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Comments: Humans are facing more extreme heat, drought, storms, floods, disappearing glaciers, shrinking water sources, warming oceans, non-arable land, uninhabitable land, food shortages, displaced populations of humans and wildlife, and a loss of species more than a thousand times faster than normal, so fast that our time is now called "The Sixth Mass Extinction." ((1)) These are all effects of climate change already occurring today and expected to grow worse in the coming decades.

The climate on Earth is and always has been changing, but the change is accelerating now due to human activities. We didn't care when our planet grew hotter and lost its polar ice caps 250 million years ago ((2)) because none of us were around. But we're here now, and one tenth of the world population lives in a low-elevation coastal zone at risk from rising seas or crumbling coastlines. ((3)) And everyone is at risk from food shortages, rising prices, and political instability.

Carbon dioxide (CO<sub>2</sub>) is a heat-trapping gas (greenhouse gas) resulting from the extraction and burning of fossil fuels like coal, oil, and natural gas, from wildfires, and from natural events like volcanic eruptions and animal flatulence. Since the beginning of the industrial age in the 18th century, human activities have raised atmospheric CO<sub>2</sub> by 50%, greater than the level that occurred naturally at the end of the last ice age 20,000 years ago. CO<sub>2</sub> in the atmosphere warms the planet, causing climate change. ((4))

Humans are pumping over 10 billion tons of carbon (36 billion tons of CO<sub>2</sub>) into our atmosphere every year ((5)), yet the net increase is only 4.7 billion tons of carbon. ((6)) The rest of the carbon is captured by plants on land and in the ocean. Forests are the largest single carbon sink, absorbing around 30 percent of the CO<sub>2</sub> emitted by human activities each year. America's forests absorb more than 10% of U.S. greenhouse gas emissions. ((7))

Mature forests still accumulate CO<sub>2</sub> because carbon makes up about half the dry weight of wood, and as trees grow older, they grow bigger, which means they absorb more carbon every year. ((6)) The largest trees in a mature forest may represent just 1% of all stems, yet store at least 40% of the above-ground carbon. Mature forests also store a lot of carbon in the soil, which is protected from erosion by the tree canopy. In fact, some mature forests can have more carbon in the soil than in the trees. ((6)) If we hope to limit the effects of climate change, the carbon dioxide removal (CDR) rate needs to increase rapidly for the Earth to remain within the 2.0C goal set by the Intergovernmental Panel on Climate Change (IPCC). ((8)) Forests are essential for raising the CDR rate.

There is a growing interest in planting more trees, like with Nature Conservancy's "Plant a Billion Trees" campaign to "slow the connected crises of climate change and biodiversity loss." ((9)) As policy scientist William Moomaw says, "planting trees is great, and it makes us all feel good, and it's a wonderful thing to do, and we absolutely should be reforesting areas that have been cut[hellip] but they will not make much of a difference in

the next two or three decades because little trees just don't store much carbon. Letting existing natural forests grow is essential to any climate goal we have." ((6))

Foresters often cite declining tree growth rates at the leaf-level and stand-level while forests age as justification for logging mature forests, going so far as to say that logging helps fight climate change by replacing old trees with more productive young trees. But it turns out the growth rate of individual trees of most species actually increases as the tree ages. For example, a tree with a 40-inch diameter trunk grows three times faster than a 20-inch diameter tree, and the mass of leaves on a typical tree can grow 100-fold for each 10-fold increase in tree diameter. So, while leaves grow slower as trees age, the increase in the number of leaves more than makes up for the decline. Large trees generally capture carbon more efficiently than smaller-sized trees. ((10))

My recommendation to the U.S. Forest Service is to protect our mature forests along with old growth forests.

#### REFERENCES:

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((6)) Yale Environment 360, Yale School of the Environment, "Why Keeping Mature Forests Intact Is Key to the Climate Fight," Fen Montaigne, 2019, <https://e360.yale.edu/features/why-keeping-mature-forests-intact-is-key-to-the-climate-fight>

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((8)) Massachusetts Institute of Technology, "Why did the IPCC choose 2C as the goal for limiting global warming?" Lindsay Fendt and Maria Ivanova, 2021, <https://climate.mit.edu/ask-mit/why-did-ipcc-choose-2deg-c-goal-limiting-global-warming>

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