



RESEARCH BRIEF

Financial Analysis of Innovative Wood Products and Carbon Finance to Support Forest Restoration in California

For more information, contact:

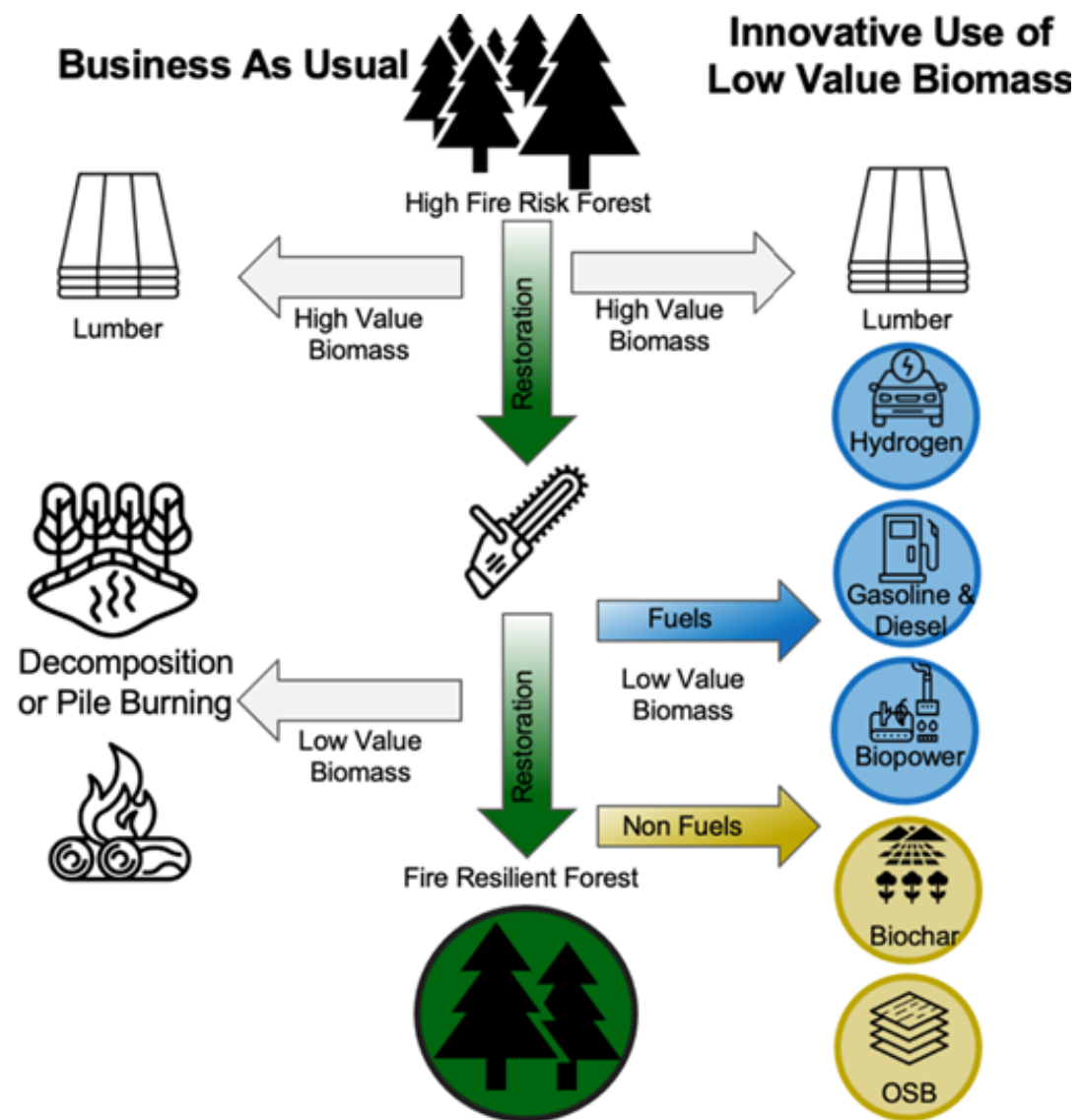
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The Challenge

- Restoration is needed on up to 50 million acres of forested land in the U.S., but finding sufficient available funding to conduct such work is one of several critical bottlenecks restoration work faces.
- Forest restoration generates large amounts of low-value biomass: small-diameter wood pieces from small trees, the tops of trees, or other debris that is not traditionally economically valuable.
- If left on the forest floor after restoration treatments are completed, low-value biomass can exacerbate wildfire severity and release carbon. Without economically viable end-uses this biomass is typically burned in piles or left to rot.

Research Summary

This research explores the financial viability of products made with low-value biomass. If profitable, these products create a demand for low-value biomass, facilitate its removal from forests, and provide an additional funding source for restoration projects.



Low-value biomass generated during forest restoration is currently left in the forest to decompose or burn. However, that biomass could be used to create a range of carbon-beneficial fuel and non-fuel products.

The Opportunity

- Innovative products made from low-value biomass are being developed.
- If these products are financially feasible, they could lead to the growth of markets for low-value biomass that would both provide critical funding for forest restoration and ensure the full benefits of forest restoration are realized.

