United States Department of Agriculture
Forest Service

Grasshopper Restoration Project

Climate Change Report

Barlow Ranger District
Mt. Hood National Forest

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1.0 Introduction

1.1 Summary

Activities proposed by Alternative 1 (the "Proposed Action") and Alternative 2 (the "Shelterwood Alternative") would result in some carbon emissions and some carbon sequestration. A project of this size would make an extremely small contribution to overall emissions. The benefits to forest health and resiliency would allow stands to adapt to the future climate. The Forest Plan, as amended, does not contain direction related to climate change.

This report qualitatively addresses aspects of the project that may affect carbon emission or sequestration and how the project may help or hinder the forest's ability to deal with climate change. This analysis does not attempt to quantify carbon emission or sequestration. A quantitative carbon analysis was not conducted for this project because it would not likely lead to changes to activities proposed or to the creation of other alternatives that achieve the purpose and need.

2.0 Existing and Future Condition

Climate change is currently affecting national forests and rangelands and is expected to intensify in the future. For the Mt. Hood National Forest, climate change projections suggest that average annual temperature will increase by 4.5° C by the end of the century. Generally, more winter precipitation as rain and fewer summer precipitation events are anticipated, as well as earlier snowmelt in the spring (Bare et al. 2005, Dale et al. 2001, Halofsky et al. 2020, Mote 2003, Mote et al. 2005). The peer-reviewed climate change vulnerability assessment, *Climate Change Vulnerability and Adaptation in the Columbia River Gorge, Mount Hood National Forest, and Willamette National Forest* (CMWAP), analyzed how these changes will impact valued ecological, hydrological, and social resources on the Mt. Hood National Forest.

Projections indicate the project area is exposed to several climate change vulnerabilities that further places the Grasshopper Restoration project area at risk (Halofsky et al. 2020). The frequency and extent of wildfire and insect outbreaks are expected to increase with climate change. The probability of more extreme droughts may increase with climate change, and the period 1987-2013 was characterized by increased drought severity compared to the period 1960-1986 for the CMWAP assessment area. These current and future conditions, combined with past management actions that resulted in dense forest and accumulated fuels, leaves stands across the project area less resilient to the increased exposure to drought and disturbance. Adaptation actions in the proposed action include reducing stand density to increase overall stand health and resiliency.

Executive Order 14008 Tackling the Climate Crisis at Home and Abroad (EO 14008) establishes a government-wide approach for addressing the risks posed by climate change. The USDA Action Plan for Climate Adaptation and Resilience identifies actions that the U.S. Forest Service can

implement to reduce vulnerability and bolster adaptation to climate change in line with EO 14008. Specifically, the USDA Action Plan identifies shocks due to extreme weather events and stress to infrastructure and public lands as two key vulnerabilities facing the U.S. Forest Service and other USDA agencies. The plan also identifies building resilience to climate change across landscapes with investments in soil and forest health as a key adaptation action. This project addresses these vulnerabilities and contributes to the goal of building resilience to climate change.

Climate change is a global phenomenon, because major greenhouse gasses (GHGs)[1] mix well throughout the planet's lower atmosphere (IPCC 2013). Global emissions of GHGs in 2019 were estimated at 36.8 ± 1.8 gigatonnes[2] carbon dioxide (CO_2) equivalent[3] (Friedlingstein et al. 2019), while national emissions in 2019 were estimated at 6.56 gigatonnes CO_2 equivalent (US EPA 2021). Regionally, Oregon's 2015 GHG emissions were 63 megatonnes CO2 equivalent OR (OR DEQ N.d.), and Washington's 2018 emissions were 99.6 megatonnes CO2 equivalent (WA Dept. of Ecology N.d.).[4]

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) summarized the contributions of global human activity sectors to climate change (IPCC 2014). From 2007 to 2016, forestry and other land uses contributed a net of 13 percent of the human-caused global CO_2 emissions[5] (Shukla et al. 2019). The largest source of GHG emissions in the forestry sector globally is deforestation (Pan et al. 2011, Houghton et al. 2012, IPCC 2014), which is defined as the removal of all trees to convert forested land to other land uses that do not support trees or allow trees to regrow for an indefinite period of time (IPCC 2000) (e.g., conversion of forest land to agricultural or developed landscapes). However, forest land in the United States has had a net increase since the year 2000, and this trend is expected to continue for at least another decade (Wear et al. 2013, USDA Forest Service 2016).

