Treatment Concepts

The focus of this report is fuel treatment in a stand of ponderosa-pine overstory with a dense ponderosa-pine understory and/or Douglas-fir encroachment. The concepts are applicable (with or without adaptation) to other stand configurations. The condition of the stand is defined as overgrown with excessive ladder fuel. Ground fuel loading may or may not be excessive. Pockets of dense, small Douglas-fir create an additional problem that's difficult to treat with prescribed fire alone.

Given these conditions, potential treatments will be divided into three categories:

- ❑ Special prescribed-fire techniques.
- ❑ Mechanical treatment.
- ❑ Fuel reduction during harvest (Note: This approach is precluded by project criteria but is included here to assist managers in taking advantage of the opportunities to reduce other fuel-treatment costs.)

Special Prescribed-Fire Techniques

Before considering expensive mechanical treatments, it's important to review possible ways to deal with excessive fuel loading by deviating from the traditional preferred prescribed fire. A preferred prescribed fire, for purposes of this report, is defined as a single burn that removes all the desired fuel with very little risk of escape and little or no problems associated with smoke management. After treatment, the stand can be put into a more historically based burning cycle. The next couple of sections present some schemes that make use of the extreme ends of the burning window and may require a short time interval between burns. Some of the concepts presented are fairly common. Others are speculative, and may or may not be practical or advisable given local circumstances.

Series of Short-Interval Prescribed Fires

A series of low-intensity prescribed fires could be attempted in some stands to use crown scorch to kill undesirable saplings and seedlings. Subsequent burns would consume dead material killed during earlier burns. A minimum of two burns in close succession would be needed. Several burns could be required to get the stand into a condition where a preferred prescribed fire could be safely applied at a landscape level. Some fire personnel have indicated their biggest problem has been getting enough suitable burn days for this technique because of narrow burning and smoke management windows.

John Waverek, Fire Management Officer at the Missoula Ranger District (Lolo National Forest), has had good results with short-interval prescribed fires, even when substantial ladder fuels were present. He generally conducts the first burn on the wetter side of the prescription. Natural barriers are used to contain the fire perimeter, whenever possible. Best results are obtained with some preparation, such as fuel augmentation. If fuels need to be augmented, the use of chain saws should be considered. Sawyers can move quickly through the stand, creating pockets of fuel to be burned. The helitorch is used to burn during wetter periods. This equipment allows burning in wetter conditions than would be possible with ground ignition or with the plastic sphere dispenser. The helitorch works very well in remote, inaccessible terrain where crew safety is a factor in determining whether the project can be accomplished by hand ignition.

The Missoula Ranger District burned 900 acres using this technique for under $14 per acre (cost of first burn, no holding lines constructed). For this approach to be used successfully, the burn boss and crews must be very knowledgeable. An inexperienced crew could end up with results that are less than desirable. Since wetter material has a tendency to smolder and produce smoke, air quality must be carefully monitored. The lack of smoke dispersal can meet with public disdain. Future treatments involve coming back on short intervals (perhaps every 2 years) until site conditions meet management objectives. A little more of the undesirable accumulated fuel and duff layer is removed with each burn.

Although some districts are treating stands exclusively with fire, their work appears to be based only on experience (trial and error). Mick Harrington, a researcher at the Rocky Mountain Fire Sciences Laboratory in Missoula, MT, indicated that very little research, if any, has been done in the area of thinning stands with fire. Research could lead to operational guidelines that would help promote this concept.

Slashing Douglas-fir and Allowing It to Dry

Fire managers in the Northern Region note that dense stands of small Douglas-fir don't burn until the site is fairly dry. Pockets of these trees that are usually found in moister areas of the stand have been known to create barriers that prevent a prescribed fire from carrying. An informal local theory holds that the short needles of Douglas-fir compact tighter than ponderosa pine needles in the duff. This characteristic, combined with the dampness in these pockets, does not produce enough heat to scorch the young Douglas-fir during a prescribed fire. By the time these pockets are ready to burn hot enough to scorch the young Douglas-fir, the ponderosa pine is very flammable and the stand is often out of prescription. Northern Region fire managers have suggested that slashing some of the dense pockets of the Douglas-fir and letting the trees dry will widen the treatment window—a procedure that also works with whitebark pine. A variation is to fell the larger Douglas-firs into the patches of the young firs and let them cure before burning. This would eliminate a large seed source, reduce the ladder fuels and encourage scorching, killing young Douglas-fir seedlings (assuming Douglas-fir regeneration is undesirable).

