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Large Aspen Tortrix

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Large aspen tortrix, *Choristoneura conflictana* (Walker) (Lepidoptera: Tortricidae), is a leaf roller and defoliator of aspen. Its natural range more or less coincides with that of its principal host, quaking aspen, *Populus tremuloides*. This insect is found from Labrador and Nova Scotia in eastern Canada, south and west into the northeastern and north central United States, west through the Prairie Provinces of Canada and the interior of Alaska and in the Rocky Mountains south to northern Arizona and New Mexico (Figure 1).

Outbreaks are characterized by the buildup of large populations that persist for 2 or 3 years and then suddenly collapse. They have been reported from Alaska, across much of Canada and the northeastern, north central and western United States. In Canada, an outbreak in northern Ontario between 1969 and 1975 encompassed 25 million acres (10 million hectares). Outbreaks in Manitoba between 1988 and 1990 peaked at 46,000 acres (18,650 ha). Between 1998 and 2000, over 700,000 acres of aspen forests in Minnesota and Michigan were defoliated. The first recorded outbreak of large aspen tortrix in Alaska occurred in 1966 when over 5,000 acres were affected. In 1978, another outbreak was detected

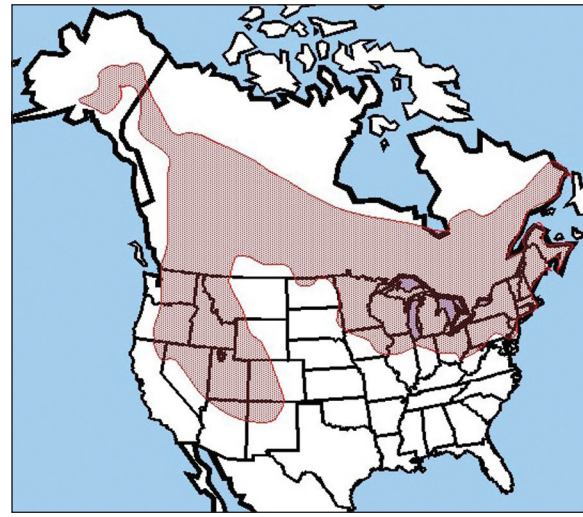

Figure 1 – Approximate distribution of the large aspen tortrix in North America

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near Willow, Alaska and the following year more than 26,000 acres were defoliated. Outbreaks tend to be more localized in the western United States. However, between 2000 and 2001, this insect, in association with western tent caterpillar, *Malacosoma californicum,* a leaf pathogen, *Marssonina populi,* and climatic factors, caused defoliation of extensive areas of aspen in Arizona and New Mexico.

Figure 2 – Rolled leaf of quaking aspen containing a large aspen tortrix larva.

Host Plants

The primary host of large aspen tortrix is quaking aspen. Bigtooth aspen, *P. grandidentata,* which occurs in the northeastern United States and eastern Canada, is also defoliated. This insect only reaches outbreak levels where aspens are abundant. During outbreaks, feeding may occur on other trees and shrubs including balsam poplar, *Populus balsamifera;* black cottonwood, *P. trichocarpa;* birches,

Figure 3 – Thin crowns on quaking aspen due to defoliation by large aspen tortrix.

Figure 4 – Individual aspen with heavy defoliation by large aspen tortrix.

Betula spp.; willow, *Salix* spp.; alder, *Alnus* spp.; and choke cherry, *Prunus virginiana,* if aspen is completely defoliated before the larvae finish feeding.

Evidence of Infestation

Early evidence of infestation by large aspen tortrix includes patches of skeletonized foliage by early instar larvae and the presence of rolled

Figure 5 – Aerial view of defoliation of aspen by large aspen tortrix in northern New Mexico.

Figure 6 – Aerial view of heavy defoliation of aspen by large aspen tortrix near Willow, Alaska.

Figure 7 – Total tree stripping and heavy accumulation of larval webbing of quaking aspen by large aspen tortrix in the interior of Alaska.

Figure 8 – Accumulation of large aspen tortrix larval webbing on understory spruce in the interior of Alaska.

leaves (Figure 2). Later, as feeding progresses, infested trees can become thin crowned and damaged foliage can take on a yellow-brown color (Figures 3, 4). During heavy infestations aspens may be completely stripped of their foliage and take on a gray or brown cast that is easily seen from the air (Figures 5, 6). Affected trees are covered with silken webbing spun by the larvae as they drop from trees (Figure 7). Understory non-host vegetation may also be covered with larval webbing (Figure 8).

