



Forest Service
U.S. DEPARTMENT OF AGRICULTURE



Rocky Mountain Research Station Science You Can Use *(in 5 minutes)*

MAY 2023

Why Invest in Biomass? The Benefits of Biomass Markets in the Southwest

In the Southwestern United States, land managers face a pressing management decision on how to dispose of the biomass resulting from the thinning of overstocked Ponderosa pine forests. These smaller-diameter trees, limbs, and tops have little to no value in the current forest products market. Additionally, pile-burning biomass can impact air quality in the surrounding communities and result in burn scars and other negative environmental effects.

With funding from the Biomass Research and Development Initiative, a team of researchers with the Rocky Mountain Research Station (RMRS), University of Montana, Northern Arizona University (NAU), and Virginia Tech studied the feasibility of developing a biomass market in Arizona, New Mexico, and southern Colorado. What set their approach apart from other biomass studies was expanding their scope beyond the economics of traditional development of the existing

industry. “These large integrated projects, which bring teams with different technical expertise—economics, forest operations, and social science—aren’t often funded, so it’s a rare opportunity and a pleasure to work on a project like this,” explains Nate Anderson, a research forester with the RMRS.

Forest Operations and Ecological Impacts

Anderson and Elizabeth “Beth” Dodson, a professor of forest operations at the University of Montana, led the analysis of the forest operations, including their productivity and cost. The team developed a productivity model upon which “What-if” scenarios could be run by land managers. A manager could ask, Dodson, says, “What if we increased the allowable cut tree size by 2 inches in diameter or decrease it by 2 inches in diameter? What does that mean in terms of how long it’s going to take to bring it to the landing and how much is it going to cost the operator?”

Biomass resulting from the thinning of overstocked Ponderosa pine forests. Smaller-diameter trees, limbs, and tops have little to no value in the current forest products market. USDA photo by Nate Anderson.



Forest Service Rocky Mountain Research Station

An ongoing question around thinning treatments is how effective the treatments are in reducing wildfire risk. Mike Battaglia, a research forester with the RMRS, and collaborators compared pre- and post-treatment site conditions to determine if there is a long-term benefit in conducting the thinning treatments. Among their findings: the model results show there were significant reductions of active crown fire potential and suppression costs would be less expensive in treated stands.

Public Health Benefits and the Future of Biomass

Hypothetical scenarios were modeled that located biomass power plants within the study area that would replace the current coal and natural gas plants or retrofit the existing plants to burn woody biomass. Their modeling found that switching to biomass energy can have net benefits over broad areas. “For our research purpose, our focus is on a certain area, but in reality, there are no boundaries,” says Ching-Hsun Huang, a professor at Virginia Tech. “The pollution goes everywhere. The impacts are beyond what we imagined when we started the study.”

An important caveat is that costs and benefits are not evenly or equally distributed. The northern counties of Arizona, where the biomass plants would be hypothetically located, potentially on Tribal lands, don’t receive the same health benefits as more distant locales. Benefits from reduced smoke are broad, but communities close to power plants experience more localized negative effects from emissions.

FURTHER READING

Townsend, L.; Dodson, E.; Anderson, N.; Worley-Hood, G.; Goodburn, J., 2019. [Harvesting forest biomass in the U.S. southern Rocky Mountains: cost and production rates of five ground-based forest operations](#). International Journal of Forest Engineering. DOI: 10.1080/14942119.2018.1563851.

Dodson, E.; Anderson, N.; Townsend, L. 2019. [Marginal cost of biomass utilization in mechanized forest restoration treatments in the Southwestern USA](#). Presented at FORMEC 2019.



Grinder shredding biomass and loading it onto a truck for delivery to a biomass power plant. USDA photo by Nate Anderson.

FEATURED SCIENTIST

[Nathaniel \(Nate\) Anderson](#) is a research forester with the USDA Forest Service Rocky Mountain Research Station, in Missoula, Montana. Nate’s research focus is on forest management and blends silviculture, operations research, and economics.

KEY MANAGEMENT CONSIDERATIONS

- Although restoration treatments may not pay for themselves financially, there are nonmonetary and related nonmarket benefits gained by mitigating wildfire risk with forest treatments.
- Treated timber stands still showed a reduction in crown fire potential 5 to 10 years after treatment. Their more park-like structures also make it easier for firefighters to suppress fires that do start, which reduces suppression costs.
- The effects of forest management and bioenergy extend beyond the borders of national forests and even beyond the state in which the forest is located. For example, displacing natural gas and coal with woody biomass resulted in improved air quality in neighboring states.
- When locating new biomass plants, discussions related to equity are necessary because the communities adjacent to the plants experience different costs and benefits than more distant communities.

The Rocky Mountain Research Station is one of seven units within USDA Forest Service Research & Development. RMRS maintains 14 field laboratories throughout a 12-state geography encompassing parts of the Great Basin, Southwest, Rocky Mountains, and the Great Plains. While anchored in the geography of the West, our research is global in scale. RMRS also administers and conducts research on 14 experimental forests, ranges and watersheds and maintains long-term research databases for these areas. Our science improves lives and landscapes. More information about Forest Service research in the Rocky Mountain Region can be found here: <https://www.fs.usda.gov/rmrs/>.

[Click Here To](#)
SUBSCRIBE
[To Future SYCU](#)

