USDA
Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

THE ASIAN LONGHORNED BEETLE: AN INVASIVE TREE PEST

This publication reports research involving pesticides. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practicies for the disposal of surplus pesticides and pesticide containers.

Program Aid No. 2182
Issued February 2016
Slightly revised July 2022

Photo Credits: APHIS photographer R. Anson Eaglin took the photos on page 3 of the exit hole, page 4 of the adult ALB, page 6 of the ground crew, and page 7 of the tree grinding and chipping work. The maple leaf photo on page 3 is from Getty Images. All other images in this brochure are USDA file photos.

THE ASIAN LONGHORNED BEETLE

The Asian longhorned beetle (*Anoplophora glabripennis*), or ALB, is an invasive insect that feeds on a wide variety of trees in the United States, eventually killing them. If it were to become established here, the ALB could become one of the most destructive and costly species ever to enter the country. The beetle threatens urban and suburban shade trees, recreational resources such as parks, and forest resources and wildlife. It could also harm industries such as maple syrup production, hardwood lumber processing, nurseries, and tourism.

The ALB most likely came to the United States inside wood packaging material from Asia. Nobody is sure exactly when the first beetle arrived here. Since its first discovery in Brooklyn, NY, in 1996, the beetle has been found in six States: New York (1996), Illinois (1998), New Jersey (2002), Massachusetts (2008), Ohio (2011), and South Carolina (2020). Alert workers have reported seeing it in ports and warehouses in other parts of the country, where the insects were destroyed before they could escape to start new infestations.

Adult beetle tunneling in a tree

The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) partners with Federal and State agencies to find and destroy ALB infestations. We have eradicated infestations in Illinois; New Jersey; Brooklyn, Islip, Manhattan, Queens, and Staten Island, NY; and Boston, MA. Eradication efforts continue in central Long Island, NY; Charleston and Dorchester counties, SC; Clermont County, OH; and Worcester County, MA. For eradication efforts to succeed, residents in infested and noninfested areas must remain on the lookout for this destructive pest.

MEET THE BEETLE

Native to China and the Korean Peninsula, the ALB is in the wood-boring beetle family Cerambycidae. Adult beetles are large, distinctive-looking insects, measuring 1 to 1.5 inches in length with long antennae. Their bodies are black with small white spots, and their antennae are banded in black and white.

Adult females chew depressions into the bark of various hardwood tree species. They lay an egg—about the size of a rice grain—under the bark at each site. (Females can lay up to 90 eggs in their lifetime.) Within 2 weeks, the egg hatches, and the white larva bores into the tree, feeding on the living tissue that carries nutrients and the layer responsible for new growth under the bark. After several weeks, the larva tunnels into the woody tree tissue, where it continues to feed and develop over the winter. Larvae molt and can go through as many as 13 growth phases. As the larvae feed, they form tunnels or galleries in tree trunks and branches. Sawdust-like material, called frass, from the insect's burrowing can be found at the trunk and branch bases of infested trees.

Over the course of a year, beetle larvae develop into adults. The pupal stage lasts 13 to 24 days. After adult beetles emerge from the pupae, they chew their way out of the tree, leaving round exit holes approximately three-eighths of an inch in diameter. Once they have exited a tree, they feed on its leaves and bark for 10 to 14 days before mating and laying eggs.

Because the ALB can overwinter in multiple life stages, adults emerge at different times. This results in their feeding, mating, and laying eggs throughout the summer and fall. While adult beetle activity is most obvious during the summer and early fall, adults have been seen from April to December. Adult beetles can fly for 400 yards or more to search for a host tree or mate. However, they usually remain on the tree from which they emerged, resulting in infestation by future generations.

Signs of the ALB start to show about 3 to 4 years after infestation, with tree death occurring in 10 to 15 years depending on the tree's overall health and site conditions. Infested trees do not recover, nor do they regenerate. Foresters have observed ALB-related tree deaths in Illinois, Massachusetts, New Jersey, New York, Ohio, and South Carolina.

