United States Department of Agriculture

Animal and Plant Health Inspection Service

Plant Protection and Quarantine

New Pest Response Guidelines

ASIAN LONGHORNED BEETLE
Anoplophora glabripennis

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PURPOSE

This New Pest Response Guideline provides guidelines and actions for an Asian Longhorned Beetle, *Anoplophora glabripennis* (Motschulsky), eradication program.

It is intended for use as a guide when an outbreak of Asian Longhorned Beetle (ALB) is known to exist. The procedures described in this New Pest Response Guideline were developed by consulting with APHIS-PPQ and State Plant Regulatory Officials directly involved in ALB eradication.

DISCLAIMER

This document is not intended to be complete and exhaustive. The information given herein was taken from consultation with ALB program managers, some of the available literature and synthesized into a specialized paper intended to assist further work, as given above.

I. GENERAL INFORMATION

A. Action Statement

The information contained in this document is intended for use when an outbreak of Asian Longhorned Beetle (ALB) is known to exist. This action plan is to be used for guidance in implementing eradication procedures and in preventing the spread of the insect to other locations. This document provides the technical and general information needed to implement any phase of an Asian Longhorned Beetle eradication program; however, the specific emergency program is to be based on information available at the time the outbreak is detected.

B. Background Information

The Asian Longhorned Beetle, *Anoplophora glabripennis* (Motschulsky), is native to Asia. It occurs in China, Japan, and Korea (Peng & Liu 1992). Eradication programs are being conducted in New York, Illinois, New Jersey, and Canada. ALB feeds on a wide variety of tree species. (See Appendix 1.)

Oviposition cavities chewed out by females are found in the tree bark, commonly at the junction of branches and the trunk (NPAG 1996). The mature ALB larvae feed in the heartwood of trees. After pupating, the adults emerge during the summer months through 3/8-inch diameter holes in the bark. Heavy sap flow may occur from these large trunk and branch wounds. Sawdust debris (or frass) is commonly found at the base of afflicted trees. Infested trees are also prone to secondary attack by other diseases or insects.

C. Life Cycle

A typical life cycle for this pest is:

Egg-->Larva-->Pupa-->Adult

Egg Stage: The off-white, oblong eggs are 5-7 mm in length. Both ends are slightly concave (Peng & Liu, 1992).

Larval Stage: Mature larvae are 50 mm in length. The prothorax has a brown mark. The front of the mark does not have a brown margin (Peng & Liu, 1992).

Pupal Stage: The off-white pupae are 30-33 mm in length with a width of 11 mm. The eighth segment of the abdomen has a protruding structure (Peng & Liu, 1992).

Adult Stage: Adults are 20-35 mm in length and 7-12 mm in width. They are jet black with white specks. The antennae have 11 segments. The base of the antenna is whitish with a blue-black color. The antennae of the males are 2.5 times their body length; the antennae of the females are 1.3 times the body length. The bases of the elytra do not have a granular structure. Each elytron has about 20 white dots (Peng & Liu, 1992).

ALB can overwinter as an egg, as a larva developed within an egg, as a larva, or as a pupa. The first three larval instars feed in the phloem and the late third and early fourth instars move into the xylem. Adult emergence occurs between June and October, with peak populations occurring in early July. Females live 14-66 days; males live 3-50 days. Females lay eggs, and larvae thrive, on healthy or stressed host trees of all ages as well as on recently cut logs. Adults tend to lay eggs on the same part of a tree, year after year, until that part dies.

II. ORGANIZATION, RESPONSIBILITIES AND STAFFING

At the outset of the project, the PPQ State Plant Health Director, in consultation with the State Plant Regulatory Official, will select the project leader. The project leader will organize the management structure, act as liaison with cooperators, develop personnel rotational schedules, and identify preliminary administrative and technical support needs. The project leader reviews, evaluates, and adjusts program functions in progress.

If the size of the project warrants, the project leader may designate any number of assistant project leaders to organize and implement duties in the areas of administrative support, survey, regulatory activities, and public outreach/media information. The duties are summarized below under individual headings. Each assistant project leader will report directly to the project leader.

TDY assignments will be for a minimum of thirty (30) days. Rotational assignments will allow for a one week overlap so that a training period of three working days is provided for the orderly transfer of duty assignments. Replacement personnel will be trained by the individual replaced.

Job announcements for full-time PPQ positions to manage and staff the ALB project should be announced no later than 60 days after the project begins.

A. Project Leader

1. Establishes a base of operations.
2. Organizes a management structure.
3. Establishes operational protocol.
4. Arranges for notification of affected individuals, agencies, or groups.
5. Ensures appropriate public notification.
6. Authorizes mobilization of emergency equipment and supply inventory.
7. Identifies preliminary technical support needs.
8. Maintains chronology of program activities.
9. Provides daily information reporting system.
10. Provides information on the preparation of budgets.
11. Provide periodic and final project reports to technical advisory representatives.
12. Establishes a computerized data processing center for timely output of information for items 8-11.
13. Obtains regular timely reports and supervises all assistant project leaders.

