Forest Insect and Disease Notes

Northwest Region *A-025*

December 1993

Contents

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BALSAM POPLAR LEAF BLIGHT

by

David Ip

Most of the balsam (black) poplar (*Populus balsamifera* L.) in southern Manitoba, from the Ontario border to the Saskatchewan border, turned yellowish brown and had premature leaf drop in mid-August this year. This phenomenon is caused by a disease known as balsam poplar leaf blight. Throughout southeastern Manitoba, all around Winnipeg and Bird's Hill Park, and west towards Riding Mountain National Park, stands of balsam poplar visible from many highways had leaf blight. Reports from southwestern Manitoba and the Interlake indicated similar conditions.

The cause of balsam poplar leaf blight is a fungus, *Linospora tetraspora* G.E.Thompson. It is a widespread fungus that attacks balsam poplar throughout most of its range, including the boreal forest, at least as far north as Fort Smith and the Slave River in the Northwest Territories. Outbreaks of this disease are usually local and repeated infestations are common. Both young and mature trees are affected, and in severe infestations up to 100% leaf colonization can occur. The disease generally occurs at the end of the growing season, with the onset of leaf senescence. Balsam poplar leaf blight often occurs in association with other leaf spot diseases such as Septoria leaf spot, caused by *Mycosphaerella populicola* G.E. Thompson and *M. populorum* G.E. Thompson.

The disease is generally considered to be of minor importance, and has not been known to cause serious growth losses or mortality. Damage is primarily due to premature leaf drop and senescence. This year's extensive outbreak of balsam poplar leaf blight in Manitoba was likely related to the record rainfalls throughout the province.

Further Reading

Sinclair, W.A., H.H. Lyon and W.T. Johnson. 1987. Diseases of trees and shrubs. Cornell Univ. Press, Ithaca, NY. 574 p.

Thompson, G.E. 1939. A leaf blight of *Populus tacamahaca* Mill. caused by an undescribed species of *Linospor*a. Can. J. Res. C17:232-238.

JACK PINE BUDWORM

by

W.J.A. Volney

The jack pine budworm (*Choristoneura pinus* Freeman) is a native insect of North America closely related to the spruce budworm *(C. fumiferana* (Clem.)). Unlike the spruce budworm, however, jack pine budworm (JPBW) populations can develop outbreaks in jack pine stands, which they defoliate periodically. Jack pine budworm is widely distributed with its range probably coinciding with that of its principal host, jack pine. It has been found from the Maritime Provinces, through the New England States, Central Canada, the Lake States, Manitoba to Saskatchewan. The first outbreak recorded in Alberta was in 1985 . In 1993 it was detected at

two new locations in Alberta at extremely low population levels. To date, it has not been recovered from the Northwest Territories.

The jack pine budworm also feeds on other native pines, and whiteand black spruce but is unable to develop outbreaks in natural stands of these hosts. Populations develop best in jack pine stands that flower profusely. In the prairie provinces this occurs when stands are about 25 years of age; however, dispersal from older stands to young jack pine stands and nursery plantings during outbreaks has resulted in damage. Outbreaks have been especially damaging in scots, red, jack, and lodgepole pine plantations. The severity of damage experienced by these plantations depends, in part, on the condition of the trees' root systems prior to outbreaks. The full explanation for these differences awaits further research.

Description and Life Cycle

Jack pine and spruce budworms coexist as separate species. The species are very similar morphologically and so individual specimens are difficult to tell apart. Although similar to the more wide-spread spruce budworm, JPBW differs from the latter in many important biological traits. They mature at different times (JPBW moths emerge two weeks later, in late July), are not cross attractive for mating in the field, and have distinctly different host requirements. The jack pine budworm moth's forewing is brick red (unlike most spruce budworms, which are grey), mottled with silvery bands and flecks of darker scales. The females have a slightly larger range in wing span (15 - 28 mm) than males (18-24 mm). Females release a sex attractant (pheromone) which is attractive to males. (The spruce budworm pheromone inhibits jack pine budworm males.) After mating, females may lay over 300 eggs in several egg masses on the convex surface of the pine needle. Egg masses laid on jack pine needles generally consist of 2 rows of eggs overlapping shingle-like. Freshly laid eggs are lime green. The hatched egg mass remains on the needles and resembles an elongate patch of white foam. The larvae hatch in early August and disperse to seek overwintering sites under bark scales on the branch or tree stem. Each larva spins a separate hibernaculum in which it moults to the second instar and then overwinters. Second instars emerge from their hibernacula and may disperse from foliage on silken threads in spring (early June). Larvae feed in the second through seventh instars consuming most food in the last instar. Fully developed larvae have reddish-tan heads with dark lateral markings. Their bodies are dark brown with two rows of paired spots along the length. Mature larvae are about 20-23 mm long. The pupa is reddish-brown with a set of terminal hooks at the hind end. The pupal stage lasts about 10 days. There is one generation per year.

