United States Department of Agriculture

Forest Service

Shasta-Trinity National Forest

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Route To:

Subject: Evaluation of East Flats Underburn (FPM Rept. N00-6)

To: District Ranger, SMMU

Approximately 300 acres near the intersection of roads 40N12 and 41N06Y were underburned in the Spring of 2000. This resulted in very noticeable orange foliage. The area was quickly evaluated on July 7, 2000 by Dave Schultz from Forest Pest Management and Dennis Poehlman and Becky May from SMMU. Dave Schultz and Pete Angwin, Plant Pathologist, returned on July 12 to take additional data on a plot which had been established in the area in 1996.

The overstory stand is almost entirely ponderosa pine. Researchers studying the recovery potential of fire-damaged ponderosa pine have focussed on the amount of crown killed, and the amount of cambium killed. The East Flats underburn moved through the stand quickly. There wasn't much large fuel in the stand, so there was relatively minor damage to the cambium. The burn was done prior to bud break. Although the flames did not reach the foliage of the overstory, a considerable amount of limbs, foliage, and buds were killed by heat.

The burn occurred at the same time that trees initiate growth in that area. Trees use some of the carbohydrates stored in their roots to initiate the flush of new foliage in the Spring. The new foliage is the most important site of carbohydrates being manufactured for storage and later use. The trees that have little or no live crown are not capable of making and storing carbohydrates for next year. New buds are set and growth shuts down by the end of July. Some of the severely injured trees will put out a small flush of foliage in 2001, and then die.

Trees were assessed for survival in the burn area by estimating the amount of live crown. Most of the trees in the area had about a 30 percent live crown ratio prior to the burn. Trees that had less than a 10 percent live crown ratio after the burn will probably be dead within 3 to 4 years. This time period corresponds with the length of the life cycle of some of the borers that infest fire-damaged timber. Enough time will have passed by 5 years after the burn that it will not be possible to make a connection between the burn and any subsequent mortality.

The most obvious signs of beetle activity in the area at the moment are the large pitch tubes of the red turpentine beetle, *Dendroctonus valens.* The adult beetles are attracted to pine resin. The tubes often indicate areas where the cambium was injured enough to cause a small wound that is leaking resin. Most (over 99%) of the turpentine beetle attacks will not be fatal. They are not a reliable indicator to mark dying trees.

There will be a number of bark beetles and borers that infest the trees as they die. These beetles will primarily be taking advantage of a plentiful food supply. They will not build up, nor will they emerge and attack perfectly healthy trees.

Based on the data from the plot that existed prior to the burn, there was an average of about 3.5 trees per acre killed. This average applies only to the northern portion of the area. The actual distribution of mortality in the northern portion of the burn consists of scattered groups of 10 or more dead and dying trees. It quickly became apparent that the distribution of the mortality

resembled a "swiss cheese."

The site quality varies with the depth of soil covering the underlying lava. The trees tend to be smaller and have less crown closure on the areas of lower site. The more open crowns also tend to allow brush to grow in the understory. These lower sites tend to be warmer, drier, and have needle-drape on the brush. The result is that if fire of equal intensity burns through an area of lower site, there will be more heat released, and the smaller trees will suffer more damage. There can be enough heat generated in the islands of low site to damage adjacent larger trees on the higher sites. This trend was very evident in the more open stands at the south end of the burn.

Some rough estimates estimates of tree mortality were derived by examining the pockets of mortalty. Isolated, single dead trees were ignored for this purpose. Approximately 12.5 percent of the trees containing about 500,000 board feet are dead or dying. If the more open, lower site area on the south end of the burn are included, the openings that would result if the dead trees were salvaged, or the area was site prepped would be about 25% of the total burn. The burn plan included the expectation that up to 10 percent of the trees might be killed.

Because a fairly high percentage of the dead and dying ponderosa pine is sawtimber size, the rate of deterioration will be slower than for smaller size trees. It would be reasonable to expect 40 to 50 percent of the volume to show blue stain and incipient decay by year 1 after the burn (Spring, 2001). By year 2 after the burn, (Spring 2002), there should be about 70 to 85 percent volume deterioration.

The SMMU has had an active burning program for a number of years. Based on those experiences, as well as the most recent burn, there are some possible points to consider:

1. **Validate the expectation of mortality**. The current mortality is 125 percent of the maximum expectation listed in the burn plan (12.5 *vs*. 10%). By its very nature, a figure of "10 percent" sounds somewhat arbitrary. The fact that there is controversy indicates that 12.5 percent mortality has the potential to conflict with the management objectives for some resources. Ultimately, the decision may be that most goals for management in the matrix will be broad averages, or compromises.
2. **Reconsider the pattern of lighting future burns**. It has become evident that "the Flats" are not actually flat. Small rises and lava outcrops can have dramatic effects on the behavior of the burn, and the amount of damage to residual trees. The potential for some damage can be reduced by using fewer lighters, and by purposely trying to cause cooler burns on the outcrops and brushy areas. This will slow production and may affect unit costs. The total impact on all of the affected resources would have to be weighed.
3. **Be wary of later season burns**. The latest burn was "in prescription". Several of the previous burns which caused enough mortality to stir controversy were also in prescription. A surprising number of the hotter burns occurred later in the Spring. At least for the pine stands on the SMMU, it would appear that there is less that can be taken for granted as the burn window approaches late April.

Let me know if you need more information.

/s/

David E. Schultz

Entomologist