Exit hole on a tree

Maple

ALB HOST TREES

Collectively, the tree species the insect favors are called ALB host trees. In the United States, known ALB host trees include all species of the following 12 genera:

- Ash (*Fraxinus*)
- Birch (*Betula*)
- Elm (*Ulmus*)
- Golden raintree (*Koelreuteria*)
- Horsechestnut/buckeye (*Aesculus*)
- Katsura (*Cercidiphyllum*)
- London planetree/sycamore (*Platanus*)
- Maple (*Acer*)
- Mimosa (*Albizia*)
- Mountain ash (*Sorbus*)
- Poplar (*Populus*)
- Willow (*Salix*)

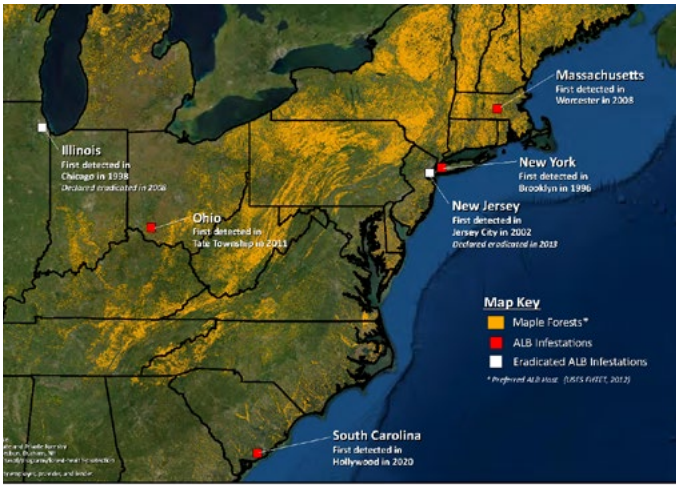
In the United States, the most commonly infested tree species is maple, followed by elm and willow.

BATTLING THE BEETLE

APHIS takes actions to exclude, eradicate, and/or control the ALB and other plant pests, as authorized by the Plant Protection Act of 2000. The agency's regulations for plant pests and ALB eradication programs can be found in title 7, sections 330 and 301.51 of the *Code of Federal Regulations* (CFR), respectively.

To stop new ALB infestations from entering the United States, APHIS regulates the import of wood packaging material, a known pathway for the insect's movement. Under Title 7, section 319.40 of the CFR, all wood packaging material must be heat treated or fumigated before being imported. Special stamps and paperwork must accompany shipments to verify which approved treatment took place. Items that do not meet these requirements are returned to their country of origin. To further exclude the ALB, all international passenger baggage, cargo, packages, mail, and conveyances are subject to inspection when entering the country.

If an ALB infestation is detected, APHIS works closely with Federal and State officials to eradicate it. Given the ALB's destructive potential, our goal is to eliminate beetle populations in the United States. To achieve this goal, we:



Infestations in North America

Front view of an adult beetle

- establish quarantines (up to a 1.5-mile radius from infested trees) to restrict the movement of regulated materials,
- inspect ALB host trees from the ground or from the air for signs of infestation,
- remove infested and high-risk host trees within a quarantine area,
- apply a preventative systemic insecticide to noninfested host trees,
- research best practices and eradication methods, and
- involve and inform the public.

Before starting eradication activities, APHIS looks closely at potential environmental effects. This process allows for better-informed decision making and public involvement. Over the years, extensive data on the beetle has been collected, enabling us to refine the eradication methods used. Through years of study and field examination of the ALB in all its life stages, we know that current methods represent the best science-based approach to eradication available today.

QUARANTINES

When ALB infestations are found, APHIS and State officials establish regulated areas (quarantines) around them. Quarantines help with beetle eradication by restricting the movement of ALB host materials (known as regulated articles). This keeps infestations from spreading to new locations.

We inspect, or survey, host trees located near infested trees to identify the extent of an infestation and set quarantine boundaries. In most cases, quarantine boundaries are 1.5 miles from trees with ALB exit holes and half a mile from trees with only egg sites. Under quarantine, regulated articles include the beetle and all its life stages; firewood of all hardwood species; green lumber; and other living, dead, cut, or fallen materials. Such materials include nursery stock, logs, stumps, roots, branches, and debris of one-half inch or more in diameter of all ALB host trees.

Cutting a tree into firewood does not kill any of the ALB life stages within it. You should never move firewood out of an ALB quarantine area. Instead, you should always buy firewood where it will be burned.

Section of a pallet showing tunneling and frass

Regulated area sign in Massachusetts

COMPLIANCE AGREEMENTS

Under Federal and State laws, you may not move regulated items out of an ALB quarantine area without a compliance agreement, permit, or certificate. If you do commercial work involving regulated materials within a quarantine area, you must enter into a compliance agreement with the ALB eradication program in your State. A compliance agreement allows you to access approved sites to dispose of woody debris. Yet, even if you have a compliance agreement, you should not move material that you think may be ALB-infested. Instead, you should notify the eradication program right away.

TREE SURVEYS

APHIS and State inspectors are always on the lookout for the ALB. We conduct year-round surveys to:

- find infested trees and determine the scope of an infestation;
- establish quarantine areas;
- determine whether the beetle has spread outside an established quarantine area and, if it has, expand the regulated area; and
- decide when to release an area from quarantine.

