Mont. The tortrix and the pine needle miner confine their feeding to current year's growth, and the needleminer mined only older foliage. Scale populations were distributed throughout the infested area, but appeared heavier on the east side of Teakettle Mountain. Heavy defoliation is anticipated for 1971.

Engelmann spruce weevil, *Pissodes engelmanni* Hopk., caused top killing of spruce reproduction throughout spruce forests in Montana, Idaho, and in Yellowstone National Park.

Heaviest leader killing occurred in a young plantation in Emery Creek on the Hungry Horse District of Flathead National Forest. Repeated attacks resulted in complete mortality of 50 sapling size spruce in this plantation since 1967. Damage is expected to continue.

Cone and seed insects. Approximately 12,000 Douglas-fir and 500 ponderosa pine cones were collected during 1970 and evaluated for insect injury. Douglas-fir cones were collected from 13 locations throughout Montana and Yellowstone National Park. An average of 56 percent of the Douglas-fir cones were visibly deformed due to insect feeding. The most damaging insects on Douglas-fir cones were the western spruce budworm, *Choristoneura occidentalis* Free., which infested 33 percent of the cones examined; cone and scale midges, *Contarinia oregonensis* Foote and *C. washingtonensis* Johnson, which infested 21 percent of the cones; Douglas-fir cone moth, *Barbara colfaxiana* (Kft.), which infested 21 percent of the cones examined; and a fir coneworm, *Dioryctria abietella* (D.&S.), which infested 14 percent of the cones.

An average of 33 percent of the ponderosa pine cones collected from six locations in Montana were visibly deformed. The most injurious insect on these cones was a pine seedworm *Laspeyresia* sp. which infested 97 percent of the cones at one location. Other insects found to be important were coneworms, *Dioryctria* sp. and *Dioryctria auranticella* (Grote), a midge, *Contarinia* sp., and a cone bug, *Leptoglossus* sp.

Other insects. Two species of needle midges, *Contarinia pseudotsugae* Condr. and *C. constricta* Condr., caused light damage on Douglas-fir near Kalispell, Mont. These midges extensively damaged Christmas-tree plantations by mining the foliage and causing gall formation on the current year's needles. The variable oakleaf caterpillar, *Heterocampa manteo* (Dbldy.), caused extensive defoliation of hardwoods on the Fort Totton Indian Reservation and in the Killdeer Mountains, N.Dak. Secondary infestations of the western pine beetle, *Dendroctonus brevicomis* LeC., occurred in ponderosa pines infested by *Ips pini* (Say) on the South Fork of the Clearwater River, Nezperce National Forest, Idaho. A small group kill attributed to *D. brevicomis* was detected in ponderosa pine on the Lolo National Forest, Mont. A bark beetle, *Pityokteines minutus* (Sw.), killed several hundred subalpine fir in two drainages on the Flathead National Forest, Mont. Infestations of a terminal weevil, *Pissodes* sp., caused top kill of lodgepole pine saplings on the Flathead National Forest and Glacier National Park. Approximately 20,000 acres of birch were defoliated by the birch skeletonizer, probably *Bucculatrix canadensisella* Chamb., along the Lochsa River in Idaho.

CENTRAL ROCKY MOUNTAINS (R-2)[3]

By Donn B. Cahill and C. Kendall Lister
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Conditions in Brief

Bark beetles continued to be the primary forest insect pests in Region 2. Spruce beetles killed about 38 million board feet of standing timber in 1970 and threatened to kill an additional several hundred million feet of mature spruce. The mountain pine beetle killed 100,000 ponderosa and lodgepole pine. Timber losses are expected to decrease in stands of ponderosa pine and increase in lodgepole pine stands.

Defoliator activity has increased. Western spruce budworm activity has increased moderately on the San Isabel National Forest and remained endemic in other previously infested

[3] Includes forested lands in Colorado, Kansas, Nebraska, South Dakota, and Wyoming.

areas. A defoliator complex of sugar pine tortrix, a needleminer, and a pine top moth caused light to moderate damage to ponderosa pine in southwestern Colorado. Lodgepole terminal weevil heavily damaged sapling stands on portions of the Roosevelt and Routt National Forests.

