United States Department of Agriculture | **Forest Service** | Northern California Shared Service Area | **2400 Washington Ave. Redding, CA 96001 530-242-2336**

File Code: 3420 **Date:** June 19, 2001
Route To:
Subject: Megram Fire Marking (FHP Rept. No. N01-04)
To: Forest Supervisor, Six Rivers NF
Forest Supervisor, Shasta-Trinity NF

On June 12, 2001, Dave Schultz and Pete Angwin from the Northern Forest Health Protection Shared Service Area accompanied Bill Jones and some of the Six Rivers NF Timber staff to examine tree marking in the Megram Fire. We visited stands of Douglas-fir, pine and white fir along the Onion Camp Road, Lone Pine Ridge and Groves Prairie area. Our purpose was to examine the damage caused to the trees by the fire, check some of the tree marking, and make some predictions for the future.

A number of studies have been done on estimating postfire survival of trees. There are a large number of factors shown to have some influence on survival of conifers after a fire. To some degree, the survival potential of conifers after a fire is dependent on the season of the fire (Dieterick 1979, Wagener 1961), percentage of crown scorched (Deterick 1979, Herman 1954, Lynch 1959, Peterson 1985, Ryan 1982, Ryan et al. 1988, Reinhart & Ryan 1988, Van Wagner 1973, Wagener 1961), amount of cambial kill (Ryan 1982, Ryan et al. 1988, Wagener 1961), amount of root kill (Ryan 1982, Reinhardt & Ryan 1988, Swezy & Agee 1991, Weatherspoon 1988), and other secondary factors such as site conditions (Dieterick 1979, Wagener 1961), availibility of growing season moisture (Dieterick 1979), and insect population pressure (Dieterick 1979, Fischer 1980, Furniss 1965, Miller & Keen 1960, Miller & Patterson 1927).

From the practical aspect of marking trees in the field, it is important to note that most of the variability in the accuracy of prediciting fire-injured tree mortality is accounted for by the two factors of the degree of crown injury and the degree of basal cambial injury. While there are some slight differences in the results presented in the literature, the critical limits of injury important to survival seem to converge around certain figures. It is important to examine both the crown and lower bole of each tree for lethal injuries.

General Characteristics that indicate Fire-injured Conifers will Survive at least 3-4 Years
(Synthesized from several literature sources)

Crown: At least one-third of original crown intact after fire.
(With many natural, mature stands, that had a 30% live crown ratio prior to being burned, this equates to a 10% live crown ratio after being burned.)

Basal Cambial Injuries:
Ponderosa pine: no more than one-third of circumference girdled.
White fir: no more than 25% of circumference girdled.
Douglas-fir: no more than 25% of circumference girdled.
Sugar pine: no more than 50% of circumference girdled (check at ground line).

It is critical to check for basal cambial injuries because intense heat can be generated by dry fuel during a late summer or early fall burn. In areas with thin-barked trees, or a lot of surface roots, the heat may remain a green color for 3 or 4 years after the fire. Water can still being conducted upward

to the crown through the xylem cells in the sapwood. Carbohydrates can't be conducted downward to the roots through the phloem. The tree slowly starves to death, or is attacked by beetles. The combination of crown and cambial damage symptoms is usually about 70-80% accurate in predicting the trees that will die within 3-4 years after the fire. By the fifth year after the fire, it is difficult to draw any conclusive connection between subsequent mortality and the fire.

On June 12, we made a stop in a Douglas-fir stand near Happy Camp Mountain on the Shasta-Trinity NF. The only tree marking visible was some orange flagging that appeared to indicate roadside hazard trees. There was no crown scorch and the stand did not appear to have much damage visible from the road. As we entered the stand, it became obvious that there had been enough ground fuel to cook the bases of many of the Douglas-fir, and a large diameter ponderosa pine. Although these trees had green-colored foliage, they are in the process of dying. Some of the trees had the butt log so severely cooked that they weren't even suitable habitat for bark beetles in the lower bole. There were some Douglas-firs under current attack by the Douglas-fir beetle.

