

Beetlejuice - Researching Sustainable Biofuels from Beetle-Kill Wood in the Rockies

Keith Paustian

Professor, Department of Soil and Crop Sciences
Natural Resource Ecology Laboratory
Colorado State University
Fort Collins, CO

Infestations of pine and spruce bark beetles have caused widespread mortality in coniferous forests in the Rocky Mountains, with 10's of million acres of U.S. forests impacted over the past two decades, a trend that is likely to intensify with future global climate change. In much of the Rocky Mountain region there is relatively little salvage harvest or utilization of beetle-kill mortality for conventional forest products, for a variety of reasons, including: poor quality, small dimension, limited product industry infrastructure, land use issues, etc. At the same time, there is interest in beetle-kill removal in many areas to meet forest restoration, hazard mitigation, and fire mitigation objectives. At present, there is substantial removal of wood from beetle-kill stands that is being disposed of through open-pile burning, which is both a resource waste and an environmental (air quality, GHG emission) problem.

The Bioenergy Alliance Network of the Rockies (BANR) is a consortium of land grant universities (Colorado State, Idaho, Montana, Montana State, Wyoming), federal agencies (USFS, National Renewable Energy Laboratory) and companies (Cool Plant Energy Systems), funded by USDA's National Institute for Food and Agriculture (NIFA), to investigate the potential for sustainable use of beetle-killed wood and other non-commercial forest biomass as a bioenergy feedstock.

In addition to the potential synergism between beetle-kill utilization and forest restoration and fuel reduction objectives, there are other potential advantages of this feedstock. These include the large amount (and often high density, i.e., mass/area) of beetle-kill wood, lack of competition with land for food or conventional forest products, and a potentially more favorable carbon balance compared with most other forest utilization, due to the underlying disturbance to ecosystem carbon stocks and net productivity. However, significant challenges to its use as a feedstock include: often remote location (far from urban industrial centers), its 'temporary nature' and patchy distribution, difficult topography and limited transport network. These conditions likely preclude the supply of biomass to conventional large-scale biomass conversion facilities. Consequently, our project is focusing on the use of scalable modular thermochemical conversion technologies, developed by our industrial partner (Cool Planet), which enables the production of drop-in liquid fuels and co-products in close proximity to available feedstocks. Other important issues to consider include potential conflicts with other resource use on public lands, where much of the beetle-kill in the Rockies is located, and economic development in rural areas.

The BANR project is developing a comprehensive program to address the major challenges limiting feedstock development, production, logistics and utilization of insect-killed trees in the Rockies. Research tasks include creation of a spatial atlas of wood availability, advances in the logistics of harvest and preprocessing, exploring issues of feedstock quality with respect to thermochemical conversion, undertaking comprehensive economic, environmental, and social/policy assessment, and integrating research results into a web-

based user-friendly decision support system to assess the sustainability of biofuel feedstock utilization at highly-resolved spatial scales.