Pinyon Juniper Harvest Study: Matching the Harvesting System to Conditions

By Bob Remmer and Darren McAvoy

Pinyon-Juniper (PJ) woodlands provide significant resource management challenges in the western United States. Excessive disturbance such as fires, pinyon and juniper trees grow closer together over time, expanding into surrounding grasslands and sagebrush habitats, occupying ever more acres. This expansion is a concern to land managers for a variety of reasons. When pinyon-juniper stands in Utah become dense, they become more prone to crown fires. This extreme fire type leaves little behind but charred stumps and a rime seedbed for cheat grass and other noxious weeds. By removing a portion of the PJ in these stands, the resistance of the remaining trees to disturbances is improved. The loss of sagebrush habitat is another concern, especially in light of the possible listing of the greater sage-grouse as an endangered species.

In an effort to slow this tide of ecological change, the Bureau of Land Management and many other organizations, such as Utah's Watershed Restoration Initiative, are spending millions of dollars each year to treat PJ stands so they are less fire prone and to improve wildlife habitat. The costs can typically start around $300 per acre, and there are far more acres that need treatment than there are dollars and workforce to do the treatments. Since there is little market value for pinyon and juniper wood, the wood is simply chipped and left on the ground.

Development of markets for PJ woody biomass is necessary. An option is harvesting and selling the biomass during restoration treatments to help offset costs and support rural communities. There are limited traditional markets for firewood and posts made of PJ, but new markets are required to make utilization of this material more universal. Most of the effort along the utilization front is focused on using the biomass material for energy production. Several surrounding states have biomass energy facilities in operation, and there are several efforts underway to utilize this clean and renewable fuel source in Utah.

A second stumbling block to economical utilization of this material is the lack of well-developed systems for cutting and handling the material. Traditional logging equipment, which was developed for more traditional forests, can be utilized, but it is oversized and, therefore, overpriced to be able to operate in a cost-efficient manner in PJ woodlands. Harvesting systems using conventional logging machines are estimated to cost at least $75 per ton. This cost can be covered by selling larger, high-value material such as sawlogs, but prices paid for biomass, based on informal surveys and observations, tend to run more in the range of $15 to $30 per ton. Therefore, a study conducted by the US Forest Service, Bureau of Land Management (BLM), Bloomington Ranch Service Area, and the Utah Biomass Resources Group attempted to identify alternative harvesting and processing methods that are more cost-effective.

The study site is plainly visible along the west side of 1-15 just south of Beaver, Utah. Passersby will notice areas where practically all of the PJ has been chipped or removed, and other areas where it has been thinned, leaving a few of the best trees widely spaced across the hillsides. Which trees were removed and which were left was carefully planned by BLM foresters in advance of the treatments. The goal was a mix of fire-hazard reduction along the highway and habitat restoration in the upper reaches of the treatment.

Evaluating Harvesting Systems

Three different PJ harvesting systems were evaluated in a thinning treatment near Beaver. The systems represented dramatically different approaches to treatment and biomass utilization: a cut-and-haul operation, a chip-and-forward operation, and a shear-and-forward operation. Each is explained in detail here. Directly comparing these systems to one another based on these results, however, is not a fair treatment of their capabilities, as each machine encountered considerably different terrain challenges and different sizes and density of PJ woodland.

The cut-and-haul operation was done by a biomass harvesting machine that combines a rotary drum shredding head with a heavy-duty round bale to fell, shred, and bale a wide range of woody biomass. The bales were towed by a four-wheel drive tractor, pulling the baling device over the tree. The bale shredded and then baled the biomass into a standardized agricultural bale (4 feet by 4 feet). The machine consistently handled material up to six inches in diameter, creating a swath that was seven feet wide. Within the baled area, three different treatment plots were evaluated, ranging in density from 35 to 170 trees per acre. Baled material included pinyon, juniper, and any sagebrush in the swath. The system was able to treat almost four acres per hour in the light-density areas and about 1.5 acres per hour in the medium- and high-density plots. Treatment costs were about $41 per acre in the light-density areas and between $95 and $110 per acre in the medium- and high-density areas. Because of the relatively low volume per acre, however, the recovered biomass still costs more than $80 per ton.

The second system tested was a chip-and-forward system, sometimes called a “chip at the stump” system. Just like it sounds, this system involves a machine that cuts the tree, chips it and bins the chips into a trailer. At the stop, collection trailer, then dumps the chips into a roadside bale. This system used a conventional skid-reef shear forklifter, a machine that cuts and piles the selected stems. The shear was followed by a mobile chipper that towed a chip trailer.

At each pile, the chipper would stop, collect, and chip the stems. When the trailer was full, the mobile chipper would drive to the roadside to dump the material. During testing, this system experienced a range of performance problems, including low chip productivity, knife wear, mechanical failures in the trailer, and power-train limitations. There is value in knowing the limitations of such equipment. Furthermore, results from the study can be used by machine manufacturers in estimating productivity and cost if the mechanical issues can be addressed in an improved machine.

The third system tested was a shear-and-forward system that used a conventional tree shear followed by a large forwarder. The forwarder is a machine with a grapple arm and bucket that collects the piled stems and carries them to roadside piles. A large eight-wheeled forwarder was used in three different treatment units. This system could treat about 0.5 acres per hour at a cost of about $350 per acre. With the higher per-acre removal volume and no chipping, this system had the lowest cost per ton to get the material to the roadside.

