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## Asian Long-Horned Beetle

*Anoplophora glabripennis*

*Ontario Ministry of Natural Resources, Forest Health and Silviculture Section*

### Introduction

The Asian long-horned beetle (*Anoplophora glabripennis*) is a forest pest native to several Asian countries that attacks and kills a wide range of hardwood trees, including maple. Also known as the starry sky beetle, this destructive wood boring insect was found in an industrial park bordering Toronto and the City of Vaughan in 2003. It is a serious threat to the forests of Ontario.

The beetle is no stranger to North America . It was first found in New York in 1996, in Chicago in 1998, and in New Jersey in 2002 and again in 2004. A native of China, it was likely introduced into North America by way of wooden pallets, crates, or packaging materials used in shipping. Millions of dollars has been spent to eradicate the insect. Though these programs have been successful to date, any new sightings require immediate action.



Immediately upon the discovery of the beetle, a joint task force was created to eradicate the insect from Canada . As the lead agency responsible for preventing the entry and spread of invasive insect species, the eradication effort is led by the Canadian Food Inspection Agency (CFIA), and includes the Ontario Ministry of Natural Resources (OMNR), the Canadian Forest Service (CFS), City of Toronto, City of Vaughan, York Region, Toronto and Region Conversation Authority, and the U.S. Department of Agriculture.

### The Threat

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- The majority of Canadian broadleaf trees are at risk from the Asian long-horned beetle (ALHB), including all species of maple. They do not attack conifers.
  - Canada 's temperate climate is well suited for the establishment of the insect as the larva spends winters deep within the wood protected from harsh winter conditions.
  - The beetle has no known natural enemies within Canada 's forests.
  - Insecticides do not protect infested trees and only kill some beetles when applied to uninfested trees before attack.
  - The only way to combat the beetle is to identify, cut down, and burn or chip the

infested tree.

- Infested trees are also prone to secondary attack from other insects and diseases.
- The beetles are believed to travel in wooden pallets or crates used to transport goods. Even though there are rules in place stipulating that crating material must not have insects in it or have insect damage, the increasing number of importers and goods coming into the country make these rules difficult to enforce.
- Once established, the beetle is extremely difficult to eliminate. In New York State alone, millions of dollars have been spent trying to eradicate this beetle, and thousands of ornamental and shade trees have been lost.

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## Adult Recognition



Asian long-horned beetle is a large, robust insect measuring 20 to 35 mm in length and 7 to 12 mm wide. It has a typical beetle shape and is shiny black with up to 20 white dots on its back. Larger white dots are usually arranged in parallel lines crossing the width of the body on the wings (elytra). Distinguishing features include the long, segmented antennae which alternate black and white or whitish-blue and are longer than the body. The legs will also be tinged blue or whitish-blue, especially for the first few days after emergence.

## Egg Recognition

Eggs resemble a small grain of rice and are approximately 5 to 7 mm in length. They are relatively easy to find as the female chews an oval or round pit 10 to 15 mm in diameter on the outside bark of the tree in which to lay the egg. The egg pits, or oviposition sites, will also leak sap causing dark spots or white foam on the trunk and branches.



## Larva Recognition

Larvae are round, worm-like and cream-coloured with a brown tip at the feeding end. At full growth, larva can reach up to 50 mm in length and 10 mm in diameter.



## Pupa Recognition

Pupae are a dark creamy orange and measure 30 to 33 mm long and 11 mm wide. Between the stage of larva and adult, pupae begin to take on physical characteristics of the adult beetle and are located deep within the wood.

## Similar Species



The Asian long-horned beetle should not be confused with the whitespotted sawyer (*Monochamus scutellatus*), a native beetle that attacks conifers. The sawyer is smaller than the Asian long-horned beetle, measuring 18 to 25 mm in length, and is bronzy-black in colour. The male sawyer has a single white spot at the base of the wings (elytra) and solid black antennae. The female is mottled with random white patches, and has faintly banded antennae. The whitespotted sawyer is found throughout Ontario and feeds on conifers, unlike the Asian long-horned beetle which feeds on hardwood trees.

