Aspen Defoliators

Alberta Government

Introduction

Insect pests periodically cause extensive and severe defoliation of aspen in Alberta. Many species of insects defoliate aspen trees in the province. The major aspen defoliators of Alberta are the forest tent caterpillar (*Malacasoma disstria*), the large aspen tortrix (*Choristoneura conflictana*) and Bruce spanworm (*Operophtera bruceata*), all of which are native to Canada.

Bruce spanworm outbreaks are normally short-lived, lasting one or two consecutive years at a given location. Likewise, the large aspen tortrix outbreaks tend to last two to three consecutive years in a given area. The forest tent caterpillar outbreaks last the longest varying from three to as many as seven years at a given location.

Historically, these three species of defoliators have had extensive outbreaks that defoliated aspen stands across the province. In 2006, aspen defoliation in Alberta caused by these insect pests was scattered over an estimated area of 5.8 million hectares and in 2013 an estimated 6.1 million hectares. During aspen defoliator outbreaks in the past, more than one pest species has been involved in defoliating aspen trees; typically forest tent caterpillar is the primary damaging agent in outbreaks. Thus, one has to know how to recognize the damage caused by each pest.

For details on other insect pests that defoliate aspen either visit the Forest Pest Damage Diagnostic System in the Forest Health Website of Alberta Environment and Sustainable Resource Development at www.esrd.gov.ab.ca or refer Hiratsuka, Langor and Crane (1995).

Distribution, host range and occurrence of damge of major aspen defoliators in Alberta

Bruce Spanworm

Distribution:	Canada-wide
Host Range in the Prairies:	trembling aspen; balsam poplar; choke cherry; Manitoba maple; Saskatoon; willows
Occurrence of Damage:	Early/ mid- May to mid- /late June

Forest Tent Caterpillar

Distribution:	Canada-wide
Host Range in the Prairies:	trembling aspen; poplar spp.; birch; elm; green ash; fruit trees; garden plants; deciduous shrubs;
Occurrence of Damage:	Late April /early-May to mid- /late June

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Large Aspen Tortrix

Distribution:	Canada-wide
Host Range in the Prairies:	trembling aspen; balsam poplar; birch; willow
Occurrence of Damage:	Late April /early-May to mid- /late June

Symptoms

How to recognize damage caused by the major aspen defoliators

The following pages illustrate symptoms and signs that can be used to tell these aspen defoliators apart.

Feeding damage by larvae

Bruce Spanworm

- First, mining of buds resulting in holes in open leaves;
- Later, feeding either on open leaves or in rolled/webbed leaves (Figure 1)
- Larvae do not feed as a group
- Silk may be profuse at high population densities

Forest Tent Caterpillar

- No mining of buds;
- Begin feeding either on opening buds or leaves; no rolled or webbed leaves (Figure 2)
- Larvae generally feed together as groups (Figure 2)
- Defoliation progresses inwards and downwards in the crown
- No visible silk

Large Aspen Tortrix

- First, mining of buds resulting in holes in open leaves;
- Later, feed on either rolled or webbed leaves giving a clumped look to foliage (Figure 3)
- Larvae do not feed together as a group
- Silk visible only at high population densities

Figure 1. Bruce spanworm larval feeding (see arrow; note holes in leaves)

Figure 2. Forest tent caterpillar larval feeding

Figure 3. Large aspen tortrix larval feeding (Note: clumpy appearance of leaves)

Symptoms

Silk

Bruce Spanworm

- Silk may be profuse at high population densities (Figure 4)

Forest Tent Caterpillar

- No visible silk (Figure 5)

Large Aspen Tortrix

- Silk visible only at high population densities (Figure 6)

Figure 4. Bruce spanworm damage (note: copious silk on trees)

Figure 5. Forest tent caterpillar damage

Figure 6. Large aspen tortrix damage (note: silk on trees)

Signs

Eggs

Bruce Spanworm

- Laid singly in bark crevices, lichens or moss at the base of the trunk; eggs orange coloured (Figure 7)

Forest Tent Caterpillar

- Laid in bands around twigs; egg mass is shiny black and covered with a frothy substance (Figure 8)

Large Aspen Tortrix

- Laid in masses on leaves (Figure 9); eggs oval and pale green; egg masses become white once hatched

Figure 7. Bruce spanworm eggs (see arrow)

Figure 8. Forest tent caterpillar egg mass (see arrow) and moth

Figure 9. Large aspen tortrix egg masses (see arrow) on aspen leaves

Signs

Larvae (caterpillars)

Bruce Spanworm

- 2 mm long and pale yellow when hatched; 18 mm, pale green or dark brown color phases, hairless with thin white stripes at maturity (Figure 10);
- 5 pairs of legs;
- move by arching the body and stretching out

Forest Tent Caterpillar

- 2-3 mm long, black and hairy when hatched; 45-55 mm long, with white key-hole shaped markings and bluish stripes on the back, hairy body at maturity (Figure 11);
- 8 pairs of legs

Large Aspen Tortrix

- 2-3 mm long, yellow or pale green larvae when hatched; moult, overwinter and become 15-21 mm long, dark green to almost black with 2 rows of small, paired black spots on the back, at maturity (Figure 12);
- 8 pairs of legs.

