TECHNOLOGY TRANSFER NOTE

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FOREST INSECT AND DISEASE NOTES

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Government of Canada
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HYPOXYLON CANKER

by
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Hypoxylon canker, caused by the fungus Hypoxylon mammatum (Wahl.) J.H. Miller, is one of the most serious diseases of aspen poplar in North America. Manion (1981) reported that in the Lake states of the United States up to 10% of the trees were affected by the disease and in some stands 90% of the trees were affected. In Alberta, Baranyay (1967) found that 45% of the aspen trees on a 1/3 acre plot were killed or infected with Hypoxylon canker. The disease can seriously reduce stand density and yield.

Hypoxylon canker is present throughout most of the range of trembling aspen in North America and has been found on large toothed aspen, alder, birch, willow, and elm. There is some confusion as to whether balsam poplar may be a host.

The cankers start as sunken, orange-yellow depressions on the bark of stems or branches. The cankers enlarge rapidly and eventually girdle the stem or branch. The bark splits and a rough black surface with a white coating can be seen erupting from underneath the bark. The reproductive structures of the fungus are found in this black mass. White fans of fungal tissue can be seen under the bark. Trees whose stems have been girdled by the canker often snap in high winds. Cankered trees often die within five years.

Ascospores produced by the fungus are thought to be the primary source of inoculum for the disease. The conditions necessary for infection are poorly understood. Cankers are often associated with branch stubs and with wounds. Wounds caused by the poplar borer, Saperda calcarata, have also been found to be points of entry for the fungus.

Management

No practical control measures are known for this disease. However, heavily infected stands should be considered for removal. There is some evidence that poorly stocked stands are more susceptible to the disease and that some aspen clones have genetic resistance.

References

Baranyay, J.A. 1967. Notes on hypoxylon canker in Alberta. For. Chron. 43:372-380

Manion, P.D. 1981. Tree disease concepts. Prentice-Hall Englewood Cliffs, New Jersey

THE WESTERN ASH BARK BEETLE

by

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Green ash, Fraxinus pennsylvanica var. subintegerrima (Vahl) Fern., is a highly prized shade tree planted in urban and rural environments of the Great Plains of the United States and prairie provinces of Canada. Green ash has been preferentially planted over other popular shade tree species in many (especially urban) areas because it is hardy, easy to maintain, and has fewer diseases and insect pests than other trees. One insect that is commonly associated with green ash and other Fraxinus species is the western ash bark beetle (WABB), Hylesinus (= Leperisinus) californicus (Swaine). In Canada the WABB occurs in the southern half of the prairie provinces, British Columbia, and likely in western Ontario. In the United States the species is widespread in the Great Plains and Rocky Mountain Region, south to northern Mexico. The WABB is also a significant pest of olive trees in California.

Larvae of the WABB are 2-4 mm long, white, legless grubs with brown head capsules. Adults are robust, oval, 2-3 mm long and have a variegated white and brown color. Good photographs of the adults, larvae and egg galleries are provided in Ives and Wong (1987).

The biology of the WABB is poorly understood. Published information on this pest indicates that its life cycle varies greatly over its geographic range. In Canada, the ecology of the WABB has not been studied but scattered observations on its life history have been made by several researchers. The species overwinters as adults in the bark of the lower 30 cm of the bole and in exposed roots of ash. The beetles emerge from overwintering sites in late April and early May and disperse to twigs and branches where they feed on phloem tissue for a brief period before breeding. The female initiates an attack and attracts a mate by producing an aggregation pheromone (sex attractant). After mating the female begins to construct a transverse egg gallery in the phloem. Eggs are laid in small pockets along both sides of the gallery and upon hatching the larvae feed in a direction perpendicular to the gallery. Development is completed in late July and August and new adults emerge from their galleries to feed for a while in the crotches of branches before moving to overwintering sites in September and October. Beetles appear to walk or fall to the base of the tree instead of flying. It is not known if all beetles overwinter at the tree base.

The WABB usually infests only the occasional weakened tree or branch and causes relatively little damage. However, when large numbers of trees are stressed (commonly by drought or ice storms) they become susceptible to WABB attack. With the sudden availability of weakened host material WABB populations quickly increase to outbreak levels causing economically significant damage. Localized and widespread droughts have become more common in the North American midwest in recent years due to changes in weather patterns and have likely contributed to the increase in WABB outbreaks. In the past five years WABB outbreaks have occurred in most major urban centers and in many rural areas in the southern half of the prairie

provinces. WABB populations are currently at outbreak levels in southern Alberta and in Montana. In 1988, 30-35% of the approximately 90 000 green ash in Calgary were attacked by the WABB and about 5% were killed.

A tree undergoing attack by the WABB can be identified by the presence of tiny holes (about 2 mm diameter) in the bark, especially in cracks and crevices, and accumulations of boring dust under the attack sites. The transverse egg galleries are evident by the sunken, discolored bark and a row of 'ventilation holes' about 4-6 mm apart along the length of the gallery. The leaves of branches girdled by egg gallery construction turn yellow by late June or early July, thus flagging infested branches.