Feeding Patterns

Damage results from larval feeding. Larvae begin by mining pollen cone buds when the buds swell in early June. At first, the only signs of feeding are frass pellets and silk webbing among the pollen cone buds. As pollen cones develop, are consumed or dry out, larvae extend their individual silken feeding tunnels along developing shoots and begin feeding on developing foliage and seed cones. Larvae retreat to the web when disturbed or resting and ultimately pupate in the web. Feeding is generally completed by mid July. This feeding results in several partially consumed pine needles enmeshed in the silken feeding tunnel used by the jack pine budworm. As these needles dry out they become rust colored. This damage gives the tree a scorched look and is used in assessing defoliation aerially because feeding is concentrated in upper tree crowns. Loss of foliage causes a reduction in annual increment. This loss may also cause top kill and even tree mortality. The probability of the more

extreme forms of damage depends on the number of years of severe defoliation. Jack pine retains up to 4 years foliage on its twigs. If defoliation continues for two or more years in the same stand, the risk of top-kill and tree mortality increases dramatically. The damage caused also seems to be influenced by the condition of the trees' roots. Root disease, root deformities (often resulting from poor planting techniques), and root disturbance are associated with an increase in the incidence of more severe damage.

Defoliation patterns vary tremendously within stands. On individual trees, upper crown and outer branch extremities sustain most damage. Apparently insects seek out these areas of the crown when searching for feeding sites because they are attracted to light. Certain trees within a stand sustain more damage than others. Defoliation also varies from plot to plot within a stand. The reason for these patterns is not fully known but appears to be associated with the condition of the tree's root system. The consequence of this observation, however, is that the variability among trees influences the manner in which JPBW populations in a stand can be sampled. The relative importance of variation in defoliation among trees and among plots within a stand also varies with the level of defoliation. Defoliation is most patchy, and therefore most difficult to assess, at low to moderate levels of damage. This pattern is a reflection of insect distribution within stands at different population densities.

Outbreak Patterns

Jack pine budworm outbreaks in Manitoba and Saskatchewan are periodic, recurring every 10 years. The last outbreak occurred in the mid 1980s. This pattern of an outbreak at mid-decade has been observed for the last 5, possibly 6, decades. Other patterns have been detected elsewhere. In Wisconsin there are areas with a similar 10-year return time for outbreaks adjacent to areas where populations peak every 5 to 6 years. The differences seem to be related to site conditions. Drier sites seem to have more frequent outbreaks than more mesic sites.

For 60 years, scientists have suspected that outbreaks are associated with the production of pollen cones by jack pine. The appealing aspect of this association is that it may provide an explanation for the short-term population dynamics of the JPBW. What is known is that the incidence of flowering is low in periods with dry summers, usually at the beginning of the decade. Poor flower crops seem to be related to poor survival of the jack pine budworm. In wetter years, jack pine flower, early instars survive better, and populations increase. These outbreaks only become detectable when the insects cause noticeable defoliation on trees. Severe defoliation suppresses flowering and so budworm populations decline. By this time there may be the onset of drought and the cycle repeats itself. Though always present in jack pine stands, the jack pine budworm is extremely difficult to find between outbreaks.

A whole suite of natural enemies that contribute to the decline and maintenance of low level population is associated with JPBW populations. These enemies include insect parasitoids, both vertebrate and invertebrate predators, and pathogens. Despite these organisms efficiency at maintaining low populations they seem unable to control populations when a combination of climatic and host conditions favour the jack pine budworm.

Management Implications

Forests managed for timber production may be protected, if warranted, with treatments of the bacterial insecticide *Bacillus thuringiensis var. kurstaki* (Btk). Various preparations of Btk have been registered for controlling jack pine budworm in Canada. *Bacillus thuringiensis var. kurstaki* has been applied operationally in

Manitoba and Ontario. Treatments with Btk should be aimed at the peak of the sixth instar minimizing the impact on natural enemies, and maximizing the exposure of larvae to the insecticide, while minimizing foliage loss. Phenological models to permit predicting opportune times to schedule pest management activities have been developed. *Bacillus thuringiensis var. kurstaki* is usually applied in early July. This technique is suitable for treating extensive areas or on large ornamental or high value trees where other techniques would yield poor control. Another technique for smaller trees is to dislodge the larvae with a jet of water. On very small trees it is sometimes feasible to remove the larvae by hand.

