Forest biomass utilization decreases wildfire risk and dependence on foreign oil.

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Catastrophic wildfire risks are high in public forest lands due to ever increasing fuel loads. Biomass fuels accumulate due to continuing forest growth, while effective fire suppression efforts have decreased cyclic consumption by natural, low-level fires. To decrease the risk of stand replacing wildfires, public land managers are mechanically removing fuels from millions of acres nationwide, but costs are staggering.

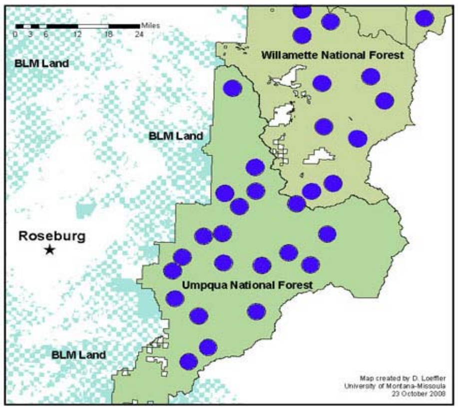

Figure 1. Map of biomass supply area with circles representing portable pyrolyzer supply areas within the Willamette and Umpqua National Forests compared with and a centralized processing facility located in Roseburg, OR with a supply area extending beyond the map area.

- Utilizing forest biomass to produce an energy product could offsets costs of mechanical biomass removal including post-fire salvage logging . However, transporting bulky biomass to central processing facilities must be minimized or eliminated in order to make forest bioenergy production viable.
- Portable pyrolysis units convert biomass into bio-oil in the woods. Bio-oil can substitute for fuel oil, or be used as a crude oil and further refined into higher value products [1]. Transporting dense, high-value bio-oil is much more cost effective than transporting bulky, low-value biomass.
- In-woods bio-oil production through pyrolysis also tackles concerns over removing carbon and nutrients from forest sites. A byproduct of pyrolysis is bio-char, which is equivalent to the charcoal found in fire ecosystems.
- Bio-char retains most of the carbon and nutrients contained in biomass and can be used as a soil amendment to enhance soil productivity. Bio-char produced by portable pyrolysis can be left at the field site to maintain soil fertility and soil carbon; which is not a possibility with centralized pyrolysis facilities, again, due to high transport costs.
- Charcoal is known to remain stable in soils for hundreds or thousands of years. It resists microbial decay that break down biomass into simple compounds, including greenhouse gases. Such long bio-char residence times allow carbon removed from the atmosphere by growing forests to be indefinitely sequestered in soil [2].

Replacing fossil fuel with bio-oil and storing carbon in soil with bio-char draws down atmospheric carbon more than other renewable energy schemes and as a consequence may include carbon trading revenue [3].

To assist the development of such ideas, we have assembled a multi-disciplinary, inter-organizational project composed of the following collaborators:

- The Umpqua National Forest is hosting this work because of their need to reduce hazard fuels in fire-prone forests ecosystems and a keen interest in maintaining soil productivity.
- Renewable Oil International® LLC, is providing portable pyrolyzer capable of operating at forestry field locations.
- The University of Montana is evaluating the economics of in-woods conversion and the avoided need to transport biomass against a centralized pyrolysis plant requiring biomass transport.
- The IFTNC and the Rocky Mountain Research Station are evaluating the impact of biomass removal and char amendments on soil fertility, soil carbon, and forest production compared to removal-only.

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Figure 2. Renewable Oil International portable pyrolyzer.

1. Badger, P.C. and P. Fransham, *Use of mobile fast pyrolysis plants to densify biomass and reduce biomass handling costs--A preliminary assessment.* Biomass and Bioenergy, 2006. **30**(4): p. 321-325.
2. Glaser, B., J. Lehmann, and W. Zech, *Ameliorating physical and chemical properties of highly weathered soils in the tropics with charcoal - a review.* Biology and Fertility of Soils, 2002. **35**(4): p. 219-230.
3. Laird, D.A., *The Charcoal Vision: A Win Win Win Scenario for Simultaneously Producing Bioenergy, Permanently Sequestering Carbon, while Improving Soil and Water Quality*. 2008. p. 178-181.

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