Figure 10. Mature Bruce spanworm larva

Figure 11. Mature forest tent caterpillar larva (Note: keyhole-like white markings)

Figure 12. Large aspen tortrix larva (Note: green-black colour and black spots)

Signs

Pupa

Bruce Spanworm

- Pupa within a cocoon in duff

Forest Tent Caterpillar

- Pupa within silken cocoon between leaves (Figure 13)

Large Aspen Tortrix

- Pupa on foliage or within leaf clusters from which pupal cases protrude (Figure14)

How to Tell Major Aspen Defoliator Damage from Similar Damage

Late spring frost as well as other caterpillar species can cause aspen damage which appear similar to that by the major aspen defoliators. Given below are ways to tell damage by some of these agents apart.

Late spring frost affects only tender and succulent leaves of aspen. The mature, hardened leaves are left on the crown (Figure 15).

The aspen leafroller (*Pseudexentera oregonana*) is a somewhat common aspen defoliator. The larva of this species has 8 pairs of legs and feeds on leaves either rolled or tied together with silk (Figure 16). The larva is 20-25 mm long and creamy white with a brown head.

Figure 13. Forest tent caterpillar pupal cocoon

Figure 14. Pupal cases of large aspen tortrix

Figure 15. Late spring frost damage to aspen

Impacts

These major aspen defoliators positively impact the environment by recycling nutrients through their mass feeding resulting in droppings that enrich the soil underneath. However, they also produce undesirable impacts as given below:

- Severe defoliation affects tree growth and reduces tree vigour; trees re-foliate later but resulting leaves are smaller and inadequate to compensate for the damage. The resulting wood volume reduction may be as much as 4.5 m^3 per hectare.
- May kill the top of the tree, side branches and even the whole tree after consecutive years of severe defoliation.
- May pre-dispose the affected tree to secondary pests or disorders that may kill it, e.g., poplar borer, hypoxylon canker, drought
- In June, crawling larvae and copious silk on understorey trees could become a public nuisance in recreational areas (Figure 4). In July, moths in large numbers may block vents and outdoor light fixtures, becoming a nuisance.
- In high population years, larvae may inhabit residential buildings becoming a nuisance (Figure 17).
- Larvae crossing highways get overrun by vehicles causing slippery conditions that become a traffic hazard (Figure 18).

Figure 16. Aspen leafroller

Figure 17: Forest tent caterpillar larvae near a house in Fort McMurray

Figure 18: Forest tent caterpillar larvae crossing a highway

Control

Bruce spanworm and large aspen tortrix infestations usually are naturally controlled lasting a year or two and intervention is not typically warranted. Many natural enemies keep Bruce spanworm populations under control. In case insecticidal control is needed, please see below for information and guidelines on using insecticidal products.

Forest tent caterpillar infestation may last several years at a given location. Many natural enemies control their populations. Late spring frosts kill buds leading to early, mass larval starvation. Later on, larvae die of starvation when they run out of food under extreme population levels. Birds feed on larvae as well as on moths of this pest. Many parasitic and predatory insects are known to attack forest tent caterpillars at every development stage of their lives. A tachinid flesh fly (*Sarcophaga aldrichi*) is one of the many natural enemies that is very effective in reducing larval populations. Many pathogens cause diseases that supplement natural kill by other organisms sometimes causing a complete collapse of forest tent caterpillar populations.

Where control is warranted over limited areas (e.g., preserve aesthetic value of ornamental trees; get rid of nuisance caused by larvae at campsites), removal of egg bands before larval emergence and removal of early larval colonies resting either in evenings or on cold days, can be effective. If control is necessary over relatively large areas (e.g., cottage country) application of either a biological or a chemical insecticide may be needed. A formulation of the naturally occurring bacterium, *Bacillus thuringiensis var kurstaki* (Btk), can be sprayed over early larval stages to control this pest.

Refrain from using insecticides for aspen defoliator control if there are signs of effective control by natural enemies, as listed above. Before using insecticidal control please visit the Pest Management Regulatory Agency website (www.hc-sc.gc.ca/cps-spc/pubs/pest/_pnotes/index-eng.php) for a list of pesticides currently registered to control aspen defoliators and guidelines on safe use of pesticides.

References

Hiratsuka, Y.; Langor, D.W.; Crane, P.E. 1995. *A field guide to forest insects and diseases of the prairie provinces*. Nat. Resour. Can., Can. For. Serv., Northwest Reg., North. For. Cent., Edmonton, Alberta. Spec. Rep. 3.

Additional Information

Contact your local ESRD Office, call toll-free at 310-0000 or visit the ESRD website at www.esrd.alberta.ca

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Figure 10

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Figure 2

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Figures 4 and 6

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Figure 17

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Figure 16

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