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Department of Agriculture

Forest Service

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Route To:

Subject: Evaluation of alternatives to prevent infection by *Heterobasidium annosum*
(FHP Rept. No. N02-06)

To: Roger Siemers

Roger Siemers asked for input to prepare a response to EPIC for a request for a "non-chemical" alternative to manage stands on the Goosenest RD. A borate compound (trade name Sporax) is commonly used to prevent infection of stumps by the root disease fungus *Heterobasidium annosum*. The alternatives for managing annosum root disease in pine are listed below.

1). Do nothing (take no special precautions). The McCloud RD of the Shasta-Trinity NF is located due south of the Goosenest RD on the Klamath NF. Surveys on the McCloud RD showed about 18% of the new stumps became infected (3420 Evaluation dated August 15, 1988, Attachment 1). Each infected stump resulted in an infection center averaging 0.1 acre in size. If 50 stumps per acre were created, we would expect up to 90% of the area to be within annosum root disease centers. These calculations are reasonably close to the situation on several Forest Health monitoring plots located on the McCloud RD (Attachment 2). Repeated entries to remove individual trees without any stump treatment have resulted in an area that has contiguous root disease centers and continual mortality in the residual ponderosa pine overstory.

2). Use solar heating. *H. annosum* will not survive at temperatures above 104 F (40 C) (Kliejunas, 1989 - Attachment 3.). Attempting to restrict harvesting to the warmest months has had some success in the southeastern US, but isn't likely to work in the cooler climate in western Washington (Edmonds and Driver, 1974 - Attachment 4). It has been suggested that leaving stumps approximately 3 feet high in would prevent *H. annosum* from becoming established because the stumps would become too warm for the fungus to penetrate to the roots. Edmonds and Driver (1974) demonstrated that Douglas-fir stumps exceeded 40 C only during the month of August. They also showed that stump temperatures in partial-cut stands did not reach as high as the temperatures in stumps in clearcuts. There is no record of this method being used on ponderosa pine in California. In addition to some drawbacks due to impacts on visual objectives, fuel, and general forest access, the loss of two feet of the butt log would have an economic loss.

3). Clearcut rather than thinning mature stands. Edmonds, et al. 1989 (Attachment 5), reported that precommercial thinning of western hemlock resulted in 90 percent infection with *H. annosum* 11 years after thinning. When the same stand was surveyed 20 years after thinning, the infection rate was only 5 percent. To a much lower extent, the same phenomenon was seen in a large clearcut in ponderosa pine made on the Edson Creek Road on McCloud Flats in 1980. Some annosum root disease spots developed in the new pine stand. The only root masses available to carry the infection were the stumps of the original stand, and the developing pine



seedlings and saplings (photo, Attachment 6). The roots of the previous stand decayed with time, and the roots of the developing stand were small. In an area without large living root masses, annosum root disease became less prevalent with time. Twenty years after the initial harvest, fresh mortality due to annosum root disease was hard to detect.

4). Apply borate compound. A number of chemical compounds have been tested to prevent infection of stumps by *H. annosum* (Edmonds et al. 1989). Sodium tetraborate decahydrate (trade name Sporax) is the only compound currently registered by the EPA for this purpose. One pound of material will treat 50 square feet of stump surface. Results from the 1988 survey of the McCloud RD suggest that ponderosa pine stumps less than 14 inches in diameter do not support active annosum root disease centers. A stump of 14 inches diameter has a surface area of 1.07 square feet. A pound of Sporax should treat 47 14-inch diameter stumps. The Farm Chemicals Handbook (Attachment 7) indicates that borax is nontoxic to livestock. A 3420 evaluation prepared for the Verdi Sale on the Tahoe NF (Attachment 8) contains the MSDS for borax and a risk assessment for using borax. Kliejunas (1989) reviewed the efficacy of treating pine stumps with a borate compound to prevent infection by annosum root disease in sales on the Modoc and Lassen NF's. Infection rates were 0 to 4 percent in treated sales and up to 70 percent in untreated sales.

If you have questions, please call either me or Pete Angwin.

Dave Schultz
Entomologist