B. Administrative Support

A full-time administrative officer should be assigned to the program from its inception. This individual will need to be on-site during program startup to facilitate the following activities:

1. Arranges for facilities, office space, and furniture.
2. Furnishes equipment, telephone, data processing, word processing, and other communication devices.
3. Arranges for vehicles, vehicle maintenance, and vehicle safety training.
4. Establishes and maintains inventory of administrative supplies manuals and forms.
5. Ensures appropriate hiring practices and paperwork.
6. Processes request for travel advances, purchase orders, invoice vouchers, travel claims, and other obligating documents.
7. Initiates contracts and cooperative agreements.
8. Maintains a record of expenditures.
9. Maintains vehicle inventory and records.
10. Develops and maintains a system for providing badges and identification.
11. Maintains time and attendance records for seasonal and permanent employees.
12. Arranges hotel reservations and travel.
13. Establishes a protocol for processing damage claims.

C. Survey Coordinator

1. Initiates and implements the survey program.
2. Arranges for personnel, equipment, and vehicles. This includes scheduling the use of Bucket Trucks and Tree Climbers.
3. Maintains survey supplies.
4. Arranges for prompt specimen identification.
5. Provides shipment protocol and handling safeguards for specimens.
6. Establishes a quality assurance program for survey activities.
7. Reports positive ALB finds to the project leader.
8. Maintains maps and complete records of all positive ALB finds.
9. Ensures the quality of all electronic data for the project.

D. Regulatory Coordinator

1. Coordinates regulatory activities with all cooperating parties.
2. Ensures that all property owners are notified prior to the removal of ALB positive host material.
3. Coordinates the proposed quarantine boundaries with the appropriate state and federal cooperators.
4. Notifies the affected industries, and others, of regulated items.
5. Makes available approved regulatory treatment procedures to all concerned groups.
6. Implements a regulatory quality assurance program to insure that all contractors are removing ALB positive host material in accordance with existing contracts.
7. Provides for continuing regulatory action as needed.

E. Public Outreach and Media Relations Coordinator

1. Prepares press releases for distribution to the media, including foreign language releases as necessary.*
2. Makes progress reports to the local media.*
3. Acts as media liaison.*
4. Provides stock footage, prints graphics and other displays.*
5. Arranges interviews.*
6. Arranges meetings with the general public.
7. Prepares and arranges mailings to the general public.
8. Cooperates with regulatory personnel to provide clearly written treatment handouts.
9. Identifies special interest groups, such as affected industries, local clubs, and environmental groups and conducts presentations.
10. Coordinates community panel meetings, as necessary.

* Coordinated with APHIS/LPA

III. SURVEY PROCEDURES

When one or more ALB are collected in an area, the survey procedures listed below will be implemented. The host tree identified as infested will serve as the epicenter. All survey protocols will originate from that point.

A. Intensive Core Survey (Level 1 Survey)

Annually, all host trees within a ½ mile radius of the initial find are surveyed visually. The initial survey is conducted by ground crews. Once visible damage is no longer evident from the ground, Bucket Trucks and Tree Climbers are used to complete the survey within the ½ mile radius. It is recommended that Tree Climbers be used whenever possible and Bucket Trucks be used when needed. If additional infestations are found, the ½ mile core area will be extended from the outermost find.

B. Delimiting Survey (Level 2 Survey)

All host trees within a minimum of 1-mile beyond the Intensive Core Survey Boundary is surveyed. Biennially, all host trees in the delimiting area are surveyed using ground crews, Bucket Trucks, or Tree Climbers.

The first delimiting survey should be completed within one year of discovering a new infestation that is not associated with the existing ALB regulated area. Subsequent years of delimiting survey will then be completed on a biennial basis.

C. High Risk Site Detection Survey (Level 3 Survey)

Using investigative work to identify potential high-risk sites where ALB infested materials may have been taken and utilizing interviews, databases, yellow pages, ads, or other potentially valuable sources of information the following sites are identified:

1. Tree services that conduct business within the infested or regulated area to determine locations where their vehicles are routinely parked and wood is disposed of or stored.

2. Municipal parks, tree wardens, foresters, or other municipal groups that may cut or trim trees.
3. In heavily infested areas, query local residents about any firewood they may have cut and given away or transported to other locations (cabins, camps, etc.).
4. Landfills or other places used for the disposal of recently cut wood and brush.
5. Utility companies.
6. Anyone else who may cut and transport wood.

At sites identified above, an annual ground-based visual survey for ALB is to be conducted of 50 to 100 potential host trees surrounding the site. Managers may choose to use Bucket Trucks and Tree Climbers based on the availability of resources. Only trees that are within 1.25 miles of the site are to be included.

If ALB is found, the Intensive Core and Delimiting Survey Protocols will be used to determine the extent of the infestation.

D. Area Wide Detection Survey (Level 4 Survey)

All one square mile areas within 25 miles of the epicenter of the current ALB infestation, but outside of the regulated area, shall be surveyed at least once every three years in the following manner. Two host trees at each of nine sites per square mile shall be inspected visually from the ground for evidence of ALB infestation. Sites shall be well distributed throughout the square mile block and separated by a minimum of 300 meters. Use a GPS unit, if available, to document locations and other data (see Survey Records section below). Where available, use Township-Range-Section to conveniently define survey blocks. The first area wide survey should be completed within one year of discovering a new infestation that is not associated with the existing regulated areas for ALB.