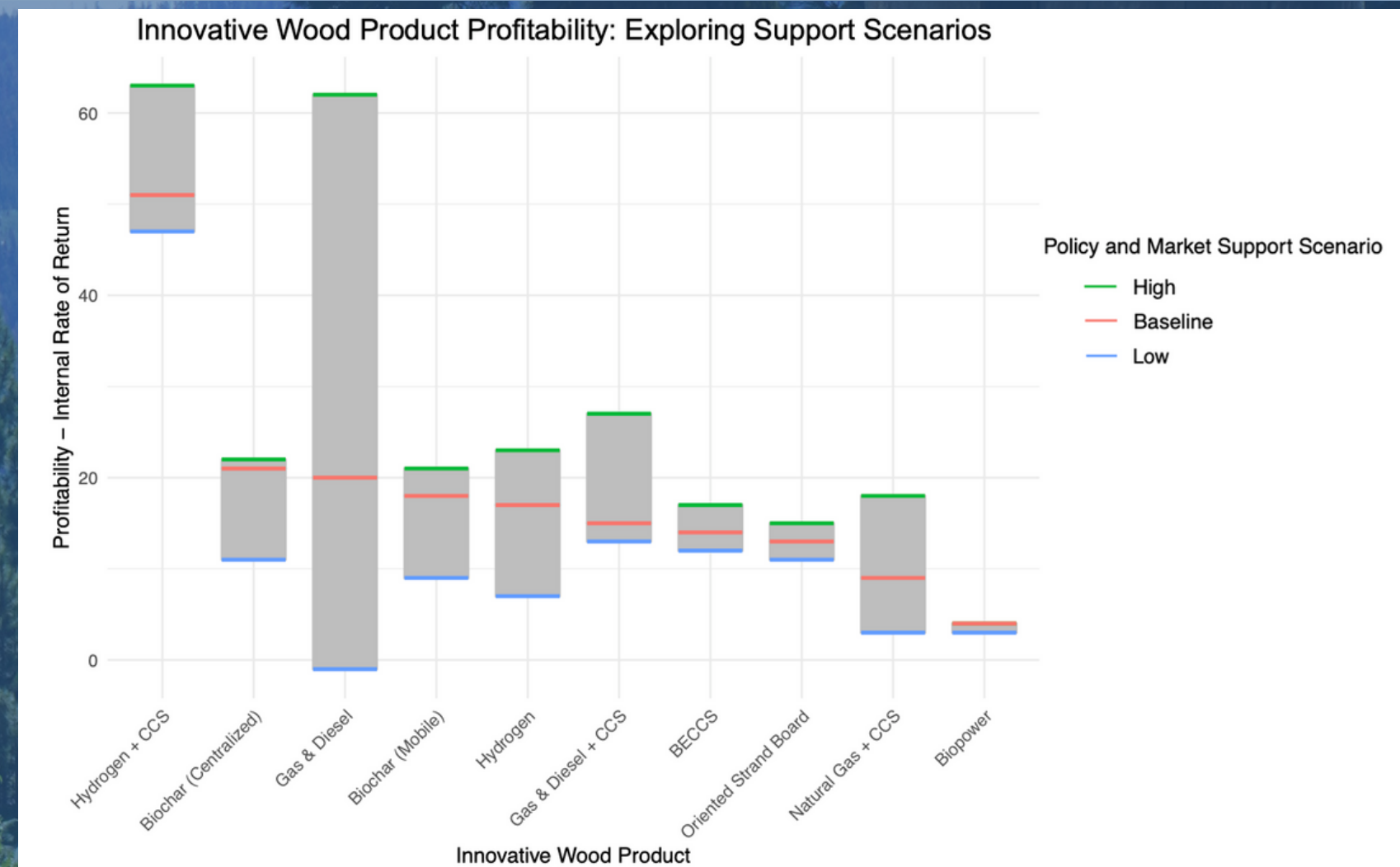
Innovative Wood Products

- A range of products can be made from low-value biomass, including gasoline, diesel, hydrogen, renewable natural gas, and electricity.
- Other products such as biochar and oriented strand board (OSB), which is used in construction similarly to plywood, are also potential products.
- Each of these products have carbon benefits from displacing fossil fuels or from providing long-term carbon storage.



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Profitability is affected by the magnitude of policy support scenarios such as California's Low Carbon Fuel Standard, the Renewable Fuel Standard, and 45Q Carbon Capture and Storage (CCS) credits along with market prices for primary products. This graph explores Internal Rate of Return given the recent range of policy support and market prices.

Carbon Benefit and Financial Viability of Wood Products

- This research analyzes 12 fuel and non-fuel wood products. It quantifies their carbon benefit and explores their economic feasibility in various climate policy and market scenarios.
- The innovative products examined are fuel products (e.g., hydrogen, renewable natural gas, biopower, diesel, etc.) used for energy generation and non-fuel products (e.g., oriented strand board, biochar).

Paths Forward

- There are several profitable uses of low-value biomass. Profitability often depends on long-term policy support and viable end markets to drive large scale investment into the space.
- Fuel products paired with carbon capture and storage (CCS) are the most carbon-beneficial products, due to the benefits of both carbon storage and the substitution of biomass for fossil fuels. Several of the fuel products included in the study are still highly profitable when biomass feedstock costs more than \$100/ton, indicating that they are viable options for providing additional revenue to forest restoration projects.
- The financial viability of non-fuel products is more sensitive to various parameters, particularly price of the primary product (hydrogen, gas, biochar, etc.). These products will require stable markets to support their continued profitability and feasibility.
- Biochar presents an immediate opportunity to develop supply chains for low-value biomass and generate high quality carbon offsets.

This research brief is based on the study *Elias et al. 2023* [Financial Analysis of Innovative Wood Products and Carbon Finance to Support Forest Restoration in California](https://doi.org/10.1016/j.jenvman.2023.118270) (https://doi.org/10.1016/j.jenvman.2023.118270) published in the Forest Products Journal (2023)