3.0 Direct, Indirect and Cumulative Effects

3.1 No Action

With no action, the stands in the project area would continue to grow. In the absence of a large-scale wildfire, the trees would continue to sequester carbon. As stands grow and become overcrowded, their growth rates and health would gradually decline. Individual trees and stands

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[1] Major greenhouse gases released as a result of human activity include carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, and perfluorocarbons.
[2] Gigatonne is one billion metric tons; equal to about 2.2 trillion pounds.
[3] Equivalent CO_2 (CO_2e) is the concentration of CO_2 that would cause the same level of radiative forcing as a given type and concentration of greenhouse gas. Examples of such greenhouse gases are methane, perfluorocarbons, and nitrous oxide.
[4] Megatonne is one million metric tons; equal to about 2.2 billion pounds.
[5] Fluxes from forestry and other land use (FOLU) activities are dominated by CO_2 emissions. Non-CO_2 greenhouse gas emissions from FOLU are small and mostly due to peat degradation releasing methane and were not included in this estimate.

would become susceptible to stressors of insects and disease that may be exacerbated by climate change. As overstocked forest conditions persist and fuels are not reduced, the area may be more at risk for high-intensity wildfire which could threaten resource values as well as the communities of the Pine Hollow WUI.

3.2 Action Alternatives

Alternative 1 proposes variable density thinning, intermediate thinning, sapling thinning, and prescribed burning. Alternative 2 proposes all these activities and shelterwood. Total acres proposed for all treatments are approximately 5,360 for both alternatives. While these treatments are important at the stand level to achieve desired conditions, at the broader landscape scale, the scope and degree of change would be minor relative to the Forest as a whole at 1.1 million acres. This equates to approximately 0.5% of the Forest.

A project of this size would make an extremely small contribution to overall emissions. Because local GHGs emissions mix readily into the global pool of GHGs, it is difficult and highly uncertain to ascertain the indirect effects of emissions from single or multiple projects of this size on global climate. Therefore, at the global and national scales, this proposed project's direct and indirect contribution to GHGs and climate change would be negligible. In addition, because the direct and indirect effects would be negligible, the proposed project's contribution to cumulative effects on global GHGs and climate change would also be negligible. Lastly, carbon emissions during the implementation of the proposed project would have only a momentary influence on atmospheric carbon concentrations because carbon will be removed from the atmosphere with time as the forest regrows, further minimizing or mitigating any potential cumulative effects.

Forested land would not be converted into a developed or agricultural condition or otherwise result in the loss of forested area. The project has been designed to maintain a vigorous condition that supports enhanced tree growth and productivity, thus contributing to long-term carbon uptake and storage. In 2019, forests in the United States removed about 789 megatonnes[6] of CO_2 from the atmosphere after accounting for natural emissions (e.g., wildfire and decomposition) (US EPA 2021).

Forests have a "boom and bust" cycle with respect to carbon, as forests establish and grow, experience mortality with age or disturbances, and regrow over time. Forest management activities such as harvests and hazardous fuels reduction have characteristics similar to disturbances that reduce stand density and promote regrowth through thinning and removal, making stands and carbon stores more resilient to environmental change (McKinley et al. 2011). The relatively small quantity of carbon released to the atmosphere and the short-term nature of the effect of the project on the forest ecosystem are justified, given the overall change in condition increases the resistance to wildfire, drought, insects and disease, or a combination of

[6] A megatonne is one million metric tons; equal to about 2.2 billion pounds.

disturbance types that can reduce carbon storage and alter ecosystem functions (Millar et al. 2007, D'Amato et al. 2011). Furthermore, any initial carbon emissions from this proposed project would be balanced and possibly eliminated as the stand recovers and regenerates, because the remaining trees and newly established trees typically have higher rates of growth and carbon storage (Hurteau and North 2009, McKinley et al. 2011).

The effects of climate change include the likelihood for summers to become drier and longer in the area including the project area. The intensity and magnitude of wildfires are expected to increase in the future. Thinning and fuels reduction treatments, including a fuel break along FS Road 4860, are proposed by both Alternatives 1 and 2. Shelterwood treatments proposed by Alternative 2 would further reduce fuels and crown density, and create a more robust fuel break along the FS Road 4860. At the landscape scale, the fuel break along would build upon fuels reduction work completed through the Rocky Restoration Project which is adjacent to and south of the Grasshopper planning area. As a result, risks associated with high-intensity wildfires may be reduced. For more information refer to the Fuels Report and Air Quality report which are incorporated by reference.

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