E. General Survey Information

The following information applies to all of the surveys listed above:

1. Survey crews must be able to recognize ALB host trees from ground level. It may be necessary for the PPQ Regional Botanist or other qualified individual to provide this training prior to starting survey activities. ALB host trees are listed in Appendix 1.
2. Bucket Trucks require trained operators to function safely. Initially, qualified survey crew members will have to accompany these operators to show them how to identify ALB damage.
3. Tree Climbers may be available from the local sources such as city and state forestry and parks. The United States Forest Service, United States Department of Agriculture – Animal and Plant Inspection Service, the Bureau of Land Management, and the National Park Service also have climbers on staff that may be available. Contracts with Commercial Tree Care Companies are also a source of climber and bucket truck crews.
4. Tree Climbers are more effective than Bucket Trucks when leaves are on the trees.
5. Trees in excess of 28 inches in diameter at breast height (DBH) may require two Tree Climbers to conduct biologically sound surveys in a timely manner.

6. All surveys will be augmented with strong local media and public outreach campaigns.

Note: See Appendix 2 for protocols for inspecting trees, Appendix 3.1-2 for recommended equipment, Appendix 4 for host tree identification aids, and Appendix 5 for pictures of the Asian Longhorned Beetle and associated damage.

F. Quality Assurance

For delimiting and high risk site detection surveys, supervisors should ensure that survey crews are routinely challenged with simulated ALB damage, such as false exit holes or pits chipped into the bark (false oviposition sites). Field or lab-collected frass may also be used. These techniques should not be used on a regular schedule, and simulated damage should not be restricted to a specific portion of trees. Location and timing of simulated damage must be carefully documented when it is put into place. The survey crew should be informed that this type of Quality Assurance testing will be ongoing but should not be told where or when it will occur.

G. Survey Records

Records of all ALB-positive host material will be maintained. These records will include the following:

1. Location of tree, street address, or GPS coordinates.
2. Ownership of tree (private or public).
3. If the tree is privately owned, the record will include the property owner's name and telephone number.
4. Whether or not the private owner was notified of the results of the survey.
5. Genus/Species of host tree.
6. Type of host tree (private, park, or street).
7. Size of tree (measured DBH).
8. Type of ALB damage found.
9. Date the ALB damage was found.
10. Surveyor name and agency.
11. Type of survey (ground, bucket truck, or tree climber).
12. Identifying marks placed on the tree by the survey crew. These can include but are not limited to colored plastic ribbons, spray paint, or other easily recognizable means of identification.
13. Hazardous conditions that would limit accessibility to tree for removal.

Records of negative ALB survey for the Intensive Core and Delimiting Survey areas will include the following:

1. Date of survey.
2. Surveyor name and agency.
3. Number, genus/species, type, and DBH of host trees surveyed.
4. Location of survey, street address, or GPS coordinates.
5. Type of survey (ground, bucket truck, or tree climber).
6. Locations of trees on property.
7. Suggested treatment type.

High Risk Site Detection Survey data will include the following:

1. Date of survey.
2. Name of business (if applicable).
3. Contact for business, including name and phone number (if applicable).
4. Location of survey, street address, or GPS coordinates.
5. Number and type of host trees surveyed.
6. Type of survey (ground, bucket truck, or tree climber).

Area Wide Detection Survey data will include the following:

1. Date of survey.
2. County of survey.
3. Township-Range-Section of survey (if available).
4. Location of survey, street address, or GPS coordinates.
5. Number and type of host trees surveyed.

H. Data Entry and Management

All data collected by survey crews and from tree removal activities will be collected daily. The data will be:

1. Checked for accuracy.
2. Be in the correct format.
3. Downloaded from field data collection devices and entered into the ALB database.

The data manager will also be responsible for:

1. Producing maps of regulated areas.
2. Maintaining GPS Units and Data Loggers.
3. Providing reports to the program manager as necessary.
4. Maintaining and updating the ALB database.
5. Keeping accurate statistical records of the number of trees removed, regulated establishments, compliance agreements, permits, and other associated paperwork.
6. Analyzing data to provide the program manager with information on trends and patterns as they relate to the ALB eradication program.

IV. REGULATORY ACTIVITIES

A. Regulatory Authorities

Federal Quarantines for ALB include 7 CFR 301.51 for eradication programs and 7 CFR 319.40 for solid wood packing material. However, under these regulations, PPQ cannot quarantine a geographical area smaller than an entire state.

As a result, the State Plant Regulatory Agency from the infested state will have to enact an interior state quarantine for ALB to facilitate regulatory activities on a geographical area within the state.

B. Regulated Articles

The regulated articles for ALB include the following:

1. The Asian Longhorned Beetle (*Anoplophora glabripennis)* in any living stage of development.
2. Firewood from all hardwood species.
3. All host material living, dead, cut, or fallen inclusive of nursery stock, logs, green lumber, stumps, roots, branches, and debris of half inch or more in diameter of the genera listed in Appendix 1.

C. Regulated Establishments

Establishments placed under regulations for ALB within a quarantined area include:

1. Landscapers.
2. Tree pruning companies.
3. Tree removal companies.
4. Firewood dealers.
5. Pallet distributors.
6. Nurseries.
7. Sanitation workers, as well as other municipal or community services and associated contractors.

