Battle of the Budworm

THE VINTAGE World War II bombers flew into the early morning darkness of northern Maine last spring to lead the attack in "The Battle of The Budworm." Loaded with insecticide instead of bombs, the planes were the tools Maine foresters used to combat the ravenous spruce budworm in the largest insecticide spray project the federal government and the State of Maine have ever mounted. This "heavy weapon" strategy is necessary, officials say, because the budworm infestation threatens to destroy nearly six million acres of northern Maine's valuable spruce and fir forest. Natural controls have not stopped the outbreak and the mushrooming worm populations are leading to even more dire predictions in the future.

The spruce budworm is a small brown moth which has been around northeastern forests for a long time — epidemics having been reported as far back as 1770. The most recent severe infestation, in 1910-1919, destroyed 27,000,000 cords of valuable spruce and fir timber. The pulp and lumber industry is Maine's most valued resource, contributing 39% of the state's economy, and the present budworm epidemic threatens to cripple it. This catastrophe would also pose problems for the many related industries dependent on this wood.

But losses of lumber are not the only consequences of budworm feeding. The recreational value of the Maine wilderness is also in jeopardy due to defoliation. Consider, too, the potential upset of the forest ecosystem: forests act as watersheds and, with a major reduction of trees, surface runoff can cause floods and erosion, further threatening the forest. Forest fires would become a more potential danger due to the number of standing defoliated and dead trees. Wildlife may also be endangered because it depends dearly on the forests for shelter, food and water.

The budworm does its damage by feeding on the buds and needles of spruce and fir trees, the fir being

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its preferred host. Early in May, the tiny larva emerges from its overwintering site called a "hibernaculum," a cocoon-like shelter on the branch of its host tree. Larval development is in six stages or "instars," each separated by a molt. The first or smallest instar occurs the previous fall and the larva overwinters in the second instar. After emerging in the spring, the larva tunnels into a spruce or fir needle and feeds by consuming the tissues within the needle. In severe epidemics such as the present one, hardly a bud or shoot can be found with no insect feeding on it. In the sixth and largest instar, the budworm larva eats more foliage than in all the previous stages put together.

In late June, the budworm pupates and emerges two weeks later as a moth. These brown moths begin to lay eggs in July. Eggs are laid in masses of about twenty, and each moth can lay up to 200 eggs in its one year life cycle. Two weeks after ovaposition, the eggs hatch and the first instar larvae spin their hibernaculum to spend the winter and begin the cycle again.

One observer noted that this past July, moth flights were so severe that they literally had to be scraped off the road with snow plows. A cloud of the insects traced by the weather bureau radar measured 64 miles long by 16 miles wide.

Control problems are compounded by the fact that many new moths are brought down on winds from Canada where over 100 million acres of forest are infested and serve as reservoirs for reinfestation in the U.S.

"The budworm infestation is massive," says John Chadwick, Director of the Presque Isle based spray operation, "and our control efforts are really a holding action. We can't hope to eradicate the budworm, but we are trying to keep those trees alive." Infested trees will die after two to three years of feeding and are salvageable for only a few more. Efforts are directed at controlling the moth in the fourth or fifth instar, or before the major amount of damage is done.

"We're talking about one to two hundred years for recycling these forests," Chadwick continues, "so we can't afford to let these trees die in the face of population pressures and use factors of the forest."

Spraying operations began in 1958 with the use of DDT on 320,000 acres. This chemical was restricted in Maine in 1967 and foresters began searching for new less

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Above: A vintage World War II bomber makes a solo pass over the budworm infested forest lands of Maine.

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persistent weapons. Zectran was tested and used operationally from 1972 until last year, but production by the manufacturer, Dow Chemical Co., has been stopped and all supplies have now been exhausted.

A 16,000 acre pilot project testing Sevin 4-Oil carbaryl insecticide in 1974 showed "quite promising results," according to Dr. John Dimond, entomologist at the University of Maine. After receiving label clearance for spruce budworm in March, 1975, 500,000 acres of the total 2.2 million acre spray project were treated with Sevin 4-Oil, also a product of Union Carbide Corporation.

According to Jean Cartier, field development representative for the company, "Sevin 4-Oil is a new oil-based formulation of Sevin carbaryl which provides long residual insect control and allows application as an ultra low volume aerial spray. A major advantage is its resistance to weathering or rain wash off on plant surfaces.

Sumithion, an organophosphate of the Sumitomo Chemical Co. of Japan, was also in large scale use and other chemicals and methods of control were tested.

"We've tried parasite releases," Chadwick states, "but they can't keep up with the epidemic proportions of the budworm population." Bacillus thuringiensis, a bacterial control agent is also being tested. Natural or biological control factors, though they may be attractive to the project's critics, appear to be ineffective against the massive epidemic proportions of the present spruce budworm infestation. Chemical spraying remains the only viable economic option the foresters have, and it has achieved good success with results generally in the 90% kill bracket.

A major hindrance in the spray program has been the instability of funding. The total apportioned to the project this year was eight million dollars, half of which was to come from the federal government, and the other half from the state, and private lumber companies. But in recent years, notably last year, funding has come through only at the last minute imposing problems for the project directors regarding procurement of the required amount of insecticides, aircraft and logistics.

The project itself is reminiscent of the Presque Isle airport's heyday as the debarkation point for World War II bombers. Many of the project staff moved into the airport barracks weeks before the spraying started to set up the necessary mixing, pumping, communications and transportation equipment. Many of the people involved have had experience with other large scale programs of this sort.

Forty-six pilots flying insecticide on the forest in the 1975 operation came from as far away as Oregon, Arizona and Georgia, and

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Planes are loaded with insecticide at this Presque Isle pumping station.

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brought with them thousands of hours of flying time ranging from crop dusting, fire bombing and range spraying to stunt work in movies.

The forty-five planes used ranged from small chase or spotter planes which were used to guide the spray planes, to Generals MacArthur and Eisenhower's Constellations. TBM's, PV-2's and C-4's, familiar planes to many, were also in abundance. Also used were several helicopters for application on the difficult areas around towns and isolated forest land. Spraying was done in the early morning and early evening hours when wind caused drift would be minimized. The planes flew only 150 feet over the forest canopy spraying insecticide with the most accuracy possible.

Spraying was confined to only the most seriously affected forest land while avoiding lakes, fish ponds and farms. The pilot's accuracy, combined with the swift biodegradation of the insecticides used and detailed mapping out of the target forests had reduced the possibility of harmful environmental impact. State health officials however, were also in attendance doing follow-up research on the wildlife and watersheds in the area.

The outlook for the future however, is grim. Although control efforts have been highly successful, they do not approach the extent of the total budworm infestation. The spray projects are expected to continue for a number of years, but officials are hoping for a beneficial shift in weather patterns or insect population developments which will provide deterrent on the epidemic. □