United States Department of Agriculture | **Forest Service** | **Region One** | **Northern Region**
200 East Broadway
Missoula, MT 59802

File Code: 3420
Date: November 25, 2003

W. J. Ellison
Cherry Creek Ranch
1565 Club View Drive
Los Angeles, CA 90024

Dear Mr. Ellison,

During September 2003, Lee Harry and Nancy Sturdevant met with you to evaluate and discuss current forest health concerns on your ranch and surrounding Forest Service land. On the ranch and on adjacent Forest Service land, we found defoliation from western spruce budworm and tree mortality caused by Douglas-fir bark beetle. Both western spruce budworm and Douglas-fir beetle infestations are increasing across many parts of Montana and also in the Trapper and Canyon Creek drainages.

The enclosed report outlines our observations, discussions and management recommendations. We hope this information is useful to you in the future. For further assistance in developing a land management plan for the ranch, please contact your service forester, Chuck Barone in Dillon at (406) 683-3925.

Sincerely,

/s/ Gregg DeNitto (for)
WILLIAM W. BOETTCHER
Director of State and Private Forestry

Enclosure

cc: Steve Kohler, Gregg DeNitto

TRIP REPORT (TR-03-31)

An Evaluation of Western Spruce Budworm and Douglas-fir Beetle on the Cherry Creek Ranch

September 15, 2003

On September 15, 2003, I accompanied Lee Harry, Beaverhead-Deerlodge Forest Silviculturist, to evaluate insect conditions on the Cherry Creek Ranch near Melrose, Montana. Mr. Ellison was concerned with an increase in the number of dead and dying trees on both his land and the adjacent Forest Service land. He was interested in knowing what insects were present, the effects they were having on forest health, and what if any treatment options were applicable.

The most obvious insect seen on both his land and adjacent Forest Service land was the western spruce budworm, *Choristoneura occidentalis* Freeman. Western spruce budworm populations have been increasing in forested areas primarily east of the Continental Divide in Montana over the past few years. Budworm populations were at epidemic conditions across Montana and parts of Idaho during most of the 1980s and early 1990s causing defoliation on millions of acres. During 1993, we experienced an unusually wet and cool spring and summer and budworm populations crashed. Between 1995 and 1998, we did not detect any acres of defoliation via our annual aerial survey flight caused by budworm in the state.

During 2002, we recorded defoliation on approximately 23,000 acres on the Beaverhead NF during our annual aerial survey flight. The amount of defoliation in the Trapper and Canyon Creek drainages near the Cherry Creek Ranch has increased from approximately 1,600 acres in 2002 to 3,200 acres in 2003.

Western Spruce Budworm Biology and Ecology

Western spruce budworm is a native insect that has co-evolved with its host, primarily Douglas-fir. It will feed on a variety of hosts including grand fir, spruce and sub-alpine fir, however, it is the most damaging in multi-storied Douglas-fir stands. Outbreaks can be either cyclical or chronic depending upon stand conditions and the location of the infestation. On the Beaverhead-Deerlodge NF, outbreaks tend to be chronic because of the prevalence of pure multi-storied Douglas-fir stands. Larger cyclical outbreaks of budworm appear to be synchronized across the west and are thought to be greatly influenced by weather patterns.

The survival of budworm larvae is highest in multi-storied stands. Adult moths lay eggs at or near the tops of mature trees. Developing larvae move down the tree canopy on silk threads to continue feeding on the growth of new shoots. Only after most of the new growth is consumed will the larvae begin to feed on old foliage. This usually occurs when budworm populations are high and have been present in an area over several years. When a budworm infestation begins, defoliation is usually not noticable from the air but can only be detected by ground surveys. After several years, the defoliation is visible from both the ground and air. Trees in infested stands have what appears to be a red-halo. This in fact is the red needles that were partially fed upon by budworm larvae. The needles are tied together with larval silk and hang on the branches until sufficient rain or snow washes them away.

Two to three years of heavy defoliation, can result in dieback of the main terminal leader-or top-kill which affects tree height and possibly vigor. After three to five years of heavy defoliation, branch dieback can occur. At this time some tree mortality may occur in the pole size and regeneration trees. As a result, the stand is thinned, but not to the extent needed to improve stand conditions. The majority of the regeneration in multi-storied Douglas-fir stands can be either killed or grossly deformed.

The following characteristics have been shown to be important in influencing budworm populations (Carlson and Wulf 1989):

- Warm and dry sites
- Have a high component of Douglas-fir and true firs
- Are densely stocked
- Multi-storied or unevenaged stands
- Low tree vigor
- Mature stands
- Primary host of Douglas-fir is continuous and is the primary component of surrounding stands.

Management Options

Any treatment to change the susceptibility of the stand to budworm is the best long-term solution. Silvicultural treatments are intended to manipulate stand age, species composition, density and height class structure to reduce stand susceptibility to attack and vulnerability to budworm-caused damage. Silvicultural treatments include:

- Changing species composition to favor non-host species. This can be accomplished by removing the most susceptible hosts such as Douglas-fir or by regeneration cuts that will favor the establishment of seral species such as pines and aspen.

- Reducing stand density to improve tree vigor. Thinning from below will improve stand and trees health over time and make a stand more resistant to damage and mortality from budworm.

- Reducing variation in height class. Single or two-storied stands are less susceptible to damage from budworm. Significant mortality can occur to developing larvae in single or two-storied stands.

- Sanitation/Salvage cuts. This is applicable in stands that are heavily damaged or in stands that are in eminent danger of heavy damage from budworm.

Spruce budworm outbreaks can also be treated effectively with insecticides. Both chemical and biological insecticides are registered for such use. Controlling budworm outbreaks by spraying insecticides, even over large acreages, was done routinely across much of the west several decades ago. However, budworm outbreaks have not been controlled with insecticides in the Northern Region since the mid-1970s. It is unlikely that the Forest Service will begin this

practice again with our management objectives. However, it is still an option for private land owners.