D. Enforcement

Compliance agreements with the regulated establishments listed previously are required to move regulated articles if program inspectors are not present to monitor the movement. An example of a compliance agreement is contained in Appendix 6. All firewood (of hardwood species), ALB-infested host material, and dead, cut, or fallen logs, green lumber, stumps, roots, branches, and debris of ½ inch or more in diameter, of regulated species are required to be chipped to a size of less than 1 inch in at least two dimensions prior to leaving the regulated area.

Nursery stock in the regulated area is subject to inspection. Any infested host material found in the nursery trade is required to be chipped. Chipped material must be no larger than 1 inch in at least two dimensions. Uninfested host material in the nursery trade is allowed to leave the regulated area if accompanied by a certificate of inspection and the approved permits. When uninfested host material is sold for planting within the regulated area the seller will keep records of the sale. These records will include the name, address, and phone number of the buyer so that regulatory officers can inspect the host material after planting for the presence or absence of ALB.

E. Trace Back Inspections and Trace Forward Inspections

Trace back inspections will be conducted in an attempt to determine the source of the infestation. These inspections will begin at the epicenter of the core area and work outward from there.

Trace forward inspections will be conducted to determine if infested host material has been moved out of the regulated area. These inspections will start with the regulated establishments located and/or conducting business within the regulated area. Once these establishments are identified, the survey protocols used for the High Risk Establishment survey will apply.

F. Quarantine Boundaries

Initial quarantine boundaries are established through consultation with the cooperating regulatory agencies on the project. Generally these boundaries are set using the delimiting protocols mentioned in the survey section of this document, in conjunction with existing geographical barriers.

Hot spot infestations are those areas which contain ALB-infested host material that can be directly linked to the movement of regulated articles outside of an existing quarantined area. These infestations are identified through the High Risk Site Survey protocols or Trace Forward Inspections. They are characterized by their small size (all infested trees are contained within a 300-yard radius). With the consensus of the cooperating regulatory agencies on the project, these areas can be placed under a transitional quarantine boundary a ½ mile in radius. These areas will be monitored throughout the year, using intensive core area and delimiting survey methods. If spread beyond a ½ mile is identified, then the standard quarantine boundary protocols will be applied.

G. Quality Assurance

Regulatory Officers will spot check the removal of ALB-positive host material to ensure that contractual obligations are being met.

V. TREE REPLACEMENT AND RESTORATION

The United States Forest Service (USFS) is the lead federal agency for this portion of the ALB eradication program. They provide funding to local cooperators to implement tree replanting and restoration efforts within regulated areas. To coordinate this effort, please contact the local USFS office.

VI. CONTROL

The control strategy provides a means to significantly reduce ALB populations by targeting the area into which the pest is most likely to naturally disperse from an outbreak site. When combined with intensive detection activities, the strategy is expected to eradicate the pest from the outbreak site within 3 to 5 years.

A. Strategy

Infested trees: Remove ALB-infested host material. Presence of oviposition sites or exit holes indicates infestation.

Control zone: Remove or chemically treat all ALB host material within a minimum ½ mile radius of infested hosts.

Hosts: For control purposes, hosts include *Acer spp., Aesculus spp., Albizia julibrissan, Betula spp, Celtis spp, Fraxinus, spp., Platanus spp., Populus spp., Salix spp., Sorbus spp., and Ulmus spp* (see Appendix 1).

Rationale for minimum radius:

- Estimated distance of natural spread/year:
  a) China: maximum distance in mark-recapture study - 4600 ft in 3 weeks,
  b) Chicago: 2 years data; measured distance from 666 trees with oviposition sites only to the nearest tree with exit hole: 80% of trees with oviposition site only are within 330 ft (1/16 mile) of a tree with an exit hole; 94% within 660 ft (1/8 mile); 99% within 1320 ft (1/4 mile); 99.7% within 1980 ft (3/8 mile); Trees with both oviposition sites and exit holes are excluded from the analysis.
- Flight ability: China: maximum distance of single observed flight - 1200 ft.

Managers may conduct control activities beyond the minimum depending upon the detection data and the degree of infestation. For example, where there is a large established core with several satellite detections beyond the minimum radius, a manager may want to conduct control activities in the area between the core and the satellite detections.

Any decision to reduce the scope of control actions will be made in consultation with the project director and cooperators.

The decision between removing and chemically treating host trees depends upon specific characteristics of the site or area. Onsite managers in conjunction with the program director and cooperators will determine the most appropriate activity based on social, biological, environmental, and economic concerns. Considerations:

- Total host removal and/or chemical treatment within a ½ mile radius would encompass an area where a large percentage of the beetles would disperse, but a low percentage will likely disperse beyond this distance. An effective detection program is essential both inside and outside the control zone.
- Host removal removes immature life stages eliminating potential adult beetle dispersal. Host removal is recommended in near proximity of an infested tree because of the likelihood of infestation.
- Removal during adult emergence and flight season may result in adults dispersing during the process. A bark spray prior to removal is warranted where public and/or environmental health would not be impacted.
- Chemical treatment will need to remain active through a minimum three emergence seasons to be effective and several applications will be required to ensure effective coverage. Chemical treatment is expected to remove a high percentage of emerging adults as they feed on twigs and leaves prior to mating and dispersal. Mated female adults are susceptible to treated trees as they prepare

oviposition sites. Additionally, young larvae burrowing into the tree are also exposed to the chemical.

