E. Alexander, and P.A.M. Fernandes. 2008. Development of a model system to predict wildfire behavior in pine plantations. Australian Forestry 71: 113-121; (b) Cruz, M.G., and M.E. Alexander. 2010. Assessing crown fire potential in coniferous forests of western North America: A critique of current approaches and recent simulation studies. International Journal of Wildland Fire 19: 377–398; (c) Cruz, M.G., M.E. Alexander, and J.E. Dam. 2014. Using modeled surface and crown fire behavior characteristics to evaluate fuel treatment effectiveness: a caution. Forest Science 60: 1000-1004; (d) Bradley, C.M. C.T. Hanson, and D.A. DellaSala. 2016. Does increased forest protection correspond to higher fire severity in frequent-fire forests of the western USA? Ecosphere 7: article e01492.

[10] (a) Donato DC, et al. 2006. Post-fire logging hinders regeneration and increases fire risk. Science 311: 352; (b) Thompson, J.R., Spies, T.A., Ganio, L.M., 2007. Reburn severity in managed and unmanaged vegetation in a large wildfire. Proceedings of the National Academy of Sciences of the United States of America 104, 10743–10748.

[11] Bradley, C.M., et al. 2016. Ecosphere 7: article e01492

[12] (a) Campbell, J.L., M.E. Harmon, and S.R. Mitchell. 2012. Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions? Frontiers in Ecology and Environment 10: 83-90; (b) Hudiburg, T.W., S. Luyssaert, P.E. Thornton, and B.E. Law. 2013. Interactive effects of environmental change and management strategies on regional forest carbon emissions. Environmental Science and Technology 47: 13132-13140.

[13] Hudiburg, T.W., et al. 2019. Meeting GHG reduction targets requires accounting for all forest sector emissions. Environmental Research Letters 14: Article 095005.

[14] (a) Campbell, J., D. Donato, D. Azuma, and B. Law. 2007. Pyrogenic carbon emission from a large wildfire in Oregon, United States. Journal of Geophysical Research Biogeosciences 112: Article G04014; and (b) Meigs et al. 2009. Forest fire impacts on carbon uptake, storage, and emission: the role of burn severity in the eastern Cascades, Oregon. Ecosystems 12: 1246-67.

[15] Moomaw, W.R, S.A. Masino, and E.K. Faison. 2019. Intact Forests in the United States: Proforestation Mitigates Climate Change and Serves the Greatest Good. Frontiers in Forests and Global Change 2: Article 27.

[16] (a) Depro, B.M., et al. 2008. Public land, timber harvests, and climate mitigation: Quantifying carbon sequestration potential on U.S. public timberlands. Forest Ecology and Management 255: 1122-1134; and (b) Strassburg, B.B.N., et al. 2020. Global priority areas for ecosystem restoration. Nature 586: 724-729.