This study highlights the importance of matching the right harvesting system to the specific conditions of the PJ treat-

The BioBaler, made by the Anderson Group Co. (grp@andersen.com), combines a rotary drum shredding head with a heavy-duty round bale to fell, shred, and bale a wide range of woody biomass. The BioBaler has an effective rot Sovling 8000 to Conditions

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Below: A Parasce (www.parasce.com) forwarder collects felled trees and carries them to roadside piles for chipping.
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B. T. Remmer of the USDA Forest Service Forest

Operations Research Center in Auburn,

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Windows Embedded Handheld or Android

operating system.

ment, as well as fears that bioenergy de­
mand will encourage landowners to vacuum" their forests of every particle of biomass, but the book ends with a
note of optimism: "Smart use of available
wood raw materials can support
long-term forest health and energy
objectives in the United States."

This 70-page booklet costs just
$9.95, plus $4 for shipping (www.fo­
resty.wu.edu); discounts are
available for orders of 10 or more
copies. At that price, any forester can af­
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library or school. I've donated one

copy to my local public library and will
provide another as a reference for

forestry students at Mt. Hood Community
College.

What next? new tools (or books) have you been using? Let me know, wilsens

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The Agony of Engine 57: Documenting the Esperanza Fire
Book Details Arsonist’s Conviction for the Murder of Five Firefighters

By Steve Willard

John N. Maclean’s The Esperanza Fire: Arson, Murder, and the Agony of Engine 57 is not a book about a wildfire. It is much more than that. With a keen eye and ear for detail and raw emotion, Maclean dissects the tragic circumstances surrounding the deaths of five firefighters in 2006 after a wind-driven fire burned over their position on a ridge amid a sea of chaparral and a few trees. Whether or not you’ve ever been on the front line of a wildfire, this book is a gut-wrenching, compelling narrative. It reads like a twist murder mystery, a whodunit novel you can’t put down, with a cast of fascinating characters that includes shady suspects, a dogged detective, DNA evidence, a divided jury, and the victims’ grieving family, friends, and colleagues.

The fire, started by an arsonist on October 26, 2006, burned about 42,000 acres and destroyed 34 homes. The arsonist was caught, tried, convicted, and sentenced to death. Maclean, a seasoned journalist with storytelling in his blood, spent six years piecing together the story of the crime. As for the deaths, he also answers the question, “Why?” as well. It can be answered—Why did the crew of Engine 57 hold in position on that hilltop, with a fire driven by Santa Ana winds below them? And was anyone, other than Raymond Lee Oyler, the arsonist, ultimately responsible for the deaths?

Maclean worked as a writer, editor, and reporter for the Chicago Tribune for 30 years. During that time he helped his father, Norman, edit Young Men and Fire, the elder Maclean’s account of the 1949 Mann Gulch Fire in Montana and the 13 men who died there. (Norman Maclean, who died in 1990, may be best known for his book A River Ran Through It and Other Stories, and the 1992 film based on the title story, directed by Robert Redford.) In 1995, John Maclean left his job with the Tribune to write Fire on the Mountain: The True Story of the South Canyon Fire, an account of the deaths of 14 firefighters in Colorado in 1994. Since then he has written Fire and Ashes: On the Front Lines of American Wildfire and The

EPA Issues New Rule as Supreme Court Hears Forest Roads Case

The US Supreme Court heard oral arguments Monday, December 3, in Decker v. Northwest Environmental Defense Center (NEDC), an appeal of a controversial decision by the US Court of Appeals for the Ninth Circuit that involves Clean Water Act permits for runoff from forest roads. However, the last-minute issuance of a rule by the US Environmental Protection Agency clarifying that such permits are not required was greeted with surprise and irritation by Supreme Court justices and commentators, who might have been a relatively straightforward appeal.

The Ninth Circuit ruled in 2011 that “stormwater runoff from logging roads that is collected and then discharged from a system of ditches, culverts, and channels” is industrial activity and therefore “a point source discharge” that requires a permit from the EPA. Many forest managers and landowners were concerned that the new requirement would result in high compliance costs and delays in conducting timber sales and other forest industry activities. In 2012, EPA submitted a brief to the court stating that existing state best-management practices (BMPs) are effective approaches to managing storm-water runoff and that EPA permits are not needed (see “SAP Briefs Supreme Court: No BMPs, EPA Road Permits Not Needed,” October).

On November 30, the Friday before the Supreme Court hearing, the EPA published a “prepublication” copy of its new rule. On (See “EPA” page 5)

Walters Elected SAF Vice-President; Cox Steps Up to President

The results of SAF’s national elections are in: William D. Walters (left) was chosen as SAF’s vice-president and three SAF members were elected to three-year positions on the SAF Council: J. Lopez, District 3; Andrew J. Hayes, CF, District 6; and Gregory A. Hoss, District 9 (see page 9 for more about the new Council members). JoAnn Meyer Cox (right), who served as vice-president in 2012, became SAF’s president for 2013. She succeeds William Rockwell Jr. A message from Cox to SAF members appears on Page 6. Walters will serve as president in 2014.

Walters has been an SAF member since 1981. He has held several SAF leadership positions, most recently as a Council member representing District 9 from...