## Symptoms and Damage

Asian long-horned beetles attack hardwoods of any age or size. Infested trees will demonstrate premature leaf drop and generalized crown dieback, typically in the top third of the tree. Adults feed on the leaves and on the bark of fine branches causing considerable damage. They prefer to attack the shoots of host trees causing the young shoots to wither and die.

Infested trees are also prone to secondary attack from other insects and diseases. Yellowing foliage, pre-mature leaf drop, and bleeding of sap from egg laying sites are other indicators that the insect is present. *Thorough investigation is critical in identifying whether symptoms are caused by the Asian long-horned beetle or some other factor.*

## What to look for:

### Leaf damage

Adults feed on the leaves and on the bark of young branches, causing considerable damage. The adults begin emerging in May and populations peak in early July. They are active until October. Egg-laying sites: Oval to round chewed wounds in the bark indicate egg-laying, or oviposition sites, where females chew a place to lay their eggs. These may be on branches, trunk or root flare.

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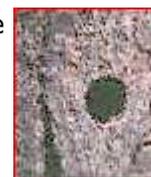
### Froth or oozing sap

Frothy or leaking sap caused by egg-laying (oviposition) sites often attracts bees, wasps, yellow jackets or butterflies.



### Exit holes

Large round holes caused by emerging adults can occur anywhere on the tree, including branches, trunk and exposed roots.



### Sawdust

Sawdust may accumulate around the base of trees or where branches meet the main stem, indicating larval feeding. Also, sawdust accumulating along cracks in the bark, or exiting from oviposition sites.

## What it does:

- The adult beetles will colonize a tree by chewing oviposition sites in the bark and laying eggs on the branches, trunk and root flare. In its early stage, the larva feed in the sappy, green inner bark and may cause sap leakage or foaming as with the oviposition sites.
- Eventually, the larval activity cuts off the transport of nutrients and water. The tree then starts to die from the top down, foliage on the tree wilts and the canopy may appear sparse.
- As the larva matures, it bores into the sapwood and heartwood, chewing large tunnels which structurally compromise the tree.
- Feeding by adult beetles also occurs on the leaves of ash trees, causing significant damage and further weakening the host tree.

## Life Cycle

- It is the responsibility of forest managers to enact remedial action related to assessments of Non Compliance (NC) or
- In its native range, this insect may have a one or two year life cycle. Research has already confirmed it has the ability to overwinter as an egg, larva or pupa.
- Females chew egg-laying sites where a single egg is laid. Eggs laid in June or July follow a one-year cycle for the emergence of a mature adult. Eggs laid in September or October follow the two-year cycle of maturation.
- Eggs hatch in one to two weeks and larvae begin aggressive feeding in the cambium and phloem, the layers of live cells between the bark and the sapwood. This feeding continues during the first three stages (instars) of development.
- As they mature, the larvae burrow deeper within the tree to the inner wood where they continue feeding until pupation occurs.
- As the weather grows colder in late fall, the larvae enter the late stage of development and move into the inner wood (xylem), chewing large tunnels which weaken the host tree.
- Pupation begins late April or early May and newly formed adults remain in their pupal chambers for several days.
- Adult beetles begin to emerge in May, with populations peaking in July.
- The young adults chew round exit holes 9 to 11 mm in diameter and emerge from the infested tree. Though the beetle is capable of flying long distances (e.g. up to 2 km), most either stay on the same tree from which they emerged or fly up to 400 metres to a new host tree.
- Adults are active from early-summer to mid-fall. They feed on leaves and the bark of twigs causing significant damage. The beetle is most active on sunny days from mid-morning to early-afternoon and usually rest in the tree canopy on cloudy days.
- Mating begins two or three days after emergence, with females mating multiple times. Females live an average of 40 days and are capable of laying up to 80 eggs during this period.

