

Forest restoration and biomass utilization for multiple benefits: A case study from Wallowa County, Oregon

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About the Dry Forest Investment Zone

The Dry Forest Investment Zone (DFIZ) is a five-year project designed to address common natural resource-based economic development challenges through increased networking and capacity building at a regional scale. Sustainable Northwest leads this project in partnership with Wallowa Resources in northeastern Oregon, the Watershed Research and Training Center in northern California, and the Ecosystem Workforce Program at the University of Oregon. The central components of the DFIZ strategy are 1) to build strong local nonprofit organizations and collaborative processes to achieve forest and economic resilience; 2) create multiple value streams from land management and incentives for forest restoration and stewardship; 3) develop integrated biomass utilization and renewable energy; and 4) create the policy conditions to support sustainable forest stewardship on public and private lands.

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In 2011, the Ecosystem Workforce Program produced a first version of this working paper, which analyzed the Reservoir Biomass project’s costs and outcomes when it was in progress. Since that time, the project has been completed. To document its final outcomes, we have released this updated edition of Working Paper #29. This second version includes updated information about acres treated, materials removed, and costs per acre.

Forest restoration and biomass utilization on public lands can create improved stand conditions and opportunities for local economic benefit.

In Wallowa County, local nonprofit organization Wallowa Resources and the Wallowa-Whitman National Forest have partnered to restore forest health and watershed conditions. With funding from the USDA Forest Service through the American Recovery and Reinvestment Act (ARRA) and the US Endowment, they tested whether mechanical treatment with biomass removal and utilization is cost-effective in achieving desired stand improvement and local benefit, in comparison to hand thinning, piling, and burning. They piloted this approach in 2009–11 on a hazardous fuels reduction project called the Reservoir Biomass project.

This case study examines the opportunities and challenges of mechanical treatment and biomass

The Reservoir Biomass project at a glance

402 acres treated

758 green tons of material removed

- 60 tons for post and pole production
- 273 tons for firewood and densified firelog production
- 425 tons for local school biomass boiler

13 jobs created

Businesses engaged

- Two logging contractors from Wallowa County
- One trucking contractor from Grant County

Biomass end users

- One local wood products business
- School district

Cost: \$296 per acre

removal. It suggests how national forests might use this approach in the future to meet restoration objectives while creating local economic benefit. We conducted eight interviews with Wallowa Resources staff, the Wallowa-Whitman National Forest, local contractors, and county leaders to understand project planning, implementation, benefits, and challenges.

Project planning and implementation

When the Wallowa-Whitman National Forest (WWNF) received hazardous fuels funding under the American Recovery and Reinvestment Act in 2009, staff at the Wallowa Mountains office of the WWNF worked with the Forest Supervisor and Wallowa Resources, a local nongovernmental organization, to find projects that could also produce small diameter material for local biomass businesses. This pairing of ecological and economic dimensions is crucial because much of the national forest in Wallowa County is at high risk for uncharacteristically severe wildfire; and because county leaders have been developing a small-diameter utilization campus to help produce greater value from material harvested from fuel reduction and restoration treatments.

The project completed work authorized in a previous NEPA decision, which called for heavy thinning of trees five inches dbh and smaller. The WWNF identified eight units appropriate for this treatment on 621 acres, and entered into an agreement with Wallowa Resources to plan, conduct, and monitor fuels reduction on these acres. The WWNF chose the Reservoir Biomass project area because it was “shovel ready” when Recovery funds arrived. It was part of a timber sale planned in 1999. The environmental analysis and timber sale had been completed, but understory and stand improvement treatments had not been performed due to lack of funding. This area is also within a high-priority landscape for fuels reduction and restoration under the Wallowa County Community Wildfire Protection Plan.

The prescription from the original EA for the Reservoir Biomass project specified that trees felled had to be less than five inches dbh; post and pole material would be piled separately from slash; and operations would only occur when soils were adequately dry, snow-covered, or frozen to minimize impact.

