Infestations of the spruce spider mite, *Oligonychus ununguis* (Jac.), in Montana and northern Idaho lessened in scope and severity, but damaged trees at scattered locations on the Deerlodge, Lewis and Clark, Helena, and Gallatin National Forests in Montana, and in Yellowstone National Park. Although mite populations were low in these areas, damage to stands from the outbreaks of prior years is clearly visible.

### Suppression Effective Against Black Hills Beetle

Infestations of the Black Hills beetle, *Dendroctonus ponderosae* Hopk., on the Dixie National Forest and at Bryce Canyon National Park in southern Utah were much reduced from levels of prior years. Sustained control efforts were primarily responsible. The downward trend of infestations first reported in 1958 continued in 1959. The severe drought in 1959 may, however, bring back high populations unless suppressive controls are continued. Some 2,200 infested trees on the national forest and about 200 in the national park require treatment during 1960 to prevent an upsurge of populations and increased tree-killing. Another infestation was reported late in the year at Wheeler Peak on the Humboldt National Forest in Nevada.

## Central and Southern Rocky Mountains

### Highlights

1. Spruce budworm infestations in southern Colorado and northern New Mexico expanded to cover more than 1 million acres. Increases in scope and severity are indicated for 1960.
2. The Engelmann spruce beetle continued to be a serious problem in spruce stands adjacent to timber sales in southern Colorado and at one location in northern New Mexico. Large numbers of beetles in cull material may cause new outbreaks.
3. A new outbreak of pandora moth was discovered in stands of lodgepole pine along the Colorado-Wyoming boundary.
4. Infestations of the Black Hills beetle increased greatly in stands of ponderosa pine in north-central Wyoming and along the Front Range in Colorado.
5. Additional defoliation by the Douglas-fir tussock moth and the New Mexico fir looper was prevented by timely suppression in outbreak areas in New Mexico and Arizona.

### Spruce Budworm Epidemic

Infestations of the spruce budworm, *Choristoneura fumiferana* (Clem.). more than doubled in size in stands of Douglas-fir and true fir in southern Colorado, northern New Mexico, and Arizona. The acreages affected in 1959 by degree of defoliation are as follows:

| | *Light (acres)* | *Moderate (acres)* | *Heavy (acres)* |
|---|---|---|---|
| Colorado | 208,860 | 133,480 | 7,260 |
| New Mexico | 469,580 | 124,260 | 25,440 |
| Navajo Indian Reservation, Ariz. | 50,500 | 29,600 | 3,200 |

In Colorado outbreaks are most serious on the Pike, Rio Grande, and San Juan National Forests and adjacent private lands. Incipient infestations were found on the Uncompahgre and Routt National Forests. The infestation on the Pike Forest was first observed in 1958; damage to trees, except in small localized areas, has been light. Infestations have persisted on the Rio Grande National Forest for about 16 years. Moderate to heavy defoliation has occurred every year since 1954, killing many trees in both the understory and overstory. Outbreaks on the San Juan National Forest are extensive. Top-killing and scattered tree-killing are noticeable throughout the fir type on the eastern edge of the forest. Greater damage is expected in 1960.

Low parasitism of the budworm in southern Colorado and the increase in the number of egg masses deposited by the 1959 flight of the moth indicate a continued uptrend in populations.

The spruce budworm caused heavy defoliation in the fir type on the Carson and Santa Fe National Forests and adjacent private lands in New Mexico, and on the Navajo Indian Reservation in Arizona. Investigations in these areas point to a further increase in populations in 1960.

### Black Hills Beetle Destructive

The Black Hills beetle, *Dendroctonus ponderosae* Hopk., increased throughout the ponderosa pine type in the Bighorn Mountains of Wyoming and the Front Range of Colorado. Epidemics exist on private lands west and northwest of Denver, Colorado. The outbreak in the Black Hills of South Dakota is

being controlled with chemicals. In northern New Mexico, infestations are decreasing. The beetle was found attacking limber pine in the San Mateo Mountains in central New Mexico in 1959--the first time the insect was reported that far south.

