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Biological evaluation of western spruce budworm defoliation on the Yakama Indian Reservation

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Background

The current outbreak of the western spruce budworm on the Yakama Indian Reservation defoliation was aerially detected on the Yakama Indian Reservation in 1985. Aerial detection probably missed the first couple of years when the population was building. In 1990, 70,827 forested acres were aerially sprayed with the insecticide *Bacillus thuringiensis* Kurstaki (BtK) (Hadfield 1990). This treatment provided one year of relief from defoliation, after which the budworm population resurged and increased in intensity and extent. By 1999, significant mortality had occurred to Douglas-fir and grand fir over a wide area of the Yakama forest. In 1999, BtK was aerially applied to 37,745 acres.

On 29 September 1999 the Wenatchee Service Center received a funding request from the Yakama Tribe and Bureau of Indian Affairs Branch of Forestry to aerially spray 5,000 acres of budworm host type in 2000. The 5,000 acres represents areas within the Klickitat River Analysis Unit (AU) that will be silviculturally treated by 2002. The objective of the proposed project is to "temporarily reduce tree defoliation, topkill, and mortality" with the expectation that "these actions will reduce economic losses to the Yakama Nation; and the temporary reprieve from defoliation will allow extra time for the areas to be silviculturally treated to reduce future budworm susceptibility". The proposal further states that "A suppression project could slow mortality and allow extra time for implementation of prescribed silvicultural treatments".

General budworm biology, ecology, and management are not discussed here; Yakama foresters are well aware of these factors as Bernie Ryan's 1991 letter to John Vitello demonstrates (attached). Additional sources of information on budworm biology and ecology include Anderson *et al.* 1987, Brookes *et al.* 1987a, Kemp *et al.* 1987, Sanders *et al.* 1984, and Swetnam and Lynch 1989, 1993. For information on budworm hazard reduction see Brookes *et al.* 1985, Brookes *et al.* 1987b, Carlson *et al.* 1983, and Carlson and Wulf 1989.

Management Alternatives

Four alternatives were considered by Yakama Tribal Forestry and the Yakama BIA Branch of Forestry. Alternatives 1, 2, and 3 included additional acreage that would not be silviculturally treated before 2002 and are not discussed in this evaluation. The proposal package (for Alternative 4) included data on current tree damage in the AU (Table 1), budworm larval densities, average number of budworm moths/trap, Douglas-fir beetle presence/absence, and a description of appropriate silvicultural methods that will be used to reduce budworm hazard. From these data it appeared that defoliation from budworms is more recent in the AU than in most areas sprayed in 1999. Average larval density per three-branch sample in the AU was 9.0, slightly above the eight larvae per three-branch sample threshold for deploying pheromone traps, collecting impact data, and refining analysis unit boundaries (Sheehan *et al.* 1993). Douglas-fir beetles and fir engraver beetles were at low population levels. Predicted defoliation in the AU in 2000, based upon 1999 moth counts, was 32% of new foliage.

Table 1. Overstory tree damage data for Klickitat River AU (means with standard errors).

percent with bare top	0.7 ± 0.3
percent with dead top	0.6 ± 0.7
percent defoliated in 1999	7.8 ± 1.6
percent defoliated from 1996-1999	6.0 ± 2.1

For purposes of the following discussion, the proposed alternative (a combination of insecticidal and silvicultural treatments within 5,000 acres) will be called 4a. Two additional alternatives that should be considered are 4b: silvicultural treatment of the 5,000 acres by 2002 with no

application of insecticide, and 4c: no silvicultural or insecticidal treatment within the 5,000 acres.

Alternatives 4a and 4b: Direct suppression of the western spruce budworm provides very short-term foliage protection but does not provide a long-term treatment effect (Carlson *et al.* 1983, Fellin *et al.* 1984, Powell 1994, Sheehan 1996, Shepard 1994, Torgersen *et al.* 1995). Population suppression of budworms following insecticidal treatments usually lasts one year. After that, as observed on the Yakama forest following the 1990 suppression project, there is typically a rapid resurgence of the budworm population. Resurgence occurs from within the treated areas, because it is impossible to achieve 100% larval mortality, and from adjacent untreated areas, such as spotted owl and riparian reserves. Silvicultural treatments that reduce host basal area and host vertical stratification offer the best long-term approach to budworm hazard reduction. If silvicultural treatments are not promptly applied after the application of an insecticide, there is no long-term benefit of direct suppression of budworms.

Alternative 4c: A "no-treatment" alternative would result in the slow replacement over time of early seral species with late seral species. This is readily apparent in the understory data collected in the three AUs (on file with Yakama Tribal Forestry). On sites where either Douglas-fir or grand fir is the most shade-tolerant conifer species, a "no-treatment" alternative would result in the steady increase of budworm, bark beetle, and wildfire hazards. This has been documented on many sites in the West, as several of the references in this document attest.

Larval sampling data and tree damage data from 1999 are averages. If a suppression project is desired, I recommend that pre-suppression larval sampling is conducted within the 5,000 acres in spring 2000 to refine potential spray blocks and to determine if western spruce budworm population levels warrant a 2000 suppression project.

On 22 September 1999, Bernie Ryan led a field trip to review current forest conditions and silvicultural treatments being implemented to improve forest health. It was obvious to all participants that the types and scale of silvicultural treatments conducted this year and proposed for the near future will cause a marked reduction in budworm and bark beetle hazards.

Sincerely,

Paul Flanagan

Paul Flanagan

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cc: Mark Petruncio, Cory Winnie, Jim Hadfield, Ken Snell

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