Several collaborative processes have built the agreement about land management that helped make the Reservoir Project possible:

- **Wallowa County Natural Resources Advisory Committee (NRAC):** Created by the County Commissioners in 1995, the NRAC is a body of local stakeholders who provide technical capacity and advice to the County Commissioners for Natural Resource issues, including the management of the Wallowa-Whitman National Forest.
- **Upper Joseph Creek Watershed Assessment:** Following years of general salmon habitat restoration work, the NRAC’s first watershed-specific collaboration was the Upper Joseph Creek watershed, which covers 174,000 acres. The Reservoir Project is within the 45 percent of the watershed that is public land.
- **Community Wildfire Protection Plan (CWPP):** The Wallowa County CWPP completed in 2006 broadly defined the county’s WUI and high-risk area for two reasons: 1) to be able to take advantage of any future opportunities for fuels reduction funding, and 2) to protect valuable natural resources outside of communities. The Reservoir Project area lies within a priority treatment area designated in the CWPP.
- **Biomass Memorandum of Understanding (MOU):** The Wallowa-Whitman National Forest, Wallowa County Board of Commissioners, Wallowa Resources, Oregon Department of Forestry, and Wallowa County Biomass Group signed a MOU in 2009 committing the Forest to making 1000 acres of biomass available for potential biomass harvest and to exploring harvest options that can increase biomass accessibility.

Piloting cost-effectiveness

The Reservoir Biomass project had two interrelated goals: to cost-effectively reduce hazardous fuels by adding value through biomass utilization; and to provide byproduct material to local biomass businesses. The first phase was a pilot treatment period to understand the operating costs and performance of different equipment and contractors.

Two local contractors participated in the pilot stage: Pro Thinning and Bear Creek Logging. Equipment included a single grip processor and skid-steer with shear. Through this trial, Wallowa Resources was able to assess the benefits and drawbacks of different equipment, and plan treatment for the remaining acres to take advantage of local contractor capacity. A project benchmark was set at \$300 per acre.

The contractors treated 207 acres in two units during the pilot stage. They decked material from the pilot on adjacent private land due to Forest Service landing limitations. Following the pilot, contractors treated 198 more acres for a total of 402 acres.* Project operational costs per acre, including thinning, chipping, and hauling, were \$296 per acre. Costs per acre fluctuated between \$258 to \$312 per acre during the project as contractors and Wallowa Resources experimented with different approaches, and dealt with changing road conditions. This data show that mechanical treatment and removal can be more cost-effective than hand thinning, piling, and burning, which can cost between \$300 to \$900 per acre depending on prescription.

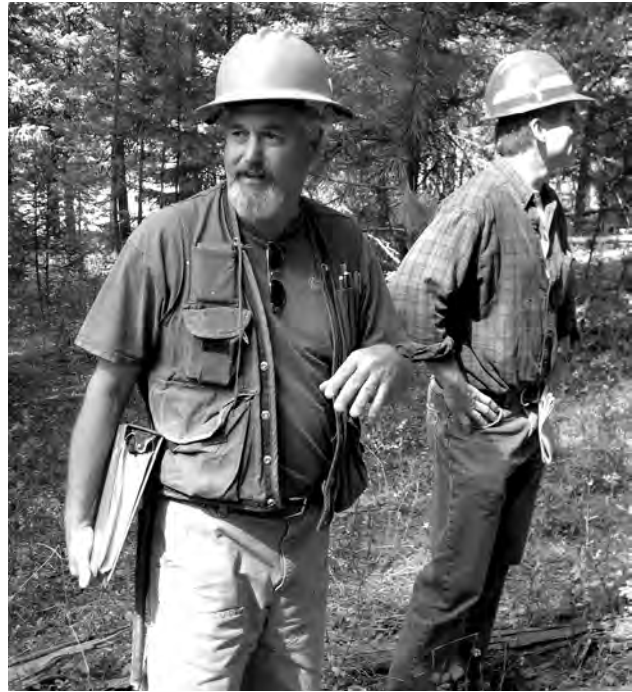
What local benefits did this project provide?