In timber production areas outbreaks may be anticipated. Older stands and stands harbouring root disease should be harvested before vigorous stands to minimize the impact of an impending jack pine budworm outbreak. Stands that have sustained top kill and mortality may be salvaged to prevent further losses from outbreaks of secondary pests. Techniques to monitor populations with pheromone traps and inspection of foliage show considerable promise in detecting incipient outbreaks. Aerial sketch mapping and ground surveys can be used to delineate stands defoliated by the jack pine budworm in preparation for salvage operations. Hazard rating stands and the development of decision support systems to integrate this information for selecting pest management options is underway in Canada and the United States .

Future Meeting

A symposium on the latest developments in research and management of jack pine budworm populations is planned for Winnipeg in January 1995. If you are interested in this meeting, please drop me a note and I shall keep you posted on any developments.

UPDATE OF MAJOR FOREST PESTS IN THE NORTHWEST REGION IN 1993 AND PREDICTIONS FOR 1994

by

James Brandt

SPRUCE BUDWORM

***Choristoneura fumiferana* (Clem.)**

In the Northwest Region spruce budworm infestations occurred in nearly all the same locations in 1993, as those reported in 1992. The infestations covered a composite forested area estimated at 293 331 ha, compared to the 345 906 ha in 1992, down about 15%. Infested areas in Alberta, Saskatchewan, and Manitoba decreased substantially in 1993, by about 66, 35, and 43%, respectively. In the Northwest Territories, spruce budworm defoliation area increased by 92%. The amount of forested area defoliated was 48 546 ha in Alberta; 56 617 in Saskatchewan; 15 051 in Manitoba and 173 118 in the Northwest Territories.

In 1993, the biological insecticide, *Bacillus thuringiensis* var. *kurstaki* (*Bt*) was applied aerially to suppress spruce budworm populations and protect foliage. The area treated in Alberta was 8230 ha and in Saskatchewan, 34 017 ha were treated in the Big River area.

In Alberta, Land and Forest Services deployed pheromone-baited traps at many locations throughout the administrative forests to monitor spruce budworm population levels. Moth counts greater than 500 moths/trap were

observed at nine locations in Athabasca, Footner Lake, Peace River, and Slave Lake forests. Second instar (L_2) surveys were conducted in Footner Lake and Athabasca forests. Results indicate that from light to severe defoliation will occur along the Chinchaga River and east along Highway 58 in Footner Lake Forest in 1994. Light and light-to-moderate defoliation is expected in Lac la Biche Forest in 1994.

In Saskatchewan, 408 pheromone-baited traps were deployed at 136 sites by Saskatchewan Environment and Resource Management. Trap catches indicated relatively high population densities throughout Saskatchewan's commercial forests, and helped to identify areas of concern for follow-up L_2 surveys. The L_2 surveys were conducted in Hudson Bay, Meadow Lake, and Prince Albert regions. Light defoliation is expected in Hudson Bay Region and at most locations in Meadow Lake and Prince Albert regions in 1994. At one location in each of Meadow Lake and Prince Albert regions moderate defoliation is expected. These forecasts are based on an average per Universal Transverse Mercator (UTM) cell.

In Manitoba, surveys used to forecast 1994 spruce budworm populations and predict defoliation levels in some administrative sections were completed by Manitoba Natural Resources. Light and light-to-moderate defoliation is expected in 1994 in Abitibi-Price F.M.L. and in Nopiming, Whiteshell, and Duck Mountain provincial parks.

JACK PINE BUDWORM

Choristoneura pinus pinus Free.

Jack pine budworm has not caused significant defoliation to pine stands in the Northwest Region since the last major outbreak. This outbreak collapsed in 1987. Monitoring of jack pine budworm populations has been ongoing through the efforts of FIDS in Alberta and Saskatchewan and Manitoba Natural Resources in Manitoba. Detection surveys have concentrated on pheromone traps for male moths and egg-mass surveys. Jack pine budworm populations are anticipated to remain low across the Northwest Region and very little defoliation is expected.

