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PINE NEEDLE CASTS

by

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Pine needle cast is a foliar disease of pines, caused by fungi, that is common through out the Northwest Region. The disease causes premature casting (shedding) of needles and can affect trees growing in the forest as well as shelterbelt, nursery, and ornamental trees. Trees with the disease often have only the current years needles as green foliage, the other needles have either been shed or are brown and discolored.

Life cycle: There are several different species of fungi that can cause needle cast (see Hiratsuka 1987 for a listing). Typically, a needle cast fungus completes its life cycle in one year. Fungal spores are released in late June through July and land on needles of the new year's growth. The spores penetrate and infect the needles but there is little evidence of infection until the following year when the needles turn brown or red, usually from May through July, and then start to drop off. The fungal fruiting bodies are often visible, depending upon the species of fungus, as darkly colored slits or spots on the needle's surface. Infection by spores seems to be greatly dependent upon environmental factors such as humidity and free moisture.

Damage: The damage to the tree depends upon the severity of the disease and whether it recurs year after year. Radial growth can be reduced and in some cases trees have died after repeated infections. Lophodermium pinastri, a common needle cast fungus, has caused needle cast problems in nurseries in British Columbia and the United States.

Control: In forested areas the disease is difficult to control other than by biological means. There are several fungi that parasitize the needle cast-causing fungi. Many of these hyperparasites are naturally occurring and will help control the disease in the field. There is genetic resistance in some lodgepole pine provenances to needle cast caused by Lophodermella concolor (Hunt et al. 1987). In nurseries, seed orchards and ornamental trees sanitation is very important. If practical, all of the shed needles should be removed or at least buried in the soil. There are a few fungicides registered for controlling needle cast on conifers in nurseries. Information on registered products is available upon request.

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THE ASPEN LEAF BEETLE

by
Jan Volney

Although the forest tent caterpillar is the insect most often associated with damage to aspen foliage, there are several leaf beetles which defoliate aspen. The most common of these, and the one which is of greatest concern, is the aspen leaf beetle (Chrysomela crotchi Brown). As with most leaf beetles, both the adults and larvae feed on the host plant. In the case of the aspen leaf beetle, the principal host plant is trembling aspen but the insect has been also collected on willow, large-toothed aspen and balsam poplar. This beetle is widely distributed in Canada east of the Rocky Mountains and north to Alaska. (It was erroneously believed to have been introduced from Europe but this arose from confusion with a similar, European, species.) The beetle is uncommon in most of its range and only causes severe defoliation in the prairies region. Because most of its feeding occurs later in the season, it can consume aspen leaves after the trees refoliate following defoliation by forest tent caterpillar populations. In such cases the damage can be extremely serious to aspen trees.

Description: Eggs are laid in circular patches of as many as 60 eggs on the underside of the leaves. The white spindle shaped eggs are about 1.5 to 1.9 mm long and .7 to .8 mm in diameter. There are three larval instars which can be distinguished by the width of the head capsule (I: 0.54-0.74 mm, II: 0.9-1.14 mm, III: 1.34-1.70 mm). The arrangement of the markings and coloration of all three instars are the same. The last few abdominal segments are somewhat lobed and seem to function in grasping the foliage while feeding. The last two thoracic, and first seven abdominal segments of second and third instars bear tubercles which emit a defensive chemical when the insect is disturbed. These tubercles are restricted to the two hind thoracic segments of the first instars. The pupae are orange or pink with brown markings and are secured to the aspen leaves by the last larval skin which is not shed. The lobed segments of the larval skin are used for the attachment of the pupa and the chemical in the tubercles of the larval skin also functions as a defensive secretion for the pupa. The head and first thoracic segment of the adult are black and the rest of the upper body is light brown. The sexes are distinguishable by the shape of the tips of the wing covers (elytra): the tips are more pointed in the female.

Feeding patterns: The first instars feed mainly on the lower leaf surface as a group, removing the lower layer of the leaf. The damaged leaves take on a blackened look with a silver sheen because of this feeding pattern. The second instars are able to skeletonize the leaf but leave the veins intact. The third instars are able to feed on all leaf tissues except the main veins, while the adults consume even the main veins leaving only the mid-rib and a few of the main lateral veins.

Life cycle: Adults are capable of living more than one year (up to three in captivity). Upon emergence from the pupae in late summer to early fall they feed on aspen foliage and in two weeks descend to the base of trees to overwinter in the duff and in the ground. Adults resume

activity in late May, begin feeding, and mate. Egg laying lasts from early June to late July and hatching begins between 6 and 20 days later. The first two larval stages each last a week, and the third stage lasts from 10 days to two weeks. The pupal stage lasts about 6 days and adults emerge starting in late July and extending beyond mid-September. Second year adults enter the quiescent stage in mid-August. The sex ratio of males to females is close to 1 to 1.

Reproductive biology: Although females mate on an average of four times, only one mating is necessary to produce viable eggs for an entire season. On average, females lay 3 to 4 egg clusters of about 38 eggs at 4 day intervals. There is little variation in the numbers of eggs laid by a female in each cluster but egg viability declines in the last laid clusters. Older females are more fecund (198 eggs) than the one year-old females (132 eggs) and females in contact with males throughout the season lay more eggs than those permitted a single mating. Males remain potent for more than one year and are capable of inseminating more than one female. Sperm transfer may therefore provide females with a source of nutrition for egg maturation in this species.