## Logging Stimulates Spruce Beetle Activity

Several outbreaks of the Engelmann spruce beetle, *Dendroctonus engelmanni* Hopk., in the spruce forests of Colorado and New Mexico resulted from a buildup of beetle populations in cull material in logged areas (fig. 9). The beetles attack and develop in the shaded and under sides of cull logs where they are protected from enemies and the cold of winter by the deep snow. One or two years after logging, broods mature and emerge to attack nearby standing trees.

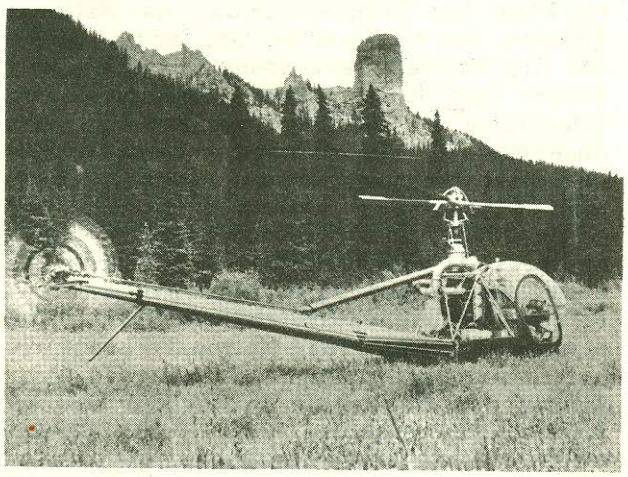

Figure 9. The helicopter is useful in surveying for *Engelmann* spruce beetle outbreaks at high elevations in central Rocky Mountains.

The more important infestations in Colorado were on the Uncompahgre and San Juan National Forests, where over 21,000 trees were killed around logging areas. Many beetles also inhabit cull logs on 45 separate timber-sales areas on these and other national forests in southern Colorado, and will be a threat to trees after emergence next June.

In New Mexico, the spruce beetle was reported in outbreak only in one area, near Chama. Probably this infestation also developed in logging slash.

## Less Pine Bark Beetle Damage In Arizona and New Mexico

Mortality of ponderosa pine throughout Arizona and New Mexico caused by the complex of *Dendroctonus* and *Ips* beetles continued to decline in 1959. *Ips* beetles, usually *I. ponderosae* Sw., often start the attack in the top section of the trees; then *D. barberi* Hopk., *D. convexifrons.* Hopk., and *D. parallelocollis* Chap., kill the lower sections. Concentrations of dead trees were seen only on part of the Lincoln National Forest in New Mexico and on the San Carlos Indian Reservation in Arizona.

## Other Bark Beetles Cause Significant Losses

Other bark beetles, destructive to coniferous stands in the central and southern Rocky Mountains, were in outbreak only in small areas. The fir engraver, *Scolytus ventralis* Lec., increased on the Lincoln National Forest and the Mescalero Indian Reservation in southern New Mexico. An outbreak of long standing continued unabated in the Sandia Mountains east of Albuquerque. The Arizona five-spined engraver, *Ips lecontei* Sw., was abundant in second-growth stands of ponderosa pine near Prescott, Arizona. The mountain pine beetle, *Dendroctonus monticolae* Hopk., increased in stands of limber pine on the Shoshone National Forest in Wyoming.

## Intensity of Douglas-fir Bettle Infestations Variable

Outbreaks of the Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopk., were reported from many areas in the central and southern Rocky Mountains. The total affected area of the Pike, Rio Grande, Roosevelt, San Isabel, and San Juan National Forests in Colorado and the Medicine Bow National Forest in Wyoming lessened in 1958. Areas of activity increased on the Shoshone National Forest and in the South Bighorn Mountains in Wyoming. In New Mexico, tree-killing was heaviest on parts of the Santa Fe and Coronado National Forests, being greater than in 1958.

