Asian Longhorned Beetle Pest Risk Assessment

Photo Courtesy of Oregon Dept of Agriculture

Identity
Scientific Name: *Anoplophora glabripennis*
Phylum: Arthropoda
Class: Insecta
Family: Cerambycidae
Common Name: Asian longhorned beetle (ALB)

Relative Risk Rating: HIGH
Numerical Score: 6-7 (Scale of 1-9)
Uncertainty: MODERATE

Pest Background:
Asian longhorned beetle (*Anoplophora glabripennis*) (ALB) is an exotic wood-boring beetle that threatens a wide variety of hardwood trees in North America. The native range of ALB includes China but its prevalence and range has increased as a result of widespread planting of susceptible poplar hybrids extending to other areas of the Far East. ALB is believed to have been introduced into the United States from wood pallets and other solid wood packing materials accompanying cargo shipments from Asia.

ALB was first discovered in August 1996 in the Greenpoint neighborhood of Brooklyn, NY and within weeks was also found on Long Island in Amityville, NY, after apparently being moved in infested wood from Brooklyn. In July 1998, following the U.S. Department of Agriculture's (USDA) national ALB pest alert campaign, a separate infestation was discovered in the Ravenswood area of Chicago. This discovery prompted APHIS to amend its existing quarantine of wood movement in infested areas and place additional restrictions on importing solid wood packing material into the United States from China and Hong Kong.

In October 2002, ALB was discovered in Jersey City, NJ, and in August 2004, ALB was discovered in the Borough of Carteret, the Avenel section of Woodbridge Township, and in the nearby cities of Rahway and Linden, NJ. It was subsequently found in 2007 in Richmond County, NY (Staten Island), across the Arthur Kill River from the New Jersey infestation sites. In August 2008, ALB was discovered in Worcester County, Massachusetts, where it was estimated that ALB has been around for up to 12 years.

ALB has also been discovered in southern Ontario and Nova Scotia, Canada, as well as in England, Austria, France, Poland, and Germany.

ALB is classified in the wood-boring beetle family Cerambycidae. Adults are 2.5 cm (1 inch) in length with long antennae and are shiny black with small white markings on the body and antennae. After mating, adult females chew depressions into the bark of host trees where they lay eggs. There are several known genera of hosts including: *Acer* (maple and box elder), *Aesculus* (horsechestnut), *Salix* (willow), *Robinia* (locust), *Ulmus* (elm), *Betula* (birch), *Albizia* (mimosa), *Celtis* (hackberry), *Fraxinus* (ash), *Plantanus* (sycamore and London planetree), *Sorbus* (mountain ash), and *Populus* (poplar).

Once the eggs hatch, the small white larvae bore into the tree and feed on the vascular layers beneath. The larvae continue to move deeper into the heartwood forming tunnels, or galleries, in the stem and branches. This damage cuts off nutrient flow and weakens the integrity of the tree, and may eventually cause mortality if the infestation is severe enough. Piles of boring dust, or frass, are commonly found at the base of affected trees. Infested trees are also more susceptible to additional damage by secondary diseases and insects. ALB usually has one generation per year, with larvae maturing and pupating within the tree, then emerging as adults. The process of adults chewing their way out of the tree forms characteristic round holes, approximately 0.9 cm (3/8 of an inch) in diameter. Adult emergence typically takes place from June - October with adults flying in search of mates and new egg-laying sites.

Unlike many cerambycid species, ALB can attack healthy trees as well as trees under stress.

The biology and ecology of ALB has allowed it to successfully establish where it has been introduced in North America. Although inspection/detection surveys, examinations of pathways of movement, and regulatory action have increased greatly since its discovery in the U.S., recent detections at new sites suggests that its movement to the Western states may occur. As such, this beetle poses a significant ecological and economic threat to Oregon.

Spread Potential to Oregon: HIGH (numerical score 3)

The high fecundity, adaptable life-cycle, and cold hardiness of ALB all contribute to its high spread potential. Females have the ability to move long distances, and can produce 35-90 eggs throughout their lifetime. Immature and resting lifestages are also able to survive for long periods of time within host materials, increasing their risk of being moved to new areas.

ALB could be readily transported to Oregon through several of the identified pathways including: solid-wood packing materials, nursery stock, logs, and firewood. Although recent infestations have led to greater regulatory action by the USDA and other agencies, enforcement has proven extremely difficult.

Transportation of solid-wood packing materials appears to be the primary means by which ALB has been introduced in the U.S., and represents the most significant threat for its movement into Oregon. Currently, the state receives large volumes of international shipments from Asia, which are received and processed at its ports, increasing the risk of introduction of ALB and other non-native woodboring pests.

