Fuels and Fire Management . . . . Prescribed Fire Use on the National Forests in the Pacific Northwest Region

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On the national forests in Oregon and Washington, we are beginning to move ahead with the application of prescribed fire as a useful land management tool. We recognize that we have a long way to go before we are in the same league as our southern colleauges. Today, prescribed burning is an established resource management tool in southern pine forests, where more than 2,000,000 acres of forest land are prescribed burned annually (Mobley, 1972). This has been proven to be a desirable and economically sound practice in the South.

Historically, here in the Pacific Northwest, most of our prescribed fire experience has been with broadcast burning of logging slash (Dell and Green, 1968; Brown and Davis, 1973). This has been the most common method of fuel treatment and site preparation ever since patch cutting and high lead logging were introduced many years ago.

Timber harvesting by patch cutting generates somewhere in the neighborhood of 60,000 acres of slash on the national forests annually. Each of these acres contains anywhere from 50 to 300 tons (dry weight) of slash, depending on the type and quality of the logged timber (Dell and Ward, 1971). The forester in the Northwest has become quite adept with the drip torch in heavy fuels on steep, rough topography, mostly where the fuel is isolated in an open area (patch cut) and perimeter firelines have been prepared.

Managing slash smoke in the forest-urban interface also requires care and coordination. Federal, State, and private forestry agencies in Oregon and Washington have developed a cooperative smoke management system that is proving quite effective (Cramer and Graham, 1973).

In addition to slash from patch cutting, approximately 550,000 acres of logging residues are created annually in partial-cut stands. Volume of slash in these areas varies from a few tons to about 150 or more tons per acre. On favorable topography, partial-cut slash is handled relatively easily by tractor piling, with follow-up pile-burning later in the year.

On steep and less accessible ground, however, fuel treatment is difficult and costly. In some cases, only expensive hand piling is possible, limiting the amount of area that can be treated, both from a physical and an economical standpoint.

A serious fuels management problem, particularly on our east side forests in Oregon and Washington, is slash created from pre-commercial thinning (Dell and Franks, 1971; Fahnestock, 1968). Thinning in stagnated stands to increase merchantable growth creates about 60,000 acres of slash annually. In the dry climate of eastern Oregon, thinning slash can represent an extreme fire hazard, and wildfire igniting or spreading in this fuel type can be explosive. In recent years we've developed various techniques of mechanical crushing to modify the thinning slash fuel bed (Dell and Ward, 1969). This has reduced potential rates of spread and resistance to control to a manageable level on many acres.

The use of prescribed underburning for fuel reduction, silvicultural improvement, thinning, and site conversion is just starting to be implemented on a truly operational basis in the various vegetative

types found in the Region. In our east side ponderosa pine type, we may be looking at our best potentials for prescribed fire use. Harold Weaver, formerly of the USDI, Bureau of Indian Affairs, conducted prescribed burns in pine and associated brush types on several Indian reservations in Oregon and Washington (Weaver, 1967). He is undoubtedly the pioneer of prescribed fire in this area. In 1957, Morris and Mowat (1958) of the Pacific Northwest Forest and Range Experiment Station conducted studies on thinning ponderosa pine thickets with prescribed fire. So we aren't completely without some background experience in the Region.

In 1972, the PNW Forest Residues research group, in cooperation with the Deschutes National Forest and the Region, conducted spring and fall prescribed fire studies in ponderosa pine on the slopes of Black Butte, near Sisters, Oregon. In this area, dense, continuous thickets of incense cedar had developed under a prime stand of mature pine. Prescribed fire was applied to eliminate the cedar and reduce scattered ground fuel accumulation on the area. Burning was conducted in both spring and fall under different conditions to determine prescription parameters and effects on the environment. Postburn studies are still underway.

In the fall of 1971, the Bend Silviculture Laboratory and the Residues Research group collaborated on an effort to study the attributes of burning in preparation for a seed catch (Schultz and Biswell, 1959). In areas having a mature ponderosa pine overstory and a manzanita-snowbrush understory with little or no pine reproduction, we usually log the overstory, pile the slash by tractor, and plant. This often results in considerable soil disturbance and bare ground for many years.