An integrated control program has been initiated for bark beetles. This program will include salvage and logging, supplemented with a trap-tree program and chemical control directed against the spruce beetle. Chemical control and logging are also being used against mountain pine beetle outbreaks.

Status of Insects

Spruce beetle, *Dendroctonus rufipennis* (Kby.), became an increasingly serious problem in mature spruce stands. In the Region, timber losses caused by spruce beetle were estimated at 75,000 trees on 26,000 acres. Epidemic populations built up in windthrown trees and green logging slash. The San Juan National Forest had epidemic beetle populations on three Ranger Districts that contained about 50,000 infested trees on 15,000 acres. An infestation near Four Mile Creek contains 4,000 trees in the San Juan Primitive Area.

The Medicine Bow National Forest conducted active salvage, logging, and trap-tree programs to control an infestation of 7,000 infested trees on about 800 acres. On the Gunnison National Forest, there are about 7,000 infested trees with about half of them located in the West Elk Wilderness. On the Bighorn National Forest about 3,000 trees are infested on 2,000 acres. Scattered static infestations were located on the Grand Mesa-Uncompahgre National Forest.

Logging, trap-tree programs, and chemical measures are planned to suppress beetle outbreak except in primitive and wilderness areas, where no control is planned.

Mountain pine beetle, *Dendroctonus ponderosae* Hopk., has been a serious problem on about a quarter-million acres of stagnated, second-growth, and mature ponderosa pine stands in the Black Hills, Roosevelt, Pike, and Arapaho National Forests. The Black Hills National Forest and the South Dakota Department of Game, Fish, and Parks found about 30,000 infested trees on 250,000 acres with the general trend classed as static. The Roosevelt and Pike National Forests and Colorado continued to have scattered infestations along the Front Range with about 20,000 attacked trees.

Mountain pine beetle activity has increased in lodgepole pine near Granby and Hot Sulphur Springs, Colo. Timber harvest has controlled one epidemic center. Other infestations and new outbreak spots, which have killed 10,000 trees, showed up in stands near the lodgepole and sagebrush transition zone. The Northwestern Colorado infestation on BLM and State lands continued to kill small sawlog timber in an isolated stand.

Douglas fir beetle, *Dendroctonus pseudotsugae* Hopk., continued to be a problem in Douglas-fir stands on rough terrain in Colorado and Wyoming. Control action has been initiated in operable stands.

Other *Dendroctonus* beetles. Mortality of high-risk ponderosa pine caused by a complex of *Dendroctonus* bark beetles continued at a low level on the San Juan and Grand Mesa-Uncompahgre National Forests. The beetles responsible are mountain pine beetle, *D. ponderosae* Hopk., western pine beetle, *D. brevicomis* LeC., and roundheaded pine beetle, *D. adjunctus* Blandf.

Western spruce budworm, *Choristoneura occidentalis* Free., defoliation has increased from no observable defoliation last year to about 32,000 acres in 1970 on the San Isabel National Forest.

Other insects. A looper, *Lambdina* sp., defoliated oak on the White River National Forest. Western balsam bark beetle, *Dryocoetes confusus* Sw., continued to kill small groups of subalpine fir throughout Colorado and Wyoming. The lodgepole terminal weevil, *Pissodes terminalis* Hopp., caused terminal damage to sapling stands of lodgepole pine on the Routt and Roosevelt National Forests. In some regenerated areas, 50 percent of the terminals were destroyed.

Light to moderate defoliation on ponderosa pine in Montezuma and La Plata Counties in Colorado was caused by terminal damage from sugar pine tortrix, *Choristoneura lambertiana* (Busck); a pine tip moth, *Rhyacionia* sp.; and an unidentified associate needleminer.

A small infestation of sawfly believed to be the lodgepole sawfly, *Neodiprion burkei* Midd., was reported around Turquoise Reservoir near Leadville, Colo. The host is lodgepole pine and the extent of damage is unknown. The smaller European elm bark beetle, *Scolytus multistriatus* Marsh., associated with Dutch elm disease, has become a problem in American elms on the Bessey Nursery administration site in Nebraska.

