Forest Fuels Reduction

Problem Identification
- From 2000—2002, wildfires burnt over 18.9 million acres and cost the Government $3.4 billion. 
- In back to back years, Oregon experienced large wildfires; The Biscuit (02) burnt 499,965 acres and the B and B (03) burned 90,769 acres.
- An estimated 190 million acres of federal forests and rangelands in the United States face high risk of catastrophic fire. 
- Many Ponderosa pine forests are 15 times denser than they were a century ago.
- In Oregon, 35% (19 million acres) of forested land across all ownerships are in the highest category of wildfire risk and another 34% (18 million acres) are at a significant level of risk compared to historical conditions. Of these categories, federal agencies or the Tribes manage 43% of the land (16 million acres).

Harvester/Forwarder
- 48 tons/acre average fuel load
- Harvesting cost = $2,371/acre
- Gross revenue = $3,483/acre
- Stand Characteristics
- 1000 stems per acre
- 9" avg. stand DBH
- 55% down material
- 60% pulplogs @ $36/ton
- Net revenue = $611/acre
- 50% of the residue remains on-site from a fuels reduction treatment. 
- Silviculture Objectives
- Reduce fuel loading
- Provide some late forest structure
- Woody debris left for ants and small mammals
- Harvested with single-grip harvester (Wanatah head) & small skyline yarder (Killer 501)
- Timber Utilization
- 29% sawlogs @ $515/MF
- 60% pulplogs @ $56/ton
- Economics
- Gross revenue = $2,581/acre
- Harvesting cost = $1,970/acre
- Net revenue = $611/acre

Past Work
Deerhorn Study
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- 48 tons/acre average fuel load
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Research Rationale
- The current forest health and fire crisis situation must address the modification of the vegetation structure to reduce fuel loadings and where feasible, allow reintroduction of low-intensity prescribed burns.
- There are numerous limitations and knowledge gaps for managers to select, plan and implement appropriate technologies to meet sustainable forest management objectives involving fuels reduction, biomass utilization and forest health.
- Virtually no comprehensive research studies have been completed to date in the USA on equipment and systems specifically designed for fuels reduction rather than logging.
- Studies to date have involved limited equipment trials and demonstrations of modified or new equipment designs for fuels reduction (e.g. mastication and/or mulching)
- A significant multi-discipline research need is for combined studies in equipment & system technologies for handling forest fuels; soil impacts & mitigating measures for equipment operations; fuel wood utilization; and fire behavior with different vegetation structure modifications.

Fuels Reduction Methods
- Prescribed Fire
  • Used for decades as a valuable management tool
  • Decrease in use
  • Smoke liability and management issues
- Manual or Hand Operations
  • Positives
  • Low capital cost
  • Greater flexibility, applicable in sensitive areas
  • Negatives
  • Intensive labor requirements, safety issues
  • Small area treated
- Mechanical Systems
  • Commercial
  • Positives
  • Opportunity to offset costs of treatment
  • Removal of fuel is immediately effective
  • Negatives
  • High harvesting costs and low product value
  • Little knowledge available concerning cost, productivity, and site impacts
- Non-Commercial—an operation which changes forest fuel structure without extracting fiber and is seen economically as a management investment
  • Applicable on public lands especially where no market for products exist
  • New Equipment Technology and Systems
    • Mastication/Mulching
    • Chip to waste
    • Fuel remains on site, but converted to finer fuels
  • VERY little knowledge available concerning cost, productivity, and site impacts

Research Questions
Fuels, Fire Control, and Stand Management
1. What should the size and distribution of the residual woody material be on-site from a fire hazard reduction perspective? How does this relate to the fire behavior/control objectives?
2. What are the soil management and watershed implications from alternative fuels reduction approaches?
3. How do the initial fuels reduction treatments leave the site with regard to long-term forest vegetation and soil management objectives, and what follow-up treatments are needed in the future?

Wood Utilization
1. What are the economic differences related to the type of biomass removed (e.g. standing dead and/or live trees; tree size; down material size and quality), and the economic differences related to the size and distribution of the residual woody material left on-site (e.g. larger vs. smaller pieces)?
2. What are the productivity and cost rates for alternative choices of equipment for mechanical fuels reduction; what are system cost rates?
3. How do factors such as terrain and transport distance affect the economics of mechanical fuel reduction alternatives? What are the economic differences related to stand type and conditions?

New Technologies
1. What equipment designs are feasible and economical to provide variety for contractors to work in different forest operation applications such as logging, fuels reduction and fire control?
2. What are the opportunities and technology for separating the woody material during fuels reduction operations for existing markets and new markets? (eg. biomass energy)