Description of Life Stages

Adults are brownish-gray moths with indistinct and variable brown markings on their forewings. Wingspan ranges from 25-35 mm (Figure 9, A-B).

Eggs are scale-like, oval in shape and pale green in color. Sixty to 450 eggs are laid in masses with rows that overlap like fish scales (Figure 9C).

Early instar larvae are pale yellow with light brown legs and head capsule. Body color of the mature larvae ranges from gray-green to almost black. The head and anal plate are a uniform reddish-brown to black. Last instar larvae range from 15-25 mm in length (Figure 9D).

Pupae are light green when first formed but soon change to a reddish-brown or black color (Figure 9E). They range in length from about 12.5 to 17 mm. The last larval skin is often attached to the base of the pupa.

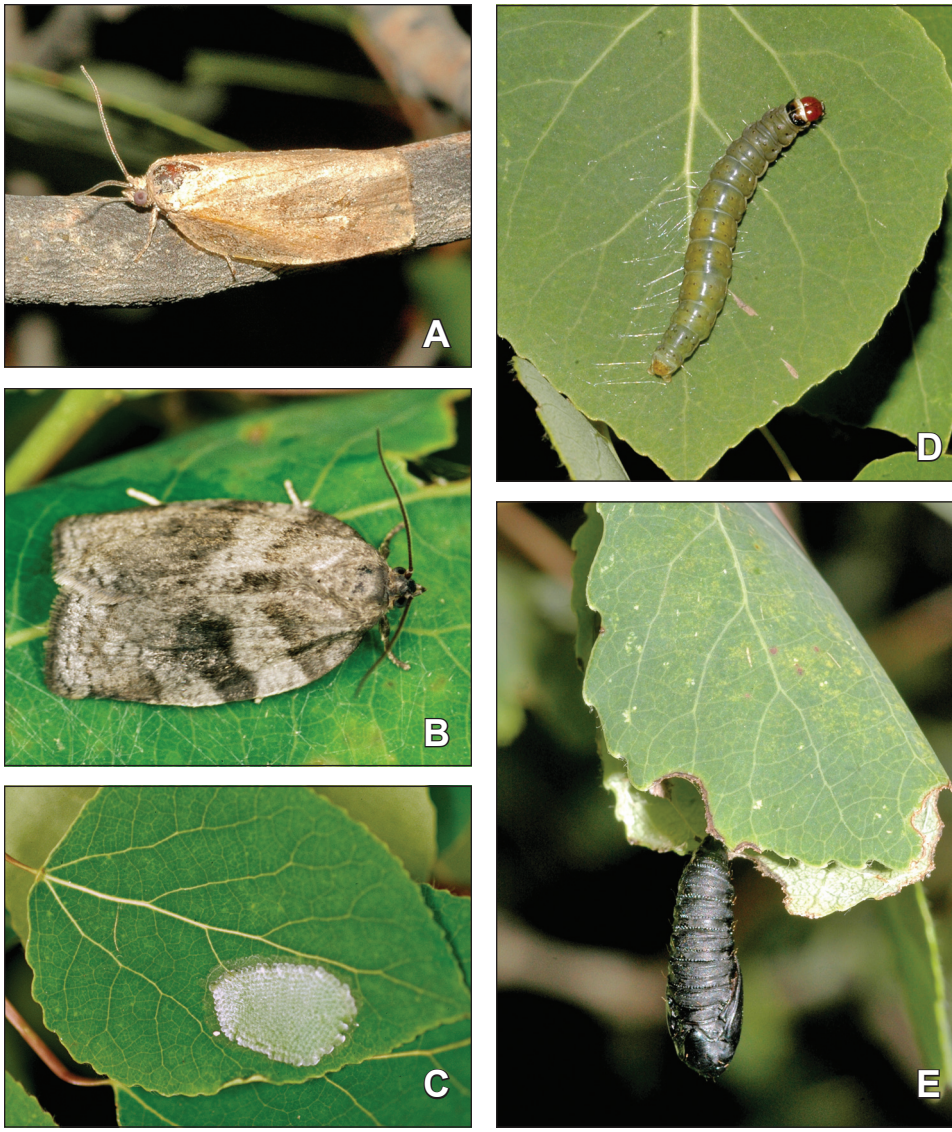

Figure 9 – Life stages of the large aspen tortrix: A – adult on branch, B – adult, showing dark markings on forewings, C – egg mass, D – mature larva, E – pupa.