SOUTHWESTERN STATES (R-3)[4]

By Robert H. Frye
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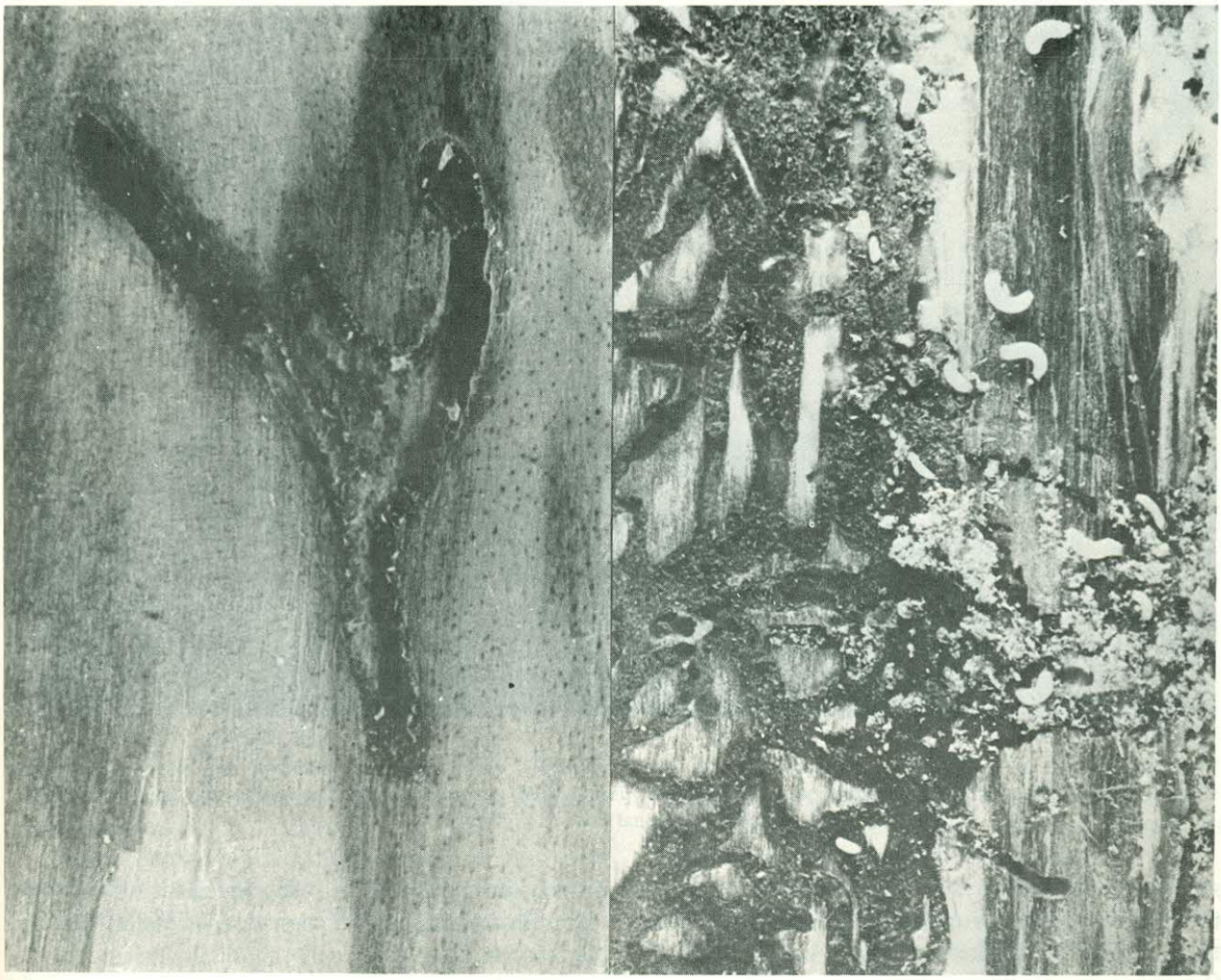
Conditions in Brief

The spruce and roundheaded pine beetles remained the most damaging pests in the Southwest. The spruce beetle infested 88,500 trees in 1970 on the Mt. Baldy area of Arizona. Seven

[4] Includes all forested lands in Arizona and New Mexico and National Park Service land in southern Colorado and western Texas.



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An abnormal spruce beetle egg gallery in a trap tree treated with cacodylic acid (left) compared to a normal egg gallery 5 weeks after attack (Santa Fe National Forest, N. Mex.).