On this study area, located in the Pringle Falls Experimental Forest, brush was crushed in late summer using a small tractor with a Tomahawk attachment. After 6 to 8 weeks, the brush was well desiccated and ready to burn under a prescription and a careful burning plan. The burn resulted in almost total removal of the brush, but produced some scorching and minor tree kill from convective heat. An excellent seedfall occurred almost immediately following the burn. Twenty seed traps were set out and reproduction "catch" was evaluated as very good.

On the Fort Rock District, also on the Deschutes National Forest, some test burning was conducted on small plots in ponderosa pine thinning slash to see if a low intensity fire could reduce fuel loading and fire hazard. The burning was done in February 1971, with patches of winter snow still on the ground. Temperatures ranged from 35° to 48°F, with humidities ranging from the low 40's to mid 60's. Most of the ground was well frozen.

On these tests, the dry slash burned extremely well, with occasional flareups in concentrations. There was very little wind to carry heat laterally out of the stand and as a result, a few trees were scorched, but generally the burn appeared to be a success. A postburn inspection of the tree foliage on the area 2 months later, however, seemed to indicate about a 75 percent kill. Although foliage appeared dead, by midsummer tufts of fresh green needles soon began to appear. Infrared photos were taken of the stand at intervals. We believe the heat of the fire, frozen ground, rapid thawing, the alteration of warm and cold air produced a "red belt" effect that temporarily discolored the tree foliage (MacHattie, 1963). Mortality, it turns out, has been quite low, and today the stand is looking green and healthy. Some additional prescribed burning of pine thinning slash on a small scale has been done on the Malheur National Forest in eastern Oregon.

On the Rogue River National Forest in southern Oregon, several Districts are using prescribed underburning for fuel reduction on partial-cut logging areas. In the past 2 years, nearly 600 acres have been broadcast burned, eliminating fuel concentrations and lowering overall flammability to an acceptable level. Most of this burning has been done in ponderosa pine, although some mixed conifer is encountered.

Although the coastal Douglas-fir of the Northwest is no stranger to fire, being a subclimax species well adapted to regeneration by fire, there is a marked absence of information or experience on the application of prescribed underburning in this species. In 1972, the Residues Research group undertook a prescribed fire study on the Detroit District, Willamette National Forest. The objectives were to determine: 1) what degree of fuels reduction could be achieved by burns of different intensities, 2) what levels of mortality to the

residual stand might occur, 3) what effect burning would have on understory vegetation and its density, and 4) differences in effects of burning done in spring and fall. Two possible benefits of prescribed underburning in Douglas-fir could be for maintenance of shaded fuelbreaks along ridgetops, and to reduce natural fuels on units to be logged, to reduce the total amount of slash disposal required after logging. Two 15-acre plots have been burned so far with minimal damage to residual trees. Burning operations were conducted safely with no spotting. Ground fuel loading was reduced considerably. Postburn studies are still underway.

Additional underburning in Douglas-fir partial-cuts was accomplished this past spring on the Siskiyou, Umpqua, and Mt. Hood National Forests. The Illinois Valley District on the Siskiyou has done spring burning of logging slash on nearly 200 acres of partial-cuts in the past 2 years. Costs are averaging about $80 per acre. On some areas, fuel loading of 100 tons per acre have been reduced to as low as 30 tons per acre, with minimal damage to the stand. Fuel hazard ratings in the high category have been reduced to low or medium.

Other uses for prescribed fire are also being explored in our national forests. The Mt. Hood National Forest, in cooperation with the PNW Experiment Station, is investigating fire as a tool in managing huckleberry. The huckleberry resource, consisting of 160,000 acres in Oregon and Washington, is rapidly dwindling (Minore, 1972).

Ecologically, huckleberry fields are seral—temporary stages in the natural succession from burned-over areas to climax forest. Without fire or other disturbance, huckleberries gradually are crowded out by invading trees and shrubs. Research is exploring ways to use fire to re-establish the huckleberry resource. Test plots have been established on the Zigzag District. On some plots trees have been felled and crushed. On others, desiccants have been used. Prescribed burning was done late this summer.

In September of last year, a 300-acre prescribed burn was conducted on the Crooked River National Grasslands in central Oregon to control sagebrush and small juniper and restore grass cover. Additional burn areas are being planned for this year. Plans call for

seeding the burned area to perennial grasses. Although such burning may have some very short-term adverse effects, benefits of the increased amounts of grass will produce a more stable soil, higher grazing capacity, and higher quantity and quality of watershed yield (Wright, 1974).