- As long as active populations exist in an area, chemical treatments may need to be applied on an annual basis.
- When using chemical treatments, managers should expect to continue to discover exit holes and/or oviposition sites on treated trees. The chemical treatment is not believed to be effective against large larvae already present in the tree at the time of treatment. Also, some holes/sites may not have been discovered during previous surveys. These newly discovered trees with exit holes and/or oviposition sites should be removed and the control zone be adjusted accordingly. Because of this possibility, tree owners should be informed that their chemically treated tree is less likely to become infested but that the tree may have to be removed in the future if evidence of the beetle is discovered.
- The cost of removing and replanting a fixed number of trees may equal or exceed chemically treating the same number of trees over a three year period.

B. Host material removal

It is recommended that infested host material removal occur within 3 days of detection when beetles are active. During adult emergence and flight season, a bark spray to the infested host material prior to removal is recommended to prevent dispersal of any adult beetles from the host. However, environmental and public concerns must be considered in any decision to use bark sprays.

All wood must be chipped inside the quarantine zone to a size of less than 1 inch in at least two dimensions. Chips of this size are no longer subject to federal or State regulations and may be disposed of at the successful bidder's discretion.

It is recommended that the roots of host material be removed to a minimum of 9 inches below ground level. Any aboveground roots of a half inch or more in diameter should also be removed.

Host material that is not chipped may be moved to an approved burning site with proper safeguards: vehicles must be tarped or covered to prevent spillage, an emergency spill plan with contact numbers must be carried by the driver, and host material may be held no longer than 24 hours at the burn site prior to burning.

C. Chemical control

All pesticides should be used according to their label instructions.

1. Soil or trunk injection of insecticides:

Imidacloprid, a chemical with systemic properties and low mammalian toxicity, has been found to be effective against adult ALB as it feeds on small twigs, the female when depositing eggs, and young larvae. This insecticide is formulated for soil and trunk applications from a number of sources. The contractor/applicator and Contracting

Officer's Representative (COR) must have all pesticide and 2(ee) labels (if required by the state) at all times during treatment. Label instructions for application must be strictly adhered to as well as all environmental and safety requirements. Proper spill cleanup material must be on site at all times. Treatments are typically made in early spring, in order to allow the insecticide to be taken up and distributed throughout the tree so as to be most effective during the ALB emergence and flight period. Soil treatments can take up to 3 months before sufficient levels are observed in target plant tissues.

Treatment options:

A. Basal Soil injection:
Rate of use: 1.42 grams of active ingredient of Merit 75 WSP (EPA Reg. No. 432-1318) per inch of tree diameter. This is the maximum soil injection rate allowed by the label. At least one of the crew members will be a fully Certified Applicator. **CLARIFICATION** Alternative brand names of Merit 75 WSP may be used as a substitute, including Touchstone 75 WSP, Criterion 75 WSP, Hunter 75 WSP, Lesco Bandit 75 WSP, Prokoz Zenith 75 WSP, Submerge 75 WSP (EPA Reg. Nos. 432-1318).

Mixing and Agitation – Portable Tanks:

1. Add 9 mL of Wex (wetting agent, Conklin Co., Inc.) to each 3 gallon tank and add water. Alternatively, fill tank with a premix of water/wex.
2. Add four water soluble packets (1.6 oz each) of Merit 75 WSP and mix well.
3. The Merit 75 WSP will be mixed and/or agitated at the start of each treatment location. Any alternative suspending and wetting agents used shall receive prior approval by USDA. Agitation may be accomplished by stirring, mixing or shaking of the canister contents; tipping and raising the canister from horizontal to vertical several times is sufficient to meet this requirement.

Mixing and Agitation – Tanker Truck:

1. Large tanks may be filled with water the night before treatment using a water metering system. Filling large tanks by sight gauges will not be allowed.
2. Add 9 mL of Wex (wetting agent, Conklin Co., Inc.) for each 3 gallons, agitate tank during mixing.
3. The mixing of Merit 75 WSP into the tank must be in the presence of USDA. While agitating the tank, place the number of Merit packets into the tank per table below.

Total Fill Gals	Packets Merit
3	2
30	20
60	40
90	60
120	80

150	100
180	120

4. The Merit 75 WSP will be mixed and/or agitated at the start of each treatment location. Any alternative suspending and wetting agents used shall receive prior approval by USDA. Chemical mixture shall be dispensed through a mechanical pumping system with no greater than 50 psi.

Equipment:

1. Portable Tanks - The equipment used for the basal soil application shall be a portable, closed, self contained unit. It shall be capable of delivering chemical through a soil injection wand without leakage. A kick-plate will be placed on the wand so that the injection depth is approximately 6". The Contractor shall provide USDA a description of the application unit and the delivery method to be used in the contract. Calibration method will be identified to and approved by the program for any application equipment used.
2. Tanker Trucks - All tanks used for ALB treatments shall be triple rinsed prior to use in the ALB treatment application. USDA-APHIS reserves the right to observe the triple-rinsing process. If a tank is used for any other treatment application outside of this contract, then the tank shall be triple rinsed prior to use again in the ALB treatment application. The Contractor shall notify USDA if tanks are used for other applications outside of the USDA contract during the performance of this contract.