Employment for two local businesses during the recession

Two local family-owned businesses received contracts through this project. They put up to seven people at a time to work on site. Employees received Davis-Bacon wages in the first phase of the project, and Service Contract Act wages in the second phase. Wallowa County faces some of the highest unemployment levels in Oregon, and has struggled to retain its forestry support businesses and workforce since the 1990s. This project demonstrated the opportunity for similar treatments to accomplish fuels reduction cost-effectively provide future contracting opportunities, and increase the supply of woody biomass to emerging new businesses.

Air quality and forest health benefits

There were several ecological benefits to this project. Biomass removal and utilization avoided the par-



ticulate emissions, nitrous and sulfuric oxides, and smoke associated with both controlled burning of treated piles and wildfire. Air quality is an important issue to residents of the Wallowa Valley, which is a Class One Airshed regulated by the EPA and home to sensitive wilderness areas.

The project also helped reduce the risk of live tree mortality from prescribed burns, particularly on steep slopes, by reducing fuel loads following completion of mechanical treatment. In addition, there is preliminary evidence that this approach supports forest resilience to mountain pine beetle by opening stands, increasing stand vigor, and altering localized air circulation patterns.

Learning about true operating costs and local biomass business needs

This project also spurred increased discussion about operating costs, supply, and sorting issues at the future integrated biomass campus. Project partners developed stronger understandings of the costs of mechanical thinning, sorting, and landing, and regulatory obstacles. They also learned in detail about the quality and types of supply that local biomass businesses and thermal end-users require.

* Two planned units were not completed due to environmental and transportation considerations. One unit (52) was located in an area where Forest Service and Wallowa Resources staff did not want to risk excessive soil disturbance. Another unit (46) was only partially treated because there were no operational roads near the unit.

What were the challenges?

Seasonal and road access to units

Federal restrictions on seasonal access (to reduce wildfire risk and bark beetle spread) greatly limited the window of time for project implementation. This window was further narrowed by the project’s mandate to conduct work when soils were frozen or snow-covered as mitigation against soil disturbance.

The Forest Service established the Reservoir Biomass project area and unit boundaries through a past timber sale. Some road conditions have deteriorated, and access to several units was impossible as a result of regulations governing seasonal road use. As a result, contractors were able to treat 402 acres of the originally targeted accomplishment of 621 acres.

Equipment capacity and limitations

Some of the smaller, lighter equipment used in this project lacked traction on snowy and frozen surfaces. Some of the larger equipment used was designed

for commercial logging applications and is not as fuel-efficient as smaller machinery designed for small-diameter thinning and stacking. Equipment and vehicle fuel costs can be one of the largest challenges for small contracting businesses. The current business and lending climate prevent contractors from investing in new equipment, particularly for specialized applications for which there may be only limited contracting opportunities.

Limitations on landing

Landing material on the WWNF is subject to limitations related to archaeology sites, soil disturbance and noxious weeds. It was difficult for project partners to find a site of appropriate size on NFS lands to aggregate slash for chipping. An adjacent private landowner offered a site that provided contractors flexibility in decking and removing material and cleaning up the site. However, this increased operational costs. Furthermore, reliance on private land to handle materials from public lands is not an appropriate solution.