Establishment Potential in Oregon: HIGH (numerical score 3)

There appears to be a high probability that ALB could become established following an introduction in Oregon. Large numbers of identified native and non-native host tree species occur at a wide range of densities across much of the western portion of the state. The most preferred hosts (*Acer, Aesculus, Betula, Salix, Ulmus*) of many species are readily found in Oregon forests, nursery, and urban/community settings. A significant number of less-preferred hosts (*Fraxinus, Populus, Sorbus*) also occur here and could potentially be affected as well. Unlike many wood-boring beetles in this family, they not

only attack weakened and stressed trees, but routinely kill apparently healthy, vigorous hosts.

In regard to climate and habitat suitability, ALB is likely to be successful in western Oregon.

Asian longhorned beetles are native to temperate, southern China and other areas of the Far East. The historical distribution of ALB is most closely associated with temperate broadleaf and mixed forests, which occur in relatively warm and rainy climates, often having a distinct dry season. The majority of western Oregon would be included in this designation and thus would appear to be favorable to ALB.

In addition to the susceptible species found in natural and urban settings, nursery plantations in Oregon containing susceptible hosts may also be suitable for ALB survival and spread. The ability of the adults to fly long distances would also allow ALB to utilize the abundant forest corridors that occur in Oregon, further increasing its dispersal and risk of establishment.

Environmental Impacts to Oregon: MODERATE (numerical score 2)

ALB damage to a particular area depends largely on the coverage and composition of host species, relative tree age and health, as well as temperature and other environmental factors. In China, ALB causes mortality in *Populus, Salix, Ulmus*, and *Acer* species. More recently, it has become a significant pest of large-scale, planted wind breaks being used in areas of desert encroachment. While severe infestations in China lead to some tree mortality, damage tends to be short-lived and localized due to the mitigating effects of natural enemies and host plant resistance.

In North America, the absence of specialized natural enemies of ALB, coupled with the lack of resistance in many hosts, have contributed to substantial infestations and some tree mortality in areas where it has occurred. Since 1996, cooperators in New York, Illinois, New Jersey, and Massachusetts, have undertaken eradication activities that have resulted in the removal of several tens of thousands of trees. While the density and abundance of preferred hosts in Western Oregon is substantially lower than areas of the Midwest and Northeastern U.S., hardwoods remain an important component in many areas, contributing to riparian health and wildlife habitat. Many are well-adapted to areas that are either not conducive to or occupy the understory of the more abundant conifers.

Substantial mortality in these areas may not only affect water resources and protection/forage for wildlife, but can also increase the risk of fire in some areas or facilitate the invasion and establishment of non-native plants.

Economic Impacts to Oregon: MODERATE (numerical score 2)

The potential economic impact of ALB in Oregon could prove to be substantial, costing municipalities, property owners, nursery operators and forest products industries potentially millions.

ALB has the ability to rapidly infest and kill trees of various size and condition, from younger nursery stock to mature, street trees. The potential impact of ALB on urban/community forest environments nationwide can be substantial.

The disposal and replacement of trees in urban/community settings can be extremely expensive when done on a large scale. Susceptible hardwood species account for a significant percentage of the street trees found throughout the U.S., and municipalities have been faced with substantially increased costs to survey and maintain them in areas where ALB has occurred. While Oregon appears to have a much lower percentage of susceptible species in these setting than other states, many preferred hosts for ALB are common ornamentals around the state (ODF Urban/Community Forestry, pers. comm.). The direct and intangible costs associated with the loss of these trees are substantial, included reduced aesthetic/social value, energy conservation, and noise buffering.

The economic impact to the nursery industry in Oregon could also be substantial. If ALB were to become established in Oregon, regulatory actions in the form of quarantines or restricted trade, could significantly reduce Oregon's substantial exports of woody ornamentals. ALB may be able to complete development in host trees as small as 2.5 cm (1 inch) (Sellmer et al 2009). According to the 2008 Oregon Agripedia, balled and burlap sales (which are typically trees and shrubs) in Oregon had gross sales of over $157 million in 2007. Unfortunately, the portion of this that represents ALB host material is unknown, but even if they were only 5% of sales, this still amounts to more than $7 million (LeaMaster).

Typically, preferred hardwood hosts of ALB are not a significant component of the wood products industry in Oregon, although they are used for some specialty products and are preferred fuelwood/firewood in some areas .

Health Impacts to Oregon Residents: LOW (numerical score 2)

ALB is not known to cause any adverse impacts to human health.

References:

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Format:

This pest risk assessment is based on the format used by the Exotic Forest Pest Information System in North America (revised January 2004).

Author(s):
Rob Flowers, PhD
Forest Entomologist
Oregon Department of Forestry
2600 State St., Salem, OR
503-945-7396
rflowers@odf.state.or.us

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