Douglas-fir Beetle

On the ranch, there are several small groups of trees that are currently infested with Douglas-fir beetle. Our annual forest health aerial survey flight also recorded several groups of Douglas-fir beetle killed trees ranging in size from a few trees to 20 trees per group in the Trapper Creek drainage near Cherry Creek ranch.

The Douglas-fir beetle is also a native insect that has co-evolved with Douglas-fir stands. It is primarily responsible for recycling mature and overmature stands of Douglas-fir. Stands that are heavily defoliated by budworm are sometimes susceptible to Douglas-fir beetle outbreaks. Douglas-fir beetle populations usually build-up in stands following disturbances such as wind-throw, drought, fire, and sometimes severe defoliation. Epidemics are relatively short lived, 3-5 years, and may result in mortality of a significant proportion of the older, mature Douglas-fir trees in a stand. Between 50-90% of mature Douglas-fir trees in a stand may be killed before the epidemic subsides. The more Douglas-fir in the stand, the more severe the outbreak and its effects will be.

Stands that are more likely to experience Douglas-fir beetle outbreaks have the following conditions:

- Stands in which Douglas-fir is the dominant species and sites on which those stands are commonly found.
- Stands greater than 100 years in age.
- Generally, trees greater than 14 inches in diameter are likely to be successfully attacked.
- Stands with a stocking density of greater than 150 square feet of basal area, the higher the stand basal area the higher the stand susceptibility.

Management Options for Douglas-fir Beetle

The greatest benefits in dealing with actual or potential Douglas-fir beetle infestations are derived from efforts aimed at preventing outbreaks rather than suppressing them (Schmitz and Gibson, 1996). To reduce the susceptibility of stands over the long-term, thinning to reduce the stand basal area is effective during the current outbreak and will reduce the susceptibility of the stand in the future. Trees that are currently infested with Douglas-fir beetle should be removed in the thinning operation. Strictly for reducing beetle hazard, stands should be thinned to 60-80 square feet per acre, if this is compatible with other management objectives. Removing the older, larger Douglas-fir from the stand will significantly reduce future beetle-caused mortality from adjacent less-hazardous stands. Highly susceptible stands have greater than 150 square feet of basal area. The more dense the stand, the more susceptible it is to Douglas-fir beetle outbreaks.

If stands cannot be thinned to the recommended basal area, removing currently infested trees is an effective way to reduce additional losses from Douglas-fir beetle. This is usually most effective when only a small group or number of trees is infested with beetles; similar as to what we found on the ranch. Trees currently infested with Douglas-fir beetle can be identified by

examining: (1) the lower boles of trees for reddish-brown boring dust found especially in the bark crevices and (2) the foliage; should be changing from green to yellow in the fall following beetle infestations. By next summer, the tree crown should be either yellow or red. If there is uncertainty as to whether or not the tree is currently infested, you can remove a small piece of bark to identify the presence of pupae or adults in galleries in the live, phloem tissue which is found underneath the outer bark in late fall to early spring. Douglas-fir beetle usually overwinter in the phloem as pupae or adults. The adults emerge in the spring, sometime between mid-April to mid-June, depending upon elevation. Egg laying begins soon after adult emergence and larvae develop throughout the summer. Surveying and removing currently infested trees should be done annually until the Douglas-fir beetle population returns to endemic levels in that area.

If beetle-caused tree mortality increases on the ranch over the next few years, other management tools exist. These include trap trees, funnel trapping and using the antiaggregation pheromone-MCH. There is also the "no action" alternative. Under this alternative, Douglas-fir beetle populations on and near the ranch will probably continue to increase over the next few years. While typically outbreaks don't last long, beetles can kill groups of trees which may reach several hundred per group.

Summary

Currently, there are low to moderate levels of tree defoliation from budworm seen on the ranch. Budworm defoliation on adjacent lands including Forest Service land is at moderate to high levels. Budworm defoliation will probably continue to increase in the Trapper and Canyon Creek areas unless stand conditions or weather patterns significantly change. The best management approach to reduce stand hazard to both budworm and Douglas-fir beetle is thinning. Thinning can also reduce the fuel hazard when properly implemented. Thinning will improve individual tree health which will enable trees to better weather the effects of defoliation. Thinning will also reduce the stand susceptibility thereby reducing the potential of a budworm or Douglas-fir beetle outbreak.

To reduce the hazard to damage from budworm, Douglas-fir beetle and to reduce fuel hazard, stands will have to be selectively thinned. To reduce hazard to budworm and fire, stands should be thinned from below, removing trees from the understory and creating a single- or two-storied stand. To also reduce Douglas-fir beetle hazard, some larger Douglas-fir will need to be removed. The goal should be to reduce the basal area to 80 square feet or below and to create a more uniformly spaced tree environment.

The service forester in your area could provide you with more details on thinning. A professional forestry consulting company could also assist you with discussing and implementing the above management recommendations. We enjoyed meeting with you and your staff. We hope this information is useful to you in the development of your land management plan.

/s/ Nancy Sturdevant
Nancy Sturdevant, PhD.
Entomologist
Forest Health Protection

References

Carlson, C.E. and Wulf, N.W. 1989. Silvicultural strategies to reduce stand and forest susceptibility to the western spruce budworm. Agricultural Handbook No. 676. Washington, DC: U.S. Department of Agriculture, Forest Service, Canada-United States Spruce Budworms Program. 31 p.

Schmitz, R.F. and Gibson, K.E. 1996. Douglas-fir beetle. Forest Insect and Disease Leaflet #5. U.S. Department of Agriculture, Forest Service. 8 p.