## Host Species

The Asian long-horned beetle attacks and kills healthy trees. Hardwoods of any age or size are attacked, from young saplings with stems over five centimeters to mature trees. Many hardwood species are susceptible. The list of preferred species includes:

- *maples (Acer), including sugar, red, silver, Manitoba, Norway, sycamore*
- *horsechestnut (Aesculus)*
- *elms (Ulmus)*
- *poplars (Populus)*
- *willows (Salix)*
- *birch (Betula)*
- *sycamore (Platanus)*
- *mountain ash (Sorbus)*
- *hackberry (Celtis)*

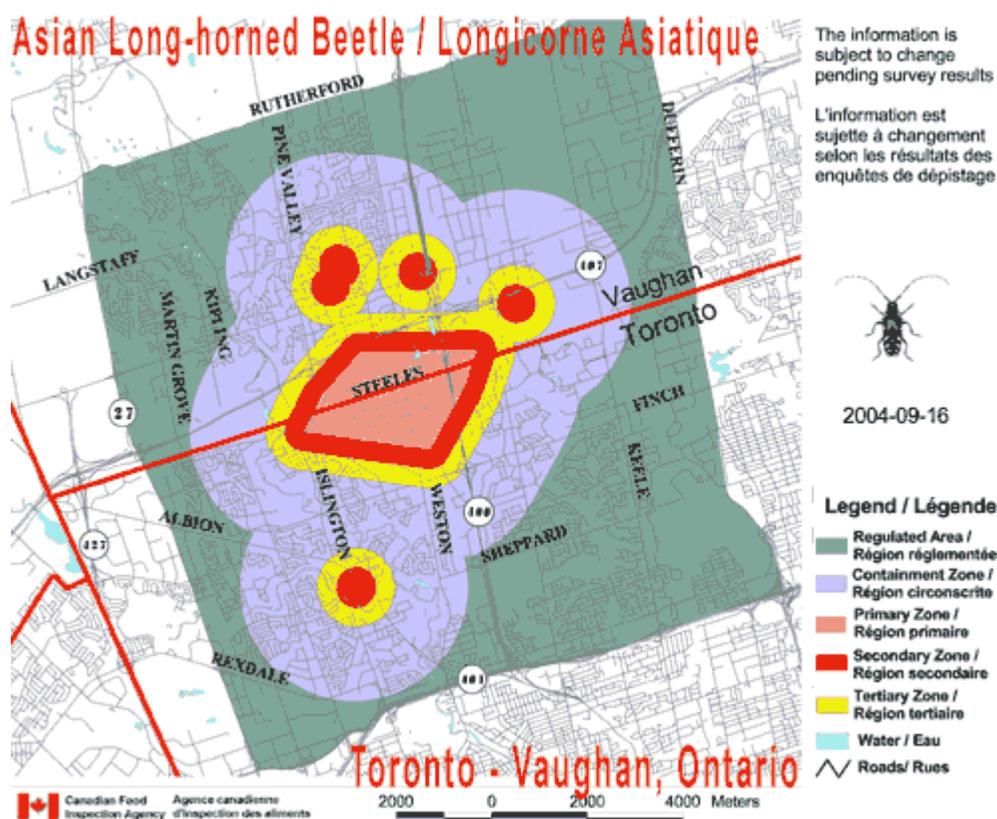
These hardwoods comprise a significant portion of the Ontario's forest. Broad-leaved deciduous trees are a vital component of healthy woodlands and have a critical role in the provincial economy. The maple syrup industry alone is worth \$15 million each year. Healthy forests also benefit the province through tourism and recreation, provision of habitat for many endangered and threatened species and are important for biodiversity. In the Greater Toronto Area, approximately 50 per cent of the trees are maple – one of the beetle's favourite hosts. These trees create healthy communities and lifestyles. They provide shade and beauty, shelter for birds and animals, clean air and increased property values.

## History of Invested Areas

Surveying and scientific data collection began immediately upon the discovery of the infestation in the Toronto–Vaughan area in September 2003.