## Fir Tussock Moth and Looper Outbreaks Suppressed

Outbreaks of Douglas-fir tussock moth, *Hemerocampa pseudotsugata* McD., in 1958 at four locations in New Mexico and Arizona were controlled by aerial spraying in 1959. Except for a small infestation in the Sandia Mountains east of Albuquerque, populations were suppressed effectively. An outbreak of the New Mexico fir looper, *Galenara consimilis* Hein., occurred on an area of 1,500 acres on the Lincoln National Forest in New Mexico. This was the first recur-

rence of this major pest since 1952. Aerial spraying to suppress the tussock moth in the same area was also successful in reducing looper populations.

### Outbreaks of Tent Caterpillars Subside From Natural Causes

Infestations of the Great Basin tent caterpillar, *Malacosoma fragile* (Stretch), have been widespread in southern Colorado and northern New Mexico for the past 10 years, and repeated defoliation killed many aspens. In 1959, natural factors drastically reduced populations over wide areas.

### Pandora Moth Outbreak Discovered in Wyoming and Colorado

The pandora moth, *Coloradia pandora* Blake, caused light to heavy defoliation of lodgepole pine on approximately 9,000 acres of the Medicine Bow and Routt National Forests near the Wyoming-Colorado boundary. Overwintering pupae, abundant in the soil will probably produce a heavy moth flight in the summer of 1960. Because the insect has a two-year life cycle, damage by the young larvae in 1960 is not expected to be severe.

## Lake States and Central States

### Highlights

1. The spruce budworm defoliated increasingly more trees over a wider area in Minnesota, and moderate to serious infestations now exist on over 1 million acres in the northern part of the State.
2. The jack pine budworm severely defoliated its host in localized areas in Wisconsin, Michigan, and Minnesota.
3. Sawflies, shoot moths, pine weevils, hardwood defoliators, and other miscellaneous insect pests continued destruction in many areas.

### Spruce Budworm Infestation Trend Upward

Infestations of the spruce budworm, *Choristoneura fumiferana* (Clem.), increased in area and intensity in spruce-fir stands in Minnesota, where more than a million acres were noticeably defoliated. The insect was active in northern Wisconsin and the Upper Michigan Peninsula, but most stands in these two States are young and vigorous, so the total damage should be small.

The severity of infestations in Minnesota prompted public and private agencies to start programs for suppression in areas of high commercial and recreational value. Using aircraft, workers sprayed a 7,240-acre area east of International Falls, and about 400 acres in the vicinity of Caribou Lake. Plans for a stepup of suppression in 1960 include spraying some 20,000 acres of commercial timber and about 300 acres of recreational lands.

The jack-pine budworm, *Choristoneura pinus* Free., has been an important pest of jack pine and of understory white and red pine in the Lake States for the past 30 years. Defoliation in 1959 was much heavier in several areas in Wisconsin, Michigan, and Minnesota, but infestations were not widespread. In the vicinity of Cass Lake, Minnesota, some 600 acres were sprayed to reduce epidemic populations and prevent severe stripping of affected trees. Sampling in the summer and fall showed only 500 acres in the Chippewa National Forest, Minnesota, requiring control in 1960.

### Defoliation Severe in Tamarack Stands

The larch sawfly, *Pristiphora erichsonii* (Htg.), has been epidemic in the Lake States since 1949 and partial to complete defoliation has occurred each year throughout the 482,000 acres of tamarack type in northern Minnesota. Defoliation in 1959 was general on about 350,000 acres in the north-central and northeastern sections of the State, and some tree mortality occurred on both the better sites and the thin soil sites. Infestations also increased in severity in northern Wisconsin and Upper Michigan and tree mortality in these areas may be expected in 2 to 3 years. Parasites exerted only a minor degree of control on sawflies because the host encapsulates the egg of its principal parasite, *Mesoleius tenthredinis* Morley.

### Pine Sawflies Defoliate Plantings and Commercial Stands

Several species of pine sawflies damaged natural pine stands and plantations throughout the Lake States and the Central States. Scattered infestations of the red-headed pine sawfly, *Neodiprion lecontei* (Fitch), occurred in Michigan, Missouri, and south and west-central Ohio on red, Scotch, shortleaf, and pitch pines. Small areas in the Upper Michigan National Forest and in the southern part of the State had to be sprayed. The Saratoga spittlebug, *Aphrophora saratogensis*