Access and Safeguard of the Treatment Sites

1. The Contractor shall have all necessary spill clean up materials readily accessible.

Precautions and Special Situations:

1. The applicator should ensure that the soil around the tree to be treated will absorb the specified dose, and that no run-off from the treatment area occurs. If any chemical bubbles to the surface the applicator will remain at the tree until any surface liquid is absorbed.

2. Applications with potential for run-off, either because of slope, because of proximity to surface water, etc. will not be permitted. Treatment of woodlots or locations with dense tree growth is not appropriate for soil treatments and trunk injection will be used in these locations (either by Mauget capsules or with an approved trunk injection system).

3. Basal soil applications will not be made to trees in close proximity to vegetable gardens or edible fruit/nut bearing trees.

4. For difficult to treat trees (large pit trees in sidewalks, trees with overgrown root masses, etc.) the application may be made to the nearest extent of the base of the tree if obstructions exist within 12 inches of the base; evenly distribute chemical

within the available injection sites. In addition, these trees can be treated using an injection wand without a kick-plate, so as to enable an application within a confined area.

5. Trees identified specifically by the COTR as appropriate for Mauget or other trunk injection treatment may be treated in this manner.

Treatment:

1. The DBH of each tree will be measured at 54 inches above the soil line. Tree diameters shall be rounded up or down to the nearest whole number. For measurement of trees with unique growth forms (apparent single-stem trees growing in dense clumps, multi-stem trees with small branches at 54 inches but with a distinct collar, etc.), the COTR will make the final determination on treatment DBH (see Appendix 7). Also reference DBH measurement protocols elsewhere in the contract.

2. Dispense the proper amount of product in a minimum of 4 injection sites, placed evenly around the base of the tree. In general, the number of injection sites for trees 12" and greater will be determined by dividing the tree diameter by two, but this may be reduced if injection sites are limited.

    a. When using a portable tank, ½ cup (4 oz) of mix is applied for each inch of tree diameter; use sight gauges to verify delivery.

    b. When using a tanker truck, 1 cup (8 oz) of mix is applied for each inch of tree diameter; use a calibrated digital flow meter to verify.

3. The treatment mixture shall be applied under the soil around the base of the tree, normally no more than 12 inches from the base. In no case will material be allowed to puddle and run off-site. Any appearance of treatment solution moving from the site will halt the treatment. All spills will be properly and promptly cleaned up by treatment crews. The Contractor shall document all spills and remedial actions performed on the daily treatment record report to USDA.

4. Potted plants may be treated by a basal soil drench using the same apparatus described in this section for basal injection, or by a unit modified with a drenching wand rather than injection tip. Chemical dosage, formulation, and mixing requirements are the same for basal application or basal soil drenching.

5. Treated areas will be monitored until all liquid chemical is absorbed by the soil.

Considerations for soil injection:

1. Once applied the treatment is complete. The treated tree does not have to be monitored for a period of time as with the Mauget application method.

2. The material and similar techniques are presently used by a number of tree companies to control other insects and are well accepted in most states.

3. The material does not move much in the soil.
4. The cost of the treatment is less expensive than trunk injections.
5. May not be authorized for use in some locations.
6. Cautions need to be taken with treatments around water.
7. Sufficient insecticide residues for ALB control are not achieved until 2 to 3 months post-application.
8. Treatment of dense tree stands may result in going over the labeled amount per acre.
9. Some urban trees are difficult to treat due to enlarged root masses, etc.

B. Mauget trunk injection:

Use 4 mL Imicide capsules with the Mauget trunk micro-injection system to treat urban and rural trees as needed. Use of Mauget Generation II capsules must follow the recommendations made in the Mauget Technical Support Bulletin 05-1005. The capsules will contain a 10% formulation of imidacloprid and will be applied at the rate of one capsule per two inches of DBH.

Determine the number of capsules to use per tree by determining the tree DBH and dividing by 2. A tree with a DBH of 20 inches would require 10 capsules. The dispensers should be placed in the root flares close to the soil (2 to 6 inches above the soil-wood line). It is very important not to place capsules in root flare valleys, as poor distribution of the material may occur. Once the tree DBH has been determined, place the dispensers on the ground around the tree in the root flare areas that will result in the best distribution of the material throughout the tree. If necessary, more than one dispenser can be placed in one root flare area. Activate the dispenser by hitting the top with a rubber mallet or by pressing between the hands. Using a battery operated drill with an 11/64 bit, drill a hole approximately 0.5 to .75 inches deep on a 45 degree angle to the main trunk where each dispenser is to be placed. The hole should extend just into the tree xylem area. Insert the dispenser tube firmly into the micro injection unit and seat snugly into the hole in the tree. Tap the barrel section lightly with a rubber mallet to firmly seat the micro injection unit in the hole. You should hear a popping sound if the unit is properly in place. Tap the dispenser tube to remove air bubbles and ensure that liquid is flowing into the tree. If not installed correctly, the material will not go into the tree and may possibly leak and cause environmental contamination.