The survey results were used to delineate a core infested area centred at Steeles Avenue West , between Kipling and Keele Streets. Three outlying, or satellite, infestations were also found – Beechwood to the northeast, Ansley Grove to the northwest, and, Thistletown to the southwest of the core. Zones were then established around the core area and each satellite:

- A primary zone, based on locations of trees with exit holes, considered to be generally infested.
- A secondary zone, 400 m wide around the primary zone, and which may contain trees with egg-laying sites but no exit holes, and
- A tertiary zone, 400 m wide around the secondary zone, with no trees with exit holes or egg-laying sites.
- A fourth zone, the containment zone, was established around the entire area to include the core area and the satellite infestations.



The eradication program began in November, 2003. In the core area and Ansley Grove satellite, all host trees within the primary zone were cut and chipped, as were all trees within the secondary zone. In the Beechwood and Thistletown, only the known infested trees were cut. Surveys were conducted using ground and tree-climbing crews in the tertiary zone and containment zone.

As each tree was cut, technicians from the Ontario Ministry of Natural Resources and the Canadian Forest Service, and later forestry staff from the City of Toronto , closely examined each tree for signs of infestation. All infested trees were taken to a laboratory for detailed examination to confirm attack by the insect, and for research into age of attack, dispersal patterns of the insect, host tree responses, host suitability, rearing of the insects, DNA analysis of the insects, and other investigations.

Approximately 17,000 trees were cut by March 31, 2004 , seven months since the beetle was first identified. Surveys since then have detected some additional infested trees, which have been cut and chipped. The surveys to detect and eliminate infested trees will continue for the next few years until no new finds are made for two to three years.

## Quarantines

Under a Ministerial Order, the Canadian Food Inspection Agency (CFIA) has established a regulated area around the containment zone of the Toronto–Vaughan infestation to prevent the spread of the Asian long-horned beetle. This Order prohibits or restricts the movement of any materials obtained from deciduous trees identified as hosts of the Asian long-horned beetle, and firewood of all species.

On February 19, 2004 the Ontario Ministry of Natural Resources announced that it will contribute up to \$1 million towards a tree planting program in areas affected by Asian long-horned beetle in Vaughan and Toronto, or by the emerald ash borer in southwestern Ontario.

The CFIA has since announced a \$6.5 million tree replacement program for trees cut by the CFIA to control Asian long-horned beetle in Toronto and Vaughan, emerald ash borer (*Agrilus planipennis*) southwestern Ontario, or brown spruce longhorn beetle (*Tetropium fuscum*).

## What is Being Done

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Ontario Ministry of Natural Resources is very concerned about the danger that the introduction of this beetle poses for Ontario's forests.

Following the discovery of the insect in the Toronto–Vaughan area in September 2003, an eradication program was underway by November 2003, led by the Canadian Food Inspection Agency (CFIA). Collaborators in the joint effort include the Ontario Ministry of Natural Resources (OMNR) and the Canadian Forestry Service (CFS), Toronto, Vaughan, York Region, Toronto and Region Conversation Authority, with advice and scientific involvement from the U.S. Department of Agriculture. With the discovery of the beetle before it was widely spread, there is a high probability of eradicating this beetle from the Canadian landscape.

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## How the Public Can Help

All discoveries of the Asian long-horned beetle in North America were made by alert, observant citizens who informed the appropriate agencies to manage and control invasive pests. Early detection is crucial to stop this beetle from becoming established and spreading.



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- Learn to recognize what the adult beetle and infested trees look like, as well as which host trees the insect targets.
  - Report signs and symptoms of infested trees to the CFIA by phone, 1 800 442-2342 (toll free), or online at [www.inspection.gc.ca](http://www.inspection.gc.ca), or contact the OMNR at 1 800 667-1940 (toll free), or your local municipal parks or forestry department.
  - Don't move infested wood material from the regulated zone to new areas. This includes firewood of all tree species, nursery stock, trees, logs, lumber and wood or bark chips.
  - Firewood should always be obtained locally and burned on-site.
  - The CFIA program is focussed on a complete eradication of the Asian long-horned beetle. Property owners within or near the infested area should watch for signs of infestation and keep trees well-watered and fertilized. If you suspect a tree is infested, notify the CFIA. The CFIA will remove infested and potentially infested trees. There is no charge for this service and you may be eligible for compensation.
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