Prevention and Control:

Since WABB populations build up in weakened host material steps can be taken to minimize the availability of such breeding material. Dead, weakened and criss-crossing branches should be pruned from trees in early spring. Infested branches and trees as well as old weakened trees should be removed and disposed of (by burning or burying) before adult emergence in July.

No insecticides are currently registered for control of WABB. However, carbaryl, methoxychlor and chlorpyrifos have been used with some success at controlling this insect in the past. Spraying of boles and larger branches in the spring kills adult beetles that are starting to feed or attack, thus protecting trees. Spraying the lower metre of bole in late summer targets beetles attempting to enter the bole to overwinter.

Little research on this insect has been done in Canada or the United States. This general lack of biological information on the WABB requires an intensive research program to learn the life history (phenology, behavior, life tables, etc.) and population dynamics. As well, there is a need to evaluate control strategies and implement effective population monitoring and management programs. Pheromones have proved very promising for monitoring and control of other bark beetles. Currently, personnel at NoFC are functioning in an advisory capacity for some preliminary research on the WABB currently being conducted by the Calgary Department of Parks and Recreation. This research will focus on detrmining the life cycle of the beetle in Calgary and will form the groundwork for any future research on this pest.

Further reading:

Ives, W.G.H. and H.R. Wong. 1988. Tree and shrub insects of the prairie provinces. Can. For. Serv., Northern For. Cent., Edmonton, Alberta. Info. Rep. NOR-X-292.

McKnight, M.E. and D.G. Aarhus. 1973. Bark beetles, Leperisinus californicus and L. criddlei (Coleoptera: Scolytidae), attacking green ash in North Dakota. Annals of the Entomological Society of America 66:955-957.

FOREST INSECT AND DISEASE SURVEY PEST DEPLETION EXERCISE 1982-87

by
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During the past decade the reporting emphasis of the Forest Insect and Disease Survey (FIDS) of Forestry Canada has changed from determining pest distribution and incidence to quantifying damage and loss due to pests (Sterner and Davidson 1981). One result of this has been the preparation of depletion estimates for the major forest pests of Canada. These are national estimates which attempt to quantify the volume of wood lost to tree mortality and growth loss as a result of pest activity. The first attempt at this depletion loss exercise was for the period 1977-81, and the results appeared in Sterner and Davidson, 1982. A second depletion loss exercise is underway for the period 1982-87.

The staff of the FIDS Technology Development Project at the Petawawa National Forestry Institute in cooperation with staff from regional Forestry Canada establishments and provincial/territorial agencies are developing Geographical Information System methodolgy to aid the depletion exercise process. The following discussion gives a simplified overview of the procedure.

Methodologies involved in estimating depletion will vary somewhat depending on the pest involved. The example illustrated below is representative of any insect which causes visible defoliation (e.g. the spruce budworm Choristoneura fumiferana) and for which annual outbreak maps are available. These outbreak maps, which are prepared by FIDS rangers, are the starting point in the procedure. The appropriate maps are assembled for the depletion period and digitized using a geographical information system. The outbreak areas are assigned a defoliation category ranging from trace to severe. Once the entire sequence of outbreak maps for a particular area or pest has been digitized they are electronically overlaid, creating an infestation composite where the defoliation history (for the entire period) of each individual area can be seen. The infestation composites are then overlaid with forest inventory information. The amount of inventory potentially available for pest depletion can then identified. The inventory used in the process is the Canada Forest Resource Data Systems (CFRDS) inventory. The selected inventory is depleted to various degrees depending on the severity of the defoliation histories specific to that area. The amount of depletion is governed by depletion factors developed by local forest pest specialists.

Information developed from the exercise will be summarized for each of the pests involved. A report will be produced after consultaion with provincial authorities.

References

Sterner, T.E.; Davidson, A.G.(Comp.). 1981. Forest insect and disease conditions in Canada, 1980. Canadian Forestry Service, Ottawa.

Sterner, T.E.; Davidson, A.G.(Comp.). 1982. Forest insect and disease conditions in Canada, 1981. Canadian Forestry Service, Ottawa.