Once treated, a 4 hour wait time is required to ensure that the material has emptied out of the micro injection unit and into the tree. Time to empty can vary depending on the time of the year, weather conditions, and tree species. Moist soil conditions and bright sun with mild temperatures facilitate the emptying of the micro injection units. At the time of notification of treatment, residents and landowners should be encouraged to water the soil under the trees prior to treatment to help increase its effectiveness. The micro injector units will remain on the treated trees for a

maximum of 4 hours, but if empty before 4 hours they can be removed from the tree. If a unit or units have not emptied at the end of a four hour period, remove the unit(s) and note on the daily report the location of the tree and the approximate % of material remaining in each capsule. Capsule applications should be timed so that all capsules are removed before dark. Once empty, the unit and feeder tube are removed from the tree and properly disposed of according to the label instructions. Personnel must be trained by the J.J. Mauget Company or one of their representatives before they attempt to do this type of treatment.

Considerations for Mauget injections:

1. Insecticide moves up into the tree in a short period of time (1-3 weeks).
2. Insecticide residue levels tend to be higher than for soil treatments.
3. Can treat urban trees with no means to soil inject (no soil, standing water, etc.).
4. Trees growing in dense stands (woodlots, forested areas) can be treated without restriction.
5. No water needed, little equipment to move around and minimal environmental impact.
6. Registered for use in most states.
7. Its use, over time, may damage trees because a number of small holes need to be drilled into each tree.
8. The micro injectors are a passive system and up to a 4 hour period may be needed for the pesticide to leave the injector and go into the tree. In an urban area, the injectors have to be monitored until such time that they can be removed.
9. Tree may not take up all of the intended dosage.
10. Capsules must be disposed of according to label directions.
11. If not applied correctly, uniform coverage may not occur throughout the tree.
12. Trees less than two inches in diameter cannot be treated with the Mauget system.
13. The cost of the treatment is more expensive than soil applications.

C. Pressurized trunk injection:

In situations where soil injections cannot be performed and immediate trunk injections are desired, pressurized trunk injection devices can be used (Appendix 3.3). Specific use instruction for each device can be found in their respective operation and maintenance manuals. Trunk injectors can use any of the approved imidacloprid formulations for these devices: Imicide HP (10% formulation, ~100 g/l, JJ Mauget Co., EPA Reg. No. 7946-25); Merit Tree Injection Insecticide (17% formulation, 200 g/l, Bayer Environmental Science, EPA Reg. No. 432-1447); IMA-jet (5%

formulation, 50 g/l, Arborjet, Inc., EPA Reg. No. 74578-1); Pointer ALB Insecticide (5% formulation, 50 g/l, ArborSystems, EPA Reg. No. 69117-1).

At the start of each work day, trunk injection devices to be used will be calibrated in the presence of a USDA representative, by injecting five 4 ml doses into a graduated cylinder, and repeated once more. This should also be repeated during the workday whenever there is an indication that the proper amount is not being injected. Chemical expended during calibration should be captured and recycled for use; chemical remaining in the application lines and system should be captured and recycled for operational use.

Pre-drill an injection hole (7/32 inch in diameter) at a slightly downward angle 3/4 inches into wood (xylem) at the base of the tree trunk with a clean, sharp brad point drill bit, approximately 6 inches above the soil line. The number of injection holes is determined by measuring the diameter at breast height (DBH), and dividing by 2. These injection sites will be as evenly spaced as possible except for situations where trunk damage exists or access is impossible. Align the USDA tip with the injection hole and push firmly with a slight rotating motion to seat the tip into wood. The minimal application rate to use is 2 ml per inch of DBH rounded to the nearest even number (based on a 100 g/l active ingredient formulation). Application should be made as evenly as possible to all sides of the tree.

Examples-

1. A tree measures 23.9 inches in DBH. As the actual DBH is less than 24 inches, round to the nearest whole number, 24 inches, and apply at the rate of 2 mLs per inch. This tree would have 12 injection sites with 4ml per injection site.
2. A tree measures 22.75 inches in DBH, round down to 22 inches and treat at the rate of 2 mLs per inch of DBH. This tree would have 11 injection sites with 4ml per injection site.

Place the holes in actively growing tissue (i.e., “peaks, not “valleys”) and avoid wounds or girdling roots. For trees that have been injected previous years, injection sites can be staggered 3 to 6 inches above and between old injection sites. In an effort to achieve good uptake, injections can be made from the root flare up to a height of 12 inches from the soil line. When the number of injection holes is reduced to accommodate inactive sites, increase the amount of material injected in other holes in order to inject the proper dose into the tree. It is anticipated that uptake will be immediate to a few seconds in most situations, particularly with certain species in the springtime. However, in the event that uptake is delayed, good judgment is required. Use 15 seconds as a guide; if the injection hole appears to be taking the material up, try to inject the appropriate amount. If the injection hole does not appear to be taking up material, move to adjacent injection sites and attempt to inject the normal dose plus one half the deficit amount from the unresponsive injection site. Whenever

possible, apply the deficit chemical into the two adjacent injection sites in order to maintain even chemical distribution throughout the tree.

It is important to inject the appropriate amount for the size of tree. Trees that have large wounds on one side (i.e., auto hits) may not take up material on that side. In these cases application will be made to the uninjured side of the tree. The application should attempt to evenly distribute the chemical through the tree by evenly spacing injection sites around the trunk of the tree. If several holes fail in the same tree, it is best to drill another hole so that not too much chemical is being injected into one side of the tree.