TABLE 1

Comparison of reported costs, benefits, and challenges of two methods of hazardous fuel reduction on the Wallowa-Whitman National Forest		
	Mechanical treatment with biomass removal (Reservoir Biomass project)	Hand thinning, piling, burning
Cost per acre	\$296	\$300–\$900*
Benefits	<ul style="list-style-type: none"> • Fewer entries • Can use light-on-hand machinery • Lower cost per acre • Engages local contractor capacity • Produces material for local business use 	<ul style="list-style-type: none"> • May require multiple entries • Light on land • Generates high number of person hours per job • Can be performed on steep terrain
Challenges	<ul style="list-style-type: none"> • Incurs road resurfacing fees if timber sale or timber removal component of a stewardship contract • Logistics and cost of landing, sorting, hauling are complex • Seasonal restrictions to road use • Fuel costs can reduce margin for contractor 	<ul style="list-style-type: none"> • Bids usually awarded to nonlocal contractors with larger labor capacity and low labor costs • No utilization of material for other local businesses • Emissions from burning impact air quality

* Estimate reported in Wallowa County Community Wildfire Protection Plan, 2006. Project costs are lower for treatments that are whip-fall only and increase with piling, burning, or other additional handling of material.

When is the case for this kind of project strongest?

If it is a total stand treatment with a commercial sawlog component

Many local stakeholders want to increase the quantity and quality of acres treated while generating wood products. They support silvicultural prescriptions that can manage whole stands and produce a suite of values. A project that is “the entire package” can use a commercial sawlog component to pay for road fees and biomass haul costs.

If stewardship contracting is applied

Stewardship contracting could also be used to carry out biomass removal for several reasons:

- It offers options for combining the removal of both high and low value material.
- It can require the removal of low value material.
- The Forest Service can retain receipts and use them to cover road and haul costs.
- Retained receipts can help a project pay for itself rather than relying on Forest Service appropriated budgets, which have steadily decreased.
- It contains best-value criteria that require the agency to consider local community benefit when selecting a contractor.

If it is planned where active roads are in good condition

Road condition and access to units is a major determinant of cost and project viability. A one-time exception from the Code of Federal Regulations for research and demonstration projects allowed the Forest Service to waive road surfacing fees for the Reservoir Biomass project, but this would not occur for future projects. These fees apply to all trucks hauling material on federal lands during timber sales or the timber removal component of a stewardship contract. The Forest Service could take an integrative approach by coordinating staff to look at the road system alongside fuels reduction and silvicultural objectives when selecting planning areas for future treatment.

If it engages local contractor capacity

Mechanical treatment produces greater and more diverse employment opportunities, and matches Wallowa County’s business capacity. There are several local businesses with the skills, workforce, and equipment to perform this work. There is limited



local contractor capacity for hand thinning fuels reduction work, and these projects are typically awarded to businesses from outside the region.

If sorting and chipping take place off-site

Road impacts and thus fees are greater for chip trucks than log trucks. Simply put, the more that material is handled, the more cost it incurs. This makes whole-log transport and off-site sorting desirable. However, there is currently inadequate sort-yard capacity in Wallowa County. On this project, sorting took place in the woods, and grinding and chip transport were based at a landing on adjacent private land.

If there is a viable local biomass market

Small diameter biomass material has little value and high haul costs. Value is added to this mate-



rial at biomass businesses. Local biomass end users currently include a post-and-pole plant; a producer of bundled firewood, densified firelogs, and chips; and a biomass-fired boiler that heats the Enterprise High School. Chips from the Reservoir Biomass project were initially utilized at the high school boiler. However, it became apparent that the boiler required high-grade, non-green chips for optimal functioning.

The future of projects like Reservoir Biomass hinges on further biomass infrastructure development. Wallowa Resources and several community partners are in the process of relocating and expanding existing biomass businesses at an integrated campus facility that will eventually include small-scale cogeneration capacity. This facility will provide adequate sorting space, reducing the need and costs of in-woods sorting. Wallowa Resources predicts this could reduce treatment costs by \$6 per ton and increase recovery volume from the woods by 15 to 17 percent.

An integrated campus and increase in thermal end-users like the Enterprise School District should also help local biomass businesses overcome their marketing and value challenges. Small sawlog and biomass prices in Wallowa County compete with prices in the pulp market since there is a pulp facil-

ity in the region in Lewiston, Idaho. By working in partnership with each other and community leaders, these businesses can expand markets for their products.