We search for signs of ALB infestation on host trees by using binoculars from the ground, conducting aerial inspections using bucket trucks, and climbing within tree canopies. Signs of infestation include egg sites, exit holes, frass, tunneling, and sap flow from damaged sites.

If we find an infestation, we conduct a Level 1 survey, also known as a core survey, to determine its scope. During Level 1 surveys, we look for signs of infestation on every host tree around the infestation until we fail to find ALBs within approximately a half-mile radius. If we discover additional infestations, the half-mile radius is extended from the farthest find. The half-mile radius is based on the ALB's natural spread potential.

To make sure an infestation is not spreading beyond this half-mile radius established during the Level 1 survey, we conduct a Level 2 survey, or buffer survey. During a Level 2 survey, we inspect host trees at least 1 mile beyond the radius set during the Level 1 survey.

Ground crew inspecting a tree

Tree climbers surveying the top of a tree

We often focus on maple trees when they are present. We may adjust the survey radius if more infested trees are found. Level 2 surveys continue until no infested trees are found.

We may also conduct a Level 3 survey, or high-risk site survey, to identify and inspect locations where potentially infested host material may have been transported, stored, processed, or sold. High-risk sites include, but are not limited to: landscape, nursery, tree, and lawn care company locations; parks and campsites; landfills and disposal sites; and import facilities. Level 3 surveys mainly focus on maple trees when they are present.

We typically survey a property or an area more than once. The area must have negative survey results to be declared free of ALB infestation.

TREE REMOVALS

Controlling the spread of the ALB is vital to eradicate the beetle. All infested trees are removed, even if they have been treated with insecticide (see "Insecticide Treatments" section on next page for more detail). A tree is considered infested if we find at least one egg site, an exit hole, or a gallery characteristic of those formed by the ALB. We notify landowners by mail or in person before removing trees from their property.

If host trees are near infested trees, they could harbor undetected infestations or be at a high risk of infestation. Due to the risk they pose, high-risk host trees within one-half mile of infested trees can be removed with the landowner's permission. If the landowner does not allow removal, we continue surveying. If trees become infested, we remove them after notifying the landowner.

After trees are removed, they are either incinerated or chipped to destroy all ALB life stages within them. Trees are chipped to less than 1 inch in two dimensions to remove the risk of ALB. Wood chips of this size are no longer a regulated article.

Material being ground into chips at a disposal yard

A tree entering the grinding machine at a residence

Because the beetle can reinfest the stumps of removed trees, it is good to remove and grind them. In some locations, stumps are left to allow for regrowth, particularly in areas prone to soil erosion or in sensitive wildlife habitats. We may also use herbicides to prevent shoots from growing out of stumps.

When trees are removed from yards and landscaped settings, we may restore the area by grading and planting groundcover. This reduces the likelihood that invasive weeds will become established and helps hold the soil in place.

TREE REPLANTING

We work with various organizations to replant nonhost trees in areas where trees are removed as part of the ALB eradication efforts. The goal is to help preserve the tree canopy lost, ensure diversity of tree species, and reinvigorate neighborhoods and streetscapes. Replanting programs vary by State, but affected residents may be eligible for tree replanting at no cost to them.

INSECTICIDE TREATMENTS

Control efforts can include treating noninfested host trees in quarantine areas with the insecticide Imidacloprid. This treatment reduces beetle populations and can prevent trees from becoming infested.

When determining whether to treat trees with Imidacloprid, APHIS and State officials consider several important factors, such as efficacy, environmental and biological issues, the scale of an infestation, and cost. We must ensure that specific criteria are met before applying the insecticide. High-risk host trees within one-half mile of an infested tree can be treated with the landowner's permission. If the landowner does not allow the treatment, survey efforts continue. If trees later become infested with ALBs, we remove them after notifying the landowner.

Imidacloprid treatments can be effective against ALBs when applied in the spring, early summer, or fall—before or when adults emerge. Imidacloprid is injected directly into the tree's trunk or into soil at the tree's base. It takes 1 to 3 weeks by trunk injection and up to 3 months by soil injection for Imidacloprid to distribute throughout the tree, depending on the tree's size and condition and weather circumstances. For maximum effectiveness, trees should be treated annually for 3 consecutive years.

Direct trunk injection

Direct soil injection

While Imidacloprid treatments can decrease beetle populations and help protect against future tree loss, they do not completely control ALB spread.