Life History and Habits

Large aspen tortrix has one generation per year. Adults are active in late June and July. Both sexes can fly and after mating the females usually lay eggs in flat clusters on the upper surface of aspen leaves. Eggs hatch in July and first instar larvae are gregarious. They web flat leaf surfaces together and skeletonize leaves within this shelter. Larvae move to hibernation sites in bark crevasses or under moss at the base of trees in August, molt to second instar larvae, spin hibernacula and overwinter. In early spring of the following year, usually by mid May, second instar larvae crawl up into the crowns and mine aspen buds. Instar II and III larvae remain in the mined buds and developing shoots for about 14 days. Instar IV and V larvae roll leaves, or pull two or more leaves together with silken threads and feed

within the rolled leaves. Affected foliage has a clumped, irregular appearance. Pupation occurs in mid-late June, and the adult moths emerge about 10 days later. Empty pupal cases can often be seen protruding from the clumps of folded leaves.

In the Rocky Mountains, large aspen tortrix often feeds in association with other defoliators of quaking aspen, such as western tent caterpillar, *Malacosoma californicum.* In Canada, large aspen tortrix is often associated with outbreaks of forest tent caterpillar, *M. disstria,* another important defoliator of aspen forests. However, in the Great Lakes region of the United States, these two defoliators are not known to be associated.

Economic Importance

Successive defoliation of two or more years in relatively vigorous aspen stands can cause growth reduction but trees should recover after the outbreaks have collapsed. Defoliated stands growing on poor soils or in the vicinity of construction, where they have suffered mechanical injury or soil compaction, or suffer from other stress factors, such as drought, may experience top kill and tree mortality. Mature aspen stands, those older than age 60, also tend to be more susceptible to top kill and tree mortality following defoliation. Defoliation in developed recreation areas or urban-wildland interface areas is unsightly and large numbers of larvae and associated webbing is a nuisance. Top kill and dead trees are a hazard near home sites or in developed recreation sites.

Natural Controls

A number of natural enemies help keep large aspen tortrix populations in check. Over 20 species of parasitic insects are known to attack eggs, larvae and pupae. Predaceous insects, such as ants, wasps, and large ground beetles, attack and feed on the larvae. Fungi and virus diseases kill larvae. Birds, including chickadees, vireos and woodpeckers, consume larvae when populations are high.

Late spring frosts can kill instar II larvae directly or by damaging developing foliage. During outbreaks, larvae often consume all of the foliage before they are ready to pupate. This forces the larvae to feed on other, less favorable, plants and can cause starvation, poor larval development and reduced egg-laying capacity of the female moths. High winds and rain can also cause a delay in, or prevent some egg laying. Competition from other aspen defoliators, such as forest tent caterpillar, which is more competitive, can deplete the available food source.

Management

Infestations tend to be short lived and are usually allowed to run their course without intervention. However, outbreaks in heavily used recreation sites, or home sites in urban-wildland interface areas may require direct control. Several chemicals and the biological insecticide, *Bacillus thuringiensis,* applied either from the ground or air are effective direct control agents. Contact local extension agents or forest health experts with USDA Forest Service or

State forest services for information on currently registered and effective insecticides.

Older aspen forests tend to be more prone to dieback and tree death following defoliation. Therefore, timely harvesting of mature stands encourages development of young, vigorous aspen forests that are more tolerant of defoliator outbreaks.

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Pesticides used improperly can be injurious to humans, animals, and plants. Follow the directions and heed all precautions on the labels. Store pesticides in original containers under lock and key--out of the reach of children and animals--and away from food and feed. Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues. Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container. If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first-aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly. Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecticides or fungicides that you use for herbicides. Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

NOTE: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the Federal Environmental Protection Agency, consult your county agricultural agent or State extension specialist to be sure the intended use is still registered.

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