Feasibility of Woody Biomass Harvesting in Managed Pine Plantations in Northwest Florida

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Understory biomass harvesting has been suggested as an economically viable method of vegetation management in pine plantations, which could be incorporated into traditional silvicultural thinning methods to increase revenue, and possibly to produce bioenergy. Understory biomass harvesting has also been suggested as a preliminary method for ground cover restoration in degraded long-leaf pine ecosystems with dense shrub and woody cover. Mechanical treatments would ideally precede re-introduction of prescribed fire regimes, or could be stand-alone treatments where fire regimes are not feasible. We conducted a project in NW Florida to determine technical and economical feasibility of biomass removal and to determine the degree to which understory biomass removal inhibits or promotes vegetative responses of understory species as compared to pulpwood harvesting alone during a tree-length thinning operation.

A loblolly pine (Pinus taeda L.) forest stand on Black River State Forest near Milton, Florida, was divided into six approximately 20-acre plots. Subsequently each plot was assigned one of two harvesting treatments: (1) roundwood only (RWO), or (2) roundwood plus fuel chips (RWF) resulting in three replications of each of the two treatments. Plots assigned the RWO treatment were third-row thinned with remaining rows receiving an operator-select thinning. Plots assigned the RWF treatment were thinned in the same manner, but in addition all understory stems > 1 inch DBH were harvested, brought to the landing deck and chipped alongside pine crown tops and limbs. The harvesting setup consisted of a feller buncher equipped with a saw head, a grapple skidder, a loader with a pull-through delimer, and a tub grinder. Fuel chips were hauled to a biomass utilization facility. Pulpwood, super pulpwood and chip-n-saw produced in both treatments were sold to a nearby mill.

Average roundwood production in both RWO (31.4 ton/ac) and RWF (31.1 ton/ac) treatments was not significantly different. However, the addition of a grinder in RWO treatment for chipping of pine tops and limbs as well as some understory which dragged to the landing along with the merchantable stems produced additional 3.76 ton/ac of chipped material. In contrast, in the RWF treatment, which included chipping of both pine limbs and tops as well as operator selected unmerchantable pine and hardwood stems, produced 5.87 ton/ac of chipped material.

In terms of machine hours and fuel usage, RWF treatment appeared to be more efficient especially in the chipping process. Utilizing equipment to harvest and chip both limbs and tops and other understory biomass was substantially more effective in RWF treatment than harvesting just roundwood or chipping just limbs and tops as was done in the RWO treatment, although these differences were found statistically not significant. Chipping in RWF treatment produced 31.0 tons/SMH (Scheduled Machine Hour) of chips as compared to 17.4 tons/SMH in RWO treatment. This possibly also resulted in lesser consumption of fuel in RWF (0.5 gal/ton of chipped material) than in RWO treatment (0.72 gal/ton).

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The machine operating costs combined with the observed productivities in the two treatments determined that the cost of chipping pine limbs and tops only from the RWO plots was $9.62/ton, and the cost of chipping limbs, tops, and other understory stems in the RWF treatment was $6.28/ton of chipped material. However, despite the RWF treatment producing a higher amount of chips at lower cost, these values were not significantly different from those of RWO treatment. Combined costs of roundwood and chip production in both harvesting treatments were very similar (approximately $20.41 per ton) and not statistically different.

Postharvest shrub cover decreased slightly but not significantly in both treatments. Forb cover, however, showed some significant changes following RWO treatment but not in RWF treatment. In RWO treatment, forb cover was significantly higher (p=0.01) in thinned portions of the stand (9.5%) when compared to preharvest stand (2.9%). In unthinned portion of stand in RWO treatment, however, the forb cover (5%) was not significantly different from preharvest stand condition. Forb cover in thinned and unthinned portions of the RWO treatment stands also did not differ significantly from each other. Grass cover, despite substantially higher following RWO harvest treatment, was also not statistically different from preharvest grass cover. The prominent forb species following harvests included comfortroot (Hibiscus aculeatus) and partridge pea (Chamaecrista fasciculate), the two native species of wildlife interest. Prominent grasses were bluestems (Andropogon spp.) and bahiagrass (Paspalum notatum).