ASPEN DEFOLIATORS

Forest tent caterpillar,
***Malacosoma disstria* Hbn.**
Large aspen tortrix,
***Choristoneura conflictana* (Wlk.)**
Aspen leafroller,
***Pseudexentera oregonana* (Wlsm.)**

In the Northwest Region aspen was defoliated by forest tent caterpillar, large aspen tortrix, and aspen leafroller. The total area defoliated by aspen defoliators was 607 690 ha in 1993. The area defoliated increased significantly in Alberta from no defoliation in 1992 to 160 017 ha in 1993. In Saskatchewan, 440 755 ha were defoliated. In Manitoba the area defoliated decreased by 86%, from 51 153 ha in 1992 to 6918 ha in 1993.

In Alberta, forest tent caterpillar egg-band surveys were conducted at 19 locations around infested areas. Severe defoliation can be expected in 1994 just north and south of Cooking Lake. Light defoliation is expected at Tofield, Miquelon Lake Provincial Park, Elk Island National Park, and north of Peace River townsite. South of the townsite along both sides of the Peace River to the Shaftsberry Ferry defoliation will range from moderate to severe. Moderate-to-severe defoliation is expected north of Guy.

In Manitoba, forest tent caterpillar egg-band surveys were conducted at 8 locations. Light defoliation is expected in 1994 near Manigotagan and Lake St. George.

No defoliation is expected in Duck Mountain Provincial Park, Riding Mountain National Park, Mafeking, Big Whiteshell Lake, Landry Lake, or Flin Flon.

BARK BEETLES
Mountain pine beetle,
***Dendroctonus ponderosae* Hopk.**
Spruce beetle,
***Dendroctonus rufipennis* (Kby.)**
Douglas-fir beetle,
***Dendroctonus pseudotsugae* Hopk.**

Mountain pine beetle infestations remained very low in the Northwest Region in 1993. Beetle presence was detected at several locations only by means of pheromone-baited trap trees. Aerial and ground surveys to detect recent mountain pine beetle-killed trees were conducted by FIDS personnel, Alberta Land and Forest Services, and Parks Canada. Survey efforts were conducted in areas where dispersing beetles might invade. Areas of concern in western Alberta included the foothills region from Willmore Wilderness Park to the Canada-U.S. border and Jasper, Banff and Waterton national parks. Cypress Hills Provincial Park in southeastern Alberta was also surveyed.

The Alberta Land and Forest Service conducted a detection survey for spruce beetle in a number of forests using Lindgren funnel traps baited with pheromones. Traps were set up at one location in Athabasca Forest, five locations in Bow-Crow Forest, three locations in Footner Lake Forest, eight locations in Peace River Forest, and two locations in Slave Lake Forest. In Peace River Forest where several patches of recently killed or dying trees were observed in 1992, large numbers of beetles were captured in traps suggesting that a population still exists in the area. The province employs three strategies to control the spruce beetle outbreak: deployment of pheromone-baited trap trees, felled trap trees, and salvage logging. During the winter of 1992-93, 9829 m^3 of spruce were salvaged in the Hawk Hills area. More salvage cutting has been approved for the winter of 1993-94: 11 136 m^3 of spruce in the Hawk Hills area, and 70 831 m^3 of spruce in the Nina lakes area.

The infestation of Douglas-fir beetle in Alberta, which was initially reported in 1991 in Jasper National Park, continued to expand in 1993. Concern over this infestation has led park staff to conduct intensive aerial and ground surveys to detect Douglas-fir beetle activity. Results of these surveys indicate that approximately 383 Douglas-fir trees were killed in 1990 and 1991, 528 trees in 1992, and 685 trees invalley, in areas adjacent to Jasper townsite and Jasper Park Lodge, and at several locations up to 15 km north and south of the town of Jasper. 1993. The killed trees were located in patches scattered along the Athabasca River

SPRUCE GALL MIDGE
***Mayetiola piceae* (Felt)**

In 1992, an infestation of spruce gall midge was detected in northern Alberta and adjacent areas in the Northwest Territories. In 1993, an intensive survey was conducted for this pest throughout Footner Lake Forest, in the northwest region of Athabasca Forest along the Birch River, and in the Northwest Territories. Thirty-two plots were examined for spruce gall midge. Midge incidence and damage were evaluated on both the 1993 and 1992 shoots.