If there is strong communication between the Forest Service, contractors, and end users from the start of project planning

Planning and implementing this project was complex. It required a willingness to consider innovative and challenging options. Committed leadership from Wallowa Resources and WWNF staff was essential to figuring out the pieces of the puzzle.

Although the Reservoir Biomass project was possible because it was “shovel-ready” when the opportunity for ARRA funding arose, a more effective future approach may be to focus on and coordinate biomass removal from the beginning of project planning. This could ensure that:

- The Forest Service understands the operating costs and equipment capabilities of local contractors; and offers contracts that are accessible
- The Forest Service and contractors understand the supply specifications of biomass end users, including species, wood conditions, and dimensions.

- The Forest Service includes mechanical treatment in its NEPA analysis and EA, and plans for an integrated resource restoration project with a single entry

Wallowa Resources staff predict that future projects with this design could possibly cost \$256 to \$276 per acre, depending on access to project units, the type of ground, and the stand conditions. Costs per acre for this project were higher than expected because this treatment was not planned in advance with the original treatment. Costs included hauling material to private land for chipping as well as other mobilization and handling costs, which would not have been incurred if this has been a single entry with commercial harvest.

When is the case for this kind of project weakest?

If vegetation management continues to be strictly guided by diameter limits and not site- and species-appropriate prescriptions

Diameter limits, usually at breast height, have been an important factor in collaboration among stakeholders in eastern Oregon. Vegetation management without litigation has relied on agreement about diameter limits. However, this challenges biomass removal prospects. Lack of social acceptance of merchantable sawlog size removal may prevent the Forest Service from planning sufficient commercial components to compensate for treatment costs, road and haul fees. Blanket diameter limits do not offer the best treatment for all species on a given site.

If it is planned using traditional service contracts and timber sales

Purchasers of timber sales are not required to remove low value material, and have the option of leaving it. Service contracts do not provide for material removal. It is the entire package of harvesting, grinding, transportation, and utilization that can make treatment less expensive as compared to direct costs for service, and this may be possible through stewardship contracting.

If the Forest Service cannot retain and grow its capacity to plan vegetation management projects that produce material

At both the national scale and on the WWNF, the

Forest Service has consistently lost staff capacity and budgeting. The majority of its current budget is for hazardous fuels reduction and this is typically achieved through thinning, piling, and burning. The agency is challenged in planning and integrating commercial values with wildfire risk reduction, habitat, hydrological, and other management objectives.

If it remains a “boutique” approach and cannot eventually prove cost-efficacy at scale

Wallowa County’s CWPP states that “conservative estimates suggest a starting point of 100,000 acres that would receive benefits from mechanical thinning and slash disposal.” There is strong desire among many local stakeholders to increase fuels reduction and restoration activities at a meaningful scale across all lands in the county. The Reservoir Biomass project enjoyed strong, broad support because these stakeholders saw it as a pilot for finding cost-effective methods of treatment that could eventually be applied across a larger landscape.

There may be opportunities to apply this approach at landscape scale in the future. The WWNF has proposed optional fiber removal up to five inches dbh under several recently planned projects. Wallowa Resources and the WWNF will be proposing treatment options in the Lower Joseph Creek watershed. They plan to use thinning to release and open stands to address overstocking, contribute to large tree retention, and increase resilience to future disturbance. The Reservoir Biomass project has accelerated stakeholder desire to identify areas in this watershed where material over five inches dbh is available.



Conclusions

The Reservoir Biomass project suggests that hazardous fuels reduction with mechanical treatment and biomass utilization is not only possible, but can be more cost-effective than hand thinning, piling, and burning. This approach makes the most sense when implemented as a stewardship contract with timber removal, and where there are local markets for small diameter material. But limited biomass markets, agency capacity and budgeting, and available planning areas challenge future implementation of similar projects in the region. If the Forest Service and community partners can succeed in developing this approach to treatment across a larger landscape, Wallowa County may reap broader benefits from its public lands.





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