Population dynamics: Parasitism is low when populations are dense and a variety of predators including wasps, predatory bugs and spiders preyed on larvae. Ants prey on eggs but were only effective in dislodging third instars. (Perhaps the secretions of the tubercles are effective in preventing ant predation.) Adult populations exposed to extreme overwintering environments above ground sustain high mortality rates. Outbreaks seem to be limited to the prairie provinces, reaching a maximum of 189,000 km^2 in 1963. Outbreaks, since 1939, occurred in 1950-53, 1959-63. Another might have begun this last summer. It appears that between 1947 and 1965 there was a single spotty outbreak in this Region. Weather conditions associated with population increases are: heavy precipitation from November to January during the early overwintering period, cool dry conditions in the fall from August to October when the insects seek overwintering sites, and warm and wet weather in May to July during the early larval feeding period.

No controls have been developed for this defoliator.

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SYNOPSIS OF TWO MAJOR PESTS IN THE NORTHWEST REGION (1989)

by
Jim Emond

SPRUCE BUDWORM Choristoneura fumiferana (Clem.)

ALBERTA:

In 1989, a notable increase in infestation area was reported in white spruce stands along the Chinchaga River in the Footner Lake Forest. A total of 78 995 ha of light-to-moderate defoliation was mapped in this area compared to 68 107 ha reported in 1988. In the Grande Prairie Forest 1 000 ha of moderate-to-severe defoliation was evident in white spruce stands along the Peace River, north of Eaglesham. An experimental aerial spray program was undertaken by the Alberta Forest Service in this area, using the biological insecticide, Bacillus thuringiensis (Dipel). In the Lac La Biche Forest, light-to-moderate defoliation was reported over an area of 4 230 ha along the House River as compared to 200 ha reported in 1988. In the Peace River Forest, a new outbreak estimated to be 1 000 ha in size was reported in the white spruce stands in the Hawk Hills.

SASKATCHEWAN:

Spruce budworm defoliation remained at much the same levels in the Porcupine Hills and Red Earth as they did in 1988. Moderate-to-severe defoliation was reported over an approximate area of 31 600 ha. A new outbreak was reported north of Big River in the Delaronde, Taggart, and Pancake lakes areas. Another new but smaller outbreak was noted along the Monnery River, north of Paradise Hill. In these areas a total of 3 050 ha of white spruce were affected.

MANITOBA:

In 1989, spruce budworm infestation areas continued to increase in size over that reported in 1988. A total of 58 016 ha of defoliation was mapped in 1989 compared to 30 821 ha in 1988. White spruce-balsam fir stands in the Lake Winnipeg-East forest section continued to be defoliated. Other outbreaks were reported in the Interlake, Pineland and Nelson River forest sections of the province.

NORTHWEST TERRITORIES:

Spruce budworm infestation areas markedly increased in size in 1989 over that reported in 1988. Trees on a total land area of 98 600 ha had some degree of defoliation compared to 14 350 ha reported in the previous season. The largest outbreak occurred throughout the Liard River valley to the B.C. border. Other outbreak areas were present north of Fort Smith along the Slave River, near the mouth of the Salt River and near Long Island.

FOREST TENT CATERPILLAR Malacosoma disstria Hubner

Forest tent caterpillar infestations showed some decline in 1989 but continued to be the major defoliator of trembling aspen in the Northwest Region in 1989. The total estimated area of defoliation was approximately 2 295 585 ha as compared to 3 750 876 ha reported in 1988. Outbreak areas declined in Alberta and Saskatchewan while an increase was evident in Manitoba.

ALBERTA:

The total estimated area of defoliation in 1989 was reported as 1 179 800 ha in aspen forest and woodlands. This was a notable decline over the 2 766 000 ha reported in 1988. The main infestation area was, as last year, throughout the central part of the province, with smaller infestations recurring in the Grande Prairie - Peace River area. Evidence of a collapse in the population and reduction in defoliation was noted in Waterton Lakes National Park, although some moderate-to-severe defoliation was still occurring in the Pincher Creek and Mountain View areas adjacent to the Park.

SASKATCHEWAN:

The total estimated area of defoliation in 1989 was approximately 790 740 ha as compared to 932 040 ha in 1988. This represents a notable decrease in total area affected. The main outbreak occurred in the west-central part of the province and extended from the Big River and Meadow Lake area south towards the Battlefords through to the Saskatchewan-Alberta border. In other parts of the province, small outbreaks were reported near Smeaton, Nipawin, Green Lake, Duck Lake and Hudson Bay.

MANITOBA:

A marked increase in the amount of defoliation was reported in the past season. A total of 325 045 ha of aspen forest showed some degree of defoliation compared to 52 936 ha recorded in 1988. An increase in defoliation was evident in every forest section where it had been detected in the previous season. Most of the damage occurred in northern Manitoba, especially in the Nelson River, Mountain, Highrock, Interlake and Saskatchewan River forest sections.

JACK PINE BUDWORM
(Choristoneura pinus Freeman)

No notable infestations of the jack pine budworm were recorded in the region in 1989.

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