No spruce gall midge was found on 1993 shoots at eight plots. Twelve plots were lightly infested (<25% of current shoots infested), seven plots moderately infested (26-50% of current shoots infested), and 5 plots severely infested (>50% of current shoots infested). Moderate to severe infested plots were located from Paddle Prairie north through High Level into the Northwest Territories just south of Enterprise, northwest of High Level to Zama Lake, and southeast of High Level to just south of Fort Vermillion. Light infestations were located southwest of High Level near Rainbow Lake, Wadlin Lake and east to the Birch River, and in the Northwest Territories near Hay River and Trout River. Whereas spruce budworm infestations along the Chinchaga River and on the Zama ridge included spruce gall midge

damage, it appears that spruce gall midge damage was reduced in these areas. Spruce gall midge was also found in the 1993 shoots at less intensively sampled sites west of Zama Lake along the Hay River and northeast of High Level as far north as the Yates River.

DUTCH ELM DISEASE
***Ophiostoma ulmi* (Buis.) Nannf.**

In Alberta, surveys to detect the incidence of Dutch elm disease (DED) were conducted by the municipalities of Medicine Hat, Red Deer, Calgary, and Edmonton and by Alberta Agriculture under the Dutch Elm Disease Initiative. The initiative consists of three programs: monitoring DED, smaller European elm bark beetle (*Scolytus multistriatus* [Marsh.]), and native elm bark beetle (*Hylurgopinus rufipes* [Eichh.]); an inventory of American elm in the province; and elm firewood confiscation at ports of entry into the province. Elm bark beetle monitoring was conducted at 30 locations in Alberta from Cold Lake to the Crowsnest Pass. Most monitoring sites were at points of entry into the province. Traps were baited with the smaller European elm bark beetle pheromone and trap logs. There were no reports of the disease or beetle vectors in the province.

In Saskatchewan, three new locations were recorded as having DED-infected elms: the town of Langenburg, just outside of MacNutt, and in the Qu'Appelle River valley southeast of Crooked Lake in the Cowesses Indian Reserve. At Langenburg three trees were infected in town and one tree just outside of town. Near Round Lake approximately 100 trees were infected. The provincial Dutch Elm Disease Program staff, the Saskatchewan Dutch Elm Disease Committee, and the public detected these new infections. In 1993, intensive ground surveys were conducted in areas known to be infested such as the Souris River valley south of Estevan, the Qu'Appelle River valley between Crooked Lake and Round Lake, and in the Wascana Creek area. Samples were taken from 237 suspect trees and sent to the laboratory for identification. Only 11 samples were identified as being positively infected by DED. No aerial surveys were conducted in 1993.

Staff of the provincial Dutch Elm Disease Program distributed approximately 80 traps baited with smaller European elm bark beetle pheromone to 34 communities for deployment. In traps placed in and around Estevan a few *H. rufipes* were captured but no *S. multistriatus* were trapped. In Regina and in Sherwood Forest, just west of Regina, traps were set up at 52 locations and visited periodically during the course of the summer and early fall. From these traps, 233 native elm bark beetles were captured. No elm bark beetles were captured in any other communities.

Limited control operations for DED were done in Saskatchewan and involved the removal of DED-infected trees. Twenty trees were removed in the Sherwood Forest Country Club west of Regina and 10 trees were removed in Carrot River.

In Manitoba, the current range of DED extends through the southern portion of the province in riparian forests and in communities north to Swan River. In Winnipeg, DED incidence remains at 2.4%. In 1993, 10 000 diseased and hazardous elm trees were marked by surveyors for removal in Manitoba: approximately 4000 in Winnipeg, 175 in Brandon, and the remainder in 42 rural communities.

Thirty-two communities participated in the 1993 cost-shared DED program with Manitoba Natural Resources. An additional ten communities that did not participate in the program were surveyed for DED by Manitoba Natural Resources. The cost-shared program helped in sanitation pruning, basal spraying with insecticide to reduce vector beetle populations, and replacement plantings.

Compiled by K.I. Mallett

This note, if cited, should be referred to as a personal communication with the author(s).

Northern Forestry Centre
5320 - 122 Street
Edmonton, Alberta
T6H 3S5
(403) 435 - 7210
FAX (403) 435 - 7359

Saskatchewan District Office
1288 Central Avenue
Prince Albert, Saskatchewan
S6V 4V8
(306) 953 - 8544
FAX (306) 953 - 8849

Manitoba District Office
200 - 180 Main Street
Winnipeg, Manitoba
R3C 1A6
(204) 983 - 4817
FAX (204) 983 - 8792