MAJOR FOREST INSECT PEST CONDITIONS
1989 PREDICTIONS

by
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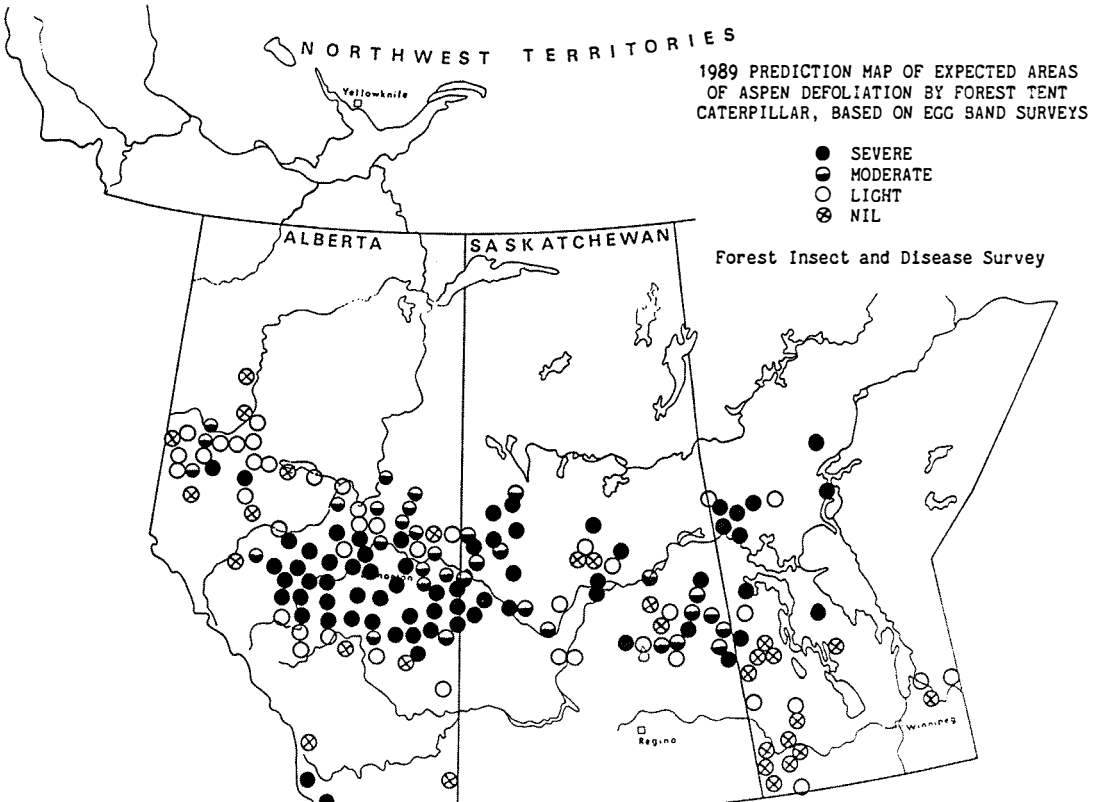
FOREST TENT CATERPILLAR (Malacosoma disstria (Hbn))

Forest tent caterpillar egg band surveys were carried out in the three provinces in the late fall of 1988. Results suggest that the forest tent caterpillar will continue to cause moderate and severe defoliation in several areas in Alberta and Saskatchewan with increased activity and defoliation in Manitoba.

Forest Tent Caterpillar Defoliation Predictions in the Prairie Provinces in 1989.

Province	Areas mapped (ha)	Estimated areas of aspen defoliation (ha)
Alberta	13 830 000	2 766 000 *
Saskatchewan	4 660 200	932 040 *
Manitoba	52 836	52 836
Total	18 543 036	3 750 876

* Estimated as 20 % of the total mapped area.



SPRUCE BUDWORM (Choristoneura fumiferana (Clem.))

Spruce budworm infestations in 1988 increased significantly in size and intensity in Alberta and Manitoba, increased slightly in the Northwest Territories and remained at approximately the same level in Saskatchewan.

Spruce Budworm Defoliation Predictions in the Prairie Provinces - 1989

Location	Predicted Defoliation 1989
ALBERTA	
Thickwood Hills	Nil
Fort McKay	Nil
Steen River	Light
Chinchaga River	Moderate
Hutch Lake	Light
Senex Creek	Light
Freeman River	Nil
Little Smoky River	Nil
Fox Creek	Nil
Nordegg	Nil
Clearwater River (western AB.)	Nil
Jct.Clearwater & Christina rivers (Ft.McMurray area)	Nil
House River	Moderate
Two Lakes	Nil
SASKATCHEWAN	
Green Lake	Nil
Big River	Nil
Montreal Lake	Nil
Hudson Bay	Light
Usherville-1	Moderate-Severe
MANITOBA	
Birds Hill Provincial Park	Light
Spruce Woods Provincial Park	Light
Duck Mt. Provincial Park	Nil
Red Deer River	Nil
Riding Mtn. National Park	Nil
Northwest Angle Provincial Forest	Light
Whiteshell Provincial Park	Severe
Wanipiagow	Severe
Hecla Island Provincial Park	Light
Lake St. George	Light-Moderate
Rocky Lake	Nil
Simonhouse	Nil
Pisew Falls	Nil

JACK PINE BUDWORM (Choristoneura pinus Free.)

In Alberta, jack pine budworm damage is predicted to be light in the Clyde-Tawatinaw areas in 1989. In Saskatchewan, defoliation was evident in only a few areas of the province in 1988. Moderate damage in patches was evident near Smeaton and between the Torch River and White Gull Creek. Similar damage was noted east of Prince Albert. Similar damage is predicted for these areas in 1989. In Manitoba, the outbreak almost completely collapsed in 1988. Light damage is only predicted for the Spruce Woods and Kettle Hills areas in 1989.

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