The burning prescription was for a running type fire with a minimum flame height of 18 inches, necessary to effectively kill sagebrush, rabbit brush, and juniper. The plan called for winds in the range of 8 to 15 m.p.h., from a general northerly direction. Relative humidity levels of 20-25 percent for minimum wind conditions and as high as 35 percent with maximum winds were prescribed. Preburn observations were made for several days to determine timing and velocity of afternoon winds. Although winds were somewhat variable in the early stages of the burn, the general conditions encountered were within prescription limits. From an operational standpoint, the burning presented no problems.

We have not even begun to recognize what the role of fire may be in wilderness management here in the Northwest. Fire, once the natural agent for forest fuel reduction, has been almost eliminated by 75 years of fire protection.

Natural fuels continue to accumulate year after year, and with heavy public use, very limited or no access for vehicles, and typical steep rough Northwest topography, the potential for large fires increases every year. Fire research and ecological study into the controlled use of fire in wilderness and alpine areas is needed (Wilson and Dell, 1971).

We recognize that prescribed fire, other than broadcast burning on the west side, is a relatively new tool in land management in the Pacific Northwest. There is still much to be learned. More research and recorded observations are needed to determine why results sometimes vary under quite similar conditions. When to burn and still maintain air quality, how to take advantage of the relatively short periods of allowable burning time, and the effects of fire on soils, watershed, wildlife and aesthetics, need additional study. In planning use of fire as a tool, experienced fire managers must work closely with other functional specialists to mutually develop specific

objectives. They must prepare and use prescriptions that will assure objectives will be met.

Just in the past few years, as you can see, we've come a long way. Still, there is a long way to go. We earnestly believe there is great potential for use of prescribed fire in the Pacific Northwest.

LITERATURE CITED

Brown, Arthur A. & K. P. Davis. 1973. Forest fire control and use. 686 pp., illus. McGraw-Hill and Co., N.Y.

Cramer, Owen P. & H. E. Graham. 1971. Cooperative management of smoke from slash fires. J. Forestry 69(6):327-331.

Dell, John D. & D. E. Franks. 1971. Thinning slash contributes to eastside cascade wildfires Fire Control Notes 32(1). Pp. 4-6. USDA, Forest Serv.

_____ & L. R. Green. 1968. Slash treatment in the Douglas-fir region. J. Forestry 66 (8). August. Pp. 610-614.

_____ & F. R. Ward. 1971. Logging residues on Douglas-fir region clearcuts—weights and volumes. USDA, Forest Serv. PNWF & RES, Res. Paper PNW 115. 10 pp.

_____ & F. R. Ward. 1969. Reducing fire hazard in ponderosa pine thinning slash by mechanical crushing. USDA, Forest Serv. PSWF & RES, Res. Paper PSW-57. 9 pp.

Fahnestock, George. 1968. Fire hazard from precommercial thinning of ponderosa pine. USDA, Forest Serv. PNWF & RES, Res. Paper PNW-57. 16 pp.

MacHattie, L. B. 1963. Winter injury of lodgepole pine foliage. Weather. Royal Meteorological Society, 49 Cromwell Road, London, S.W. Pp. 301-307.

Mobley, Hugh E. et al. 1972. A guide for prescribed fire in southern forests. USDA, Forest Serv. Atlanta, Georgia. 35 pp.

Minore, Don. 1972. The wild huckleberries of Oregon and Washington—A dwindling resource. USDA, Forest Serv., PNWF & RES, Research Paper 143. 20 pp.

Morris, William G. & E. L. Mowat. 1958. Some effects of thinning a ponderosa pine thicket with prescribed fire. J. Forestry 56:203-209.

Schultz, A. M. & H. H. Biswell. 1959. Effect of prescribed burning and other seedbed treatments on ponderosa pine seedling emergence. J. Forestry 57:816-817.

Weaver, Harold. 1967. Fire and it's relationship to ponderosa pine. Proceedings, California Tall Timbers, Fire Ecology Conf. Nov. 9-10. Pp. 127-149.

Wilson, Carl C. & J. D. Dell. 1971. The fuels Buildup in American forests: A plan of action and research. J. Forestry 68(8): 471-475.

Wright, Henry A. 1974. Range burning. J. Range Mgt. 27(1):5-11.