RESEARCH

Laboratories across USDA conduct research to learn more about the ALB. This information, in turn, guides the eradication methods APHIS and State cooperators develop and carry out. U.S. scientists have traveled to China to learn more about the insect. But, even in Asia, little scientific information was available in 1996, when the beetle was first detected in the United States. Field studies and trials and laboratory research over the years have been vital in developing the protocols used today to fight the beetle.

USDA is now researching regulatory treatments for wood and nursery stock, chip size and grinding techniques to deregulate ALB host materials, traps to lure adult beetles, and the use of dogs to detect the insect's presence. USDA is also studying how quickly the insect spreads on its own and its host tree preference and range. In addition, USDA is conducting DNA analysis and various behavioral experiments.

OUTREACH AND EDUCATION

Public involvement is an important part of ALB eradication efforts. We strive to share as much information as possible with people who live and work in ALB-affected areas. An alert Brooklyn homeowner was the first to notice beetle damage on his trees and report it to authorities, leading to the discovery of this invasive pest in the United States. Since then, residents have helped uncover infestations in other areas of New York and in Illinois, Massachusetts, New Jersey, Ohio, and South Carolina. Informed residents also help by giving our officials access to their property so we can survey for the pest, apply treatments, and remove infested trees, if needed. This cooperation is vital to keep infestations from spreading to other areas.

Checking a tree trap

Table at an outreach event

ERADICATION

To declare eradication in an area, APHIS and State officials require a final round of negative survey results. A final survey cycle is completed at least 4 years after an initial ALB detection. The exact timing depends on several factors, including the size and scope of the original infestation and other programmatic and logistical aspects.

AFFECTED STATES

We are now fighting ALB infestations in four States: Massachusetts, New York, Ohio, and South Carolina. Information about the eradication program in each State is below.

If you perform work on regulated articles in any quarantine area, you must enter into a compliance agreement with the ALB eradication program in your State to move items to approved sites for disposal. Before entering into an agreement, you need to attend free compliance training. To register for this training, please call:

- **508-852-8110** if you work in Massachusetts.
- **631-288-1751** if you work in New York.
- **513-381-7180** if you work in Ohio.
- **843-973-8329** if you work in South Carolina.

NEW YORK PROGRAM

The ALB was discovered infesting trees in Brooklyn, NY, in August 1996. Since then, it was detected in other areas of the State. To achieve ALB eradication in New York, APHIS partners with the New York State Department of Agriculture and Markets (NYSDAM).

Currently, 53 square miles are regulated for ALB in the State, in central Long Island. APHIS and NYSDAM have eradicated infestations in Brooklyn, Islip, Manhattan, New York City, Queens, and Staten Island.

For questions about the New York ALB Eradication Program, call 866-265-0301.

Map of regulated areas in New York

HOW YOU CAN HELP

One of the most important ways you can help stop the ALB is to look for it and report it. During the summer and early fall, check your trees once a month. A quick tree check in your yard or neighborhood could help you spot the signs of the beetle early enough to prevent it from spreading further. If you see a beetle or suspect that tree damage is caused by the ALB, please report it by calling **866-702-9938** or filling out the online form at www.aphis.usda.gov/pests-diseases/alb/report.

Before reporting it, record the area where you found the insect or damage. If possible, capture the insect you think is an ALB, place it in a jar, and freeze it. This will preserve the insect for easy identification. It is also a good idea to take digital pictures of the insect and/or tree damage in case officials request them.

RESIDENTS IN QUARANTINE AREAS

If you live in an ALB quarantine area, you can help by allowing program officials access to your property to perform tree surveys and remove infested and, in some cases, high-risk host trees. Also, be sure to hire companies that have compliance agreements with the eradication program for working on host trees.

If you need to move woody materials such as stumps, logs, brush, and twigs, please contact your local eradication program office or municipality for information on proper yard waste disposal. You should not move any infested tree materials, live trees, or nursery stock of host trees. Instead, contact your local eradication program office.

Finally, never move wood out of ALB-regulated areas. It can spread the beetle and other tree pests and diseases.

To report a sighting of the beetle or signs of damage, call **866-702-9938** or contact the ALB eradication program operating in your State:

- Massachusetts: **508-852-8090**
- New York: **866-265-0301** or **877-STOPALB**
- Ohio: **513-381-7180**
- South Carolina: **843-973-8329**

MORE INFORMATION

For more information about the ALB—including maps, videos, photographs, publications, and other useful resources—visit www.aphis.usda.gov/plant-health/alb or www.AsianLonghornedBeetle.com.

Information is also available through Facebook (www.facebook.com/asianlonghornbeetle) and Twitter (@StopALB).