In conclusion, our results suggest that utilization of understory biomass along with the tree tops and limbs of harvested trees can be efficiently integrated with conventional roundwood harvest operations for providing chipped woody biomass. Chipping of biomass incurs cost, and the economic feasibility of adding chipping operation to a conventional roundwood harvest will depend on the market price of the chipped material which must be more than the combined cost of chip production and transport of the chipped material to utilization plant. In our study, we found the cost of chip production (on-board) to be $6.3 to 9.6 per ton based on the assumptions stipulated in the study. However, our results also suggest that there is improved efficiency in terms of machine hours and fuel usage per ton harvested by harvesting and chipping both understory stems along with limbs and tops from merchantable trees as opposed to just chipping the limbs and tops of merchantable trees. In our study, we also observed recovery of groundcover, with higher proportions of forbs six months after harvesting. Based on our short term observations, understory biomass removal in conventional thinning operations appears to be ecologically feasible option for at the very least maintaining groundcover, temporarily reducing hardwood competition and fuel loads, and providing a source of bioenergy production. However, long-term monitoring of understory and overstory will be required for confirmation of these initial conclusions.

Out of the Land of Oz: the Importance of Tackling Wicked Environmental Problems Without Taming Them

ABSTRACT: Struggling with complex environmental decision making often makes us feel that only the wizard in the movie, “The Wizard of Oz” (Fleming in Wizard of Oz, Metro-Goldwyn-Mayer, California, 1939) can produce agreeable solutions. However, this need not be the case if we distinguish between the technical information used in decision making versus the process of decision making. Making environmental decisions is a wicked problem, meaning that values are imposed, whether or not we explicitly acknowledge or understand what those values are. Classic wicked problems are those such as how to choose among potential ozone control policies, climate change policies or developing a sustainability plan. In contrast, tame problems are those where there is a knowable truth. Classic tame problems are those such as estimating the ground level ozone level given source emissions and meteorology within a chosen spatial and temporal scale such as that stipulated by assessing compliance with the federal ozone standard. Lack of understanding that environmental decision making utilizes tame problem information while remaining a wicked problem is a barrier to finding policy solutions. Hence, we challenge environmental professionals to rethink their processes of decision making with the tame/wicked insight offered here.
Upcoming Events

- **Fire in Eastern Oak Forests Conference.** The 5th Fire in Eastern Oak Forests Conference will be held 27-29 May 2015 at the Bryant Conference Center on the University of Alabama campus in Tuscaloosa, Alabama. The goal of the Fire in Eastern Oak Forests Conference is to improve land stewardship through transfer of knowledge and technology of fire as a management tool and its role in a historical context. The conference brings together noted experts in research and management to present state-of-the-art information, perspectives, and syntheses on key issues and provides learning and networking opportunities to over 300 participants. [http://easternfire.as.ua.edu/](http://easternfire.as.ua.edu/)

- **2015 Conference on Laurel Wilt Disease and Natural Ecosystems: Impacts, Mitigation and the Future.** June 16–18, 2015. This conference provides a timely opportunity to learn the most recent state of knowledge regarding laurel wilt, its biology, impacts in native ecosystems and efforts to mitigate for its devastating effects. Coral Springs Marriott, 11775 Heron Bay Blvd. Coral Springs, FL. Contact: Beth Miller-Tipton at bmt@ufl.edu or call 352-392-5930. [http://conference.ifas.ufl.edu/LaurelWilt/](http://conference.ifas.ufl.edu/LaurelWilt/)

- **S-212 Wildland Fire Chainsaws.** Natural Areas Training Academy. Monday, June 22, 2015 at 8:00 AM - Wednesday, June 24, 2015 at 5:00 PM (EDT), Kissimmee, FL. This course prepares you to perform low complexity project and fireline tasks under the supervision of a fully qualified trainer. It will provide the basic skills required by NWCG member agencies for using chain saws safely. This wildland fire chain saw program was developed to provide new sawyers with a solid foundation for safe and efficient chain saw handling and operation while bucking, limbing, brushing and slashing, and felling for project work or fireline construction. For more information: (850) 875-7153, sefriedl@ufl.edu, [http://wec.ufl.edu/nata](http://wec.ufl.edu/nata).

- **S-131 Firefighter Type I and S-133 Look up, Down, Around.** Natural Areas Training Academy. Thursday, June 25, 2015 at 8:00 AM - Friday, June 26, 2015 at 5:00 PM (EDT). Kissimmee, **S-131** is an eight-hour course designed to meet the training needs of the Firefighter Type 1 (FFT1). This course is designed to be interactive in nature. It contains several tactical decision games designed to facilitate learning the objectives and class discussion. Topics include fireline reference materials, communications, and tactical decision making. **S-133** is designed to train Incident Commander Type 5 (ICT5) and Firefighter Type 1 (FFT1) to identify environmental factors and indicators of hazardous fire conditions, and how to use these indicators when implementing the Risk Management Process. Registration closes June 6, 2015. For more information: (850) 875-7153, sefriedl@ufl.edu, [http://wec.ufl.edu/nata](http://wec.ufl.edu/nata).