Burning Duff

Karen Jones, a silviculturist for the Truckee Ranger District on the Tahoe National Forest, mentioned that they occasionally burn the litter/duff layer at the base of pines after snow has melted at the base of the trees, but while snow is still on the ground between the trees. They use a drip torch to ignite the dried litter layer. Snow patches between the trees prevent fire escapes and help control treatment intensity. This approach also reduces flame lengths and fire intensity around tree bases when the crew comes back after snowmelt and burns strips between the trees. This approach may not be adequate to deal with the ladder-fuel problem on the more heavily overgrown sites considered in this report. It can also lead to loss of nutrient cycling and long-term productivity.

Steve Arno, a researcher at the Rocky Mountain Fire Sciences Laboratory, expressed concern that burning the thick duff layer at the base of mature trees could damage root systems. He mentioned that some tree mortality has been attributed to this problem. Raking the duff layer from the base of mature leave trees before burning has been suggested. Steve says that raking the duff around mature trees is also costly and not realistic on large landscape-type burns. The Pacific Southwest Experiment Station is conducting a multiyear study on the effects of burning around large mature sugar pines on the Eldorado National Forest (Pacific Southwest Region). Effects of raking around the base of trees, season of the fire, and fire duration are among the elements being analyzed.

Burning During Snow Season

The Bitterroot National Forest sometimes goes into an area twice in the same year. If there is too much fuel on the ground, crews go in while the unit is still wet or has snow remaining and does a jackpot burn. Jackpot burning ignites ground-fuel concentrations remaining from a slashing operation or from natural fuel buildup over the years. Burn crews return the same year under drier conditions for a followup burn.

A technique used in the past by private timber companies was to wait until the first snowfall before burning. A small crew would traverse the unit using drip torches to ignite anything that would burn. Nature put out the fire during the winter. The concept was to reduce the fuel loading and create a mosaic in the unit at a reduced cost. Some States, such as Montana, have state air pollution laws that generally do not allow fires that will burn for several days to be ignited between November and March. Some exceptions are allowed.

Another burning opportunity occurs in the spring when crews can burn at and below the snow line. Larger fuels are still saturated with moisture. The snow line acts as a natural barrier, preventing escapes. The crew returns to the unit repeatedly as the snow line recedes and the fuels dry out. Spring burning may not be practical because of the smoke management problems associated with smoldering, damp fuels.

Aerial Options

A variation of the last two concepts is to use aerial ignition (helitorch or plastic-sphere dispenser). A major drawback to the helitorch is that vegetation is burned indiscriminately. Occasionally, torch fuel lands on desirable leave trees. A concern when using the plastic-sphere dispenser in wet conditions is the possibility that plastic debris and residual chemicals from the spheres will not be consumed by the fire.

In general, aerial ignition is associated with lower costs. Costs can be reduced further when new treatment areas are near areas that received previous burn treatments. If the helitorch is used, the helicopter can treat the new areas and treat older areas a second time while working from the same helispot. A variation on this approach is to burn smaller blocks on the perimeter of a larger block. The smaller blocks can act as a safety buffer so the interior can be burned under more intense conditions at a later date.

Fireproofed Perimeter With Hot Center Burn

A more radical approach is to fireproof a perimeter and then conduct a hot burn in the middle. Very little preparation takes place in the interior and some crowning will occur. This treatment will occasionally cause intense burns that create mosaics in the stand. Some desirable trees will be lost, but it is to be expected. This approach involves burning under hot prescriptions and making maximum use of the natural barriers like ridgetops or rock outcroppings. The possibility of an unplanned increase in target acres should be discussed and addressed through contingency planning. Increased biomass reduction during the initial burn should reduce the number of times the area has to be burned to achieve the desired end result. If the fire does not escape, this approach should result in lower overall treatment costs. Although fuel-reduction treatment costs may be lower, they must be weighed against possible reduction of stand diversity and long-term productivity. There is also the potential for suppression costs associated with fire escapes. Managers must consider these risks and compare them to the costs and extreme site damage associated with a wildfire during the height of the fire season. This approach is not acceptable near the forest/residential interface, but may be acceptable in more remote areas. Some field units have used this approach successfully on wildlife burns and have kept the treatment costs well within $100 per acre.

Residential/Forest Interface

Although some homeowners in residential/forest interface areas may object to fire treatments because of smoky conditions or blackened ground, these effects usually are short lived. Homeowners need to know that the greatest reductions in fire behavior or flame lengths—short of removing fuels from the site—come through prescribed burning. A well-written burn plan should keep undesirable visual effects to a minimum. The Forest Service's liability is not to be taken lightly. More money may need to be invested in preburn mechanical treatments in stands close to populated areas. Mechanical treatments can range from none to total when they are used instead of, or in conjunction with, fire. Chipping may be an effective option here. Recently, more consideration has been given to breaking up fuel patterns across large areas away from the residential/forest interface, areas that would otherwise be economically unfavorable to treat. The extent of mechanical treatments has to be worked out between fire managers and homeowners.