Many of the roads in the area run near the ridgeline. Normal fire behavior is for the upper slopes and ridge tops to be the hottest areas of the fire. In the Megram Fire area, the ridge tops also have a high percentage of white fir. We passed many stands near Onion Camp, Lone Pine Ridge and Groves Prairie that had the superficial appearance of having been lightly underburned. These stands were generally comprised of second growth white fir. The trees had green-colored crowns, and scorch marks on the boles that extended only 1 to 3 feet from the ground. It was obvious from a distance that some stems were dead because there were conks of the pouch fungus, *Cryptoporus volvatus*, present. Fresh conks of *Cryptoporus volvatus* are produced about one year after the tree dies. Examination of trees with basal scorch quickly showed that a high percentage of the trees near the road system are dead, and already have sapwood decay. Because many of these trees are almost entirely sapwood, they should begin falling by 2002 or 2003.

We stopped to examine some of the trees specifically marked as wildlife leave trees in the Six Rivers Late Successional Reserve along the Onion Camp Road. One of the primary marking criteria for selection of these trees was that they had at least 10% live crown. Based on a very small sample, it would appear that about 75% of the marked trees had enough basal girdling to be dead by 2002 or 2003. Some of the Douglas-fir marked as wildlife leave trees were under current attack by the Douglas-fir beetle.

The Megram Fire has presented us with a number of challenges. Some of these challenges are beyond our control. We need to utilize the existing information to efficiently deal with the problems we can address. Please let me know if you need access to the existing literature, or if additional field visits would be helpful.

/s/

Dave Schultz
Entomologist

LITERATURE CITED

Dieterich, J.H. 1979. Recovery potential of fire-damaged southwestern ponderosa pine. USDA-FS, Rocky Mountain Forest and Range Expt. Station. CSU, Fort Collins, CO. Res. Note RM-379, 8pp.

Fischer, W.C. 1980. Prescribed fire and bark beetle attack in ponderosa pine forests. USDA-FS, Fire Management Notes. (Spring Vol.) pp 10-12.

Furniss, M.M. 1965. Susceptibility of fire-injured Douglas-fir to bark beetle attack in southern Idaho. J.Forestry 63 (1):8-14..

Herman, F.R. 1954. A guide for marking fire-damaged ponderosa pine in the southwest. USDA-FS, Rocky Mountain Forest and Range Expt. Station, Res. Notes RM-13, 4 pp.

Lynch, D.W. 1959. Effects of a wildfire on mortality and growth of young ponderosa pine trees. USDA-FS, Int. Forest & Range Expt. Station, Ogden, UT. Res. Note INT-66. 8pp.

Miller, J.M. & F.P.Keen. 1960. Biology and Control of the western pine beetle. USDA-FS, Wash. D.C., Misc. Publ. No.800, 281 pp.

Miller, J.M. & J.E. Patterson. 1927. Preliminary studies on the relation of fire injury to bark beetle attack in western yellow pine. J. Agr. Res. 34(7):597-613.

Peterson, D.L. 1985. Crown scorch volume and scorch height: estimates of postfire tree condition. Can. J. For. Res. 15: 596-598.

Reinhardt, E.D. & K.C. Ryan. 1988. How to estimate tree mortality resulting from underburning. Fire Management Notes. 49 (4):30-36.

Ryan, K.C. 1982. Evaluating potential tree mortality from prescribed burning. In: Baumgartner, D.M., ed. Site Preparation and Fuels Management on Steep Terrain. WSU Cooperative Ext. Ser., Pullman, WA. pp. 167-179.

Ryan, K.C., D.L. Peterson, & E.D. Reinhardt. 1988. Modeling long-term fire-caused mortality of Douglas-fir. For. Sci. 34(1):190-199.

Swezy, D.M. & J.K. Agee. 1991. Prescribed fire effects on fine-root and tree mortality in old-growth ponderosa pine. Can. J. For. Res. 21:626-634.

Van Wagner, C.E. 1973. Height of crown scorch in forest fires. Can. J. For. Res. 3(3):373-378.

Wagener, W.W. 1961. Guidelines for estimating the survival of fire-damaged trees in California. USDA-FS, Pacific Southwest Forest & Range Expt. Sta. Berkeley, CA. Misc. Paper No. 60, 11pp.

Weatherspoon, C.P. 1988. Evaluating fire damage to trees. In: Proc. 9th Ann. Forest Veg. Mgt. Conf., Nov. 4-5, 1987, Redding, CA. pp. 106-110.