Trunk injection units will be cleaned of all debris and inspected on a daily basis. Regular maintenance will be performed as detailed in the user's manuals. Prudent preventative maintenance should minimize delays due to equipment malfunction. Malfunctioning equipment will be removed from service and replaced with a working unit, or may be repaired and returned to service if the problem can be corrected in a reasonable amount of time.

Considerations for Trunk Injections (also see those listed for Mauget injections, above):

1. Capability to deliver custom doses of chemical at each injection site.
2. Ability to immediately treat a tree and move on (average time to inject a 10" tree is less than 5 minutes).
3. Label rates allow for an increased dose of insecticide for larger diameter trees. Adequate residue levels are typically not achieved when using the minimal application rate in the larger trees.
4. Usage rates may be less than that listed on the label, requiring the need for state notification or a special label recommendation (2ee).
5. Equipment may be complicated, subject to breakdown and time-consuming maintenance.
6. May require training before use.

2. Bark sprays:

Bark sprays target the adult beetles as they feed on the twigs and deposit eggs during the adult emergence and flight period. Thorough coverage of the bark is required; therefore apply material with a hydraulic type sprayer with pressure (400-800 psi). Bark sprays may be used during the adult emergence and flight period: 1) on individually infested trees prior to removal to prevent any adults that may be present from dispersing or 2) on large tracts of wooded land surrounding infested trees to quickly suppress populations or protect from infestation.

There are a number of pesticides that have been tested for their contact and stomach effect on adult beetles when applied as bark sprays. Tests in China and the United States

indicate that a number of registered pesticides are effective against the adult beetles when applied as bark sprays in the laboratory.

Recommended bark sprays are in the following order of priority:

1. Chemical: Demand CS (λ-cyhalothrin) 9.7% (microencapsulated)

Demand CS (Syngenta Professional Products; EPA Reg. No. 100-1066) can be mixed with water and used as a bark spray with hydraulic spray equipment using 5 fluid ounces of formulation in 100 gallons of water. There should be good agitation in the mixing tank and the material should be applied so that all tree bark is covered with the material. Major emphasis should be on good coverage of bark in the upper 2/3 of the tree, including twigs 0.25 to 0.75 inches in diameter. The applicator should try to prevent the spray material from going onto the ground if possible. It may be advisable to use a good agricultural sticker with the spray mix to keep the material on the bark when exposed to rainfall. An alternate method is to restrict applications to larger stems (>2 to 3 cm diameter) in the upper portions of trees. The latter method will likely be somewhat less effective but could reduce insecticide usage and over-spray depending on the application method. Do not apply Demand if rain is expected within 6 hours of spraying and do not apply to wet bark. Do not apply when wind speed and/or direction favors drift beyond the area intended for treatment. Do not apply to food crops or to plants being grown for sale or other commercial purposes. Repeat applications may be made but do not apply more than 0.36 lbs A.I. (52.4 fl. oz. of concentrate) per acre per year. See product label for additional details. NOTE: The current label supports use on ornamental trees and shrubs, but does not specifically support use against wood borers on ornamentals.

2. Chemical: Tempo SC Ultra (β-cyfluthrin) 11.8% (1 lb. per gallon)

Tempo SC Ultra (Bayer Environmental Science, EPA Reg. No. 432-1363) can be mixed with water and used as a bark spray with hydraulic spray equipment using 5.4 fluid ounces of formulation in 100 gallons of water. There should be good agitation in the mixing tank and the material should be applied so that all tree bark is covered with the material. Major emphasis should be on good coverage of bark in the upper 2/3 of the tree, including twigs 0.25 to 0.75 inches in diameter. The applicator should try to prevent the spray material from going onto the ground if possible. It may be advisable to use a good agricultural sticker with the spray mix to keep the material on the bark when exposed to rainfall. Do not apply the spray if rain is expected within 6 hours of spraying and do not apply to wet bark. Do not apply when wind speed and/or direction favors drift beyond the area intended for treatment. Repeat applications may be made. Do not apply to food crops or to plants being grown for sale or other commercial purposes. See product label for additional details. NOTE: Current label supports use on ornamental trees and shrubs and against structural

wood-boring pests, but does not specifically support use against wood borers on ornamentals.

3. Chemical: Astro Insecticide (Permethrin) 36.8% (3.2 lbs. A.I. per gallon)

Astro Insecticide (FMC Corporation; EPA Reg. No. 279-3141) can be mixed with water and used as a bark spray with hydraulic spray equipment. For broadcast sprays (covering small twigs and foliage), mix formulation at 8 fluid ounces per 100 gal. of water. There should be good agitation in the mixing tank and the material should be applied so that all tree bark is covered with the material. Major emphasis should be on good coverage of bark in the upper 2/3 of the tree, including twigs 0.25 to 0.75 inches in diameter. The applicator should try to prevent the spray material from going onto the ground if possible. It may be advisable to use a good agricultural sticker with the spray mix to keep the material on the bark when exposed to rainfall. Do not apply the spray if rain is expected within 6 hours of spraying and do not apply to wet bark. Do not apply when wind speed and/or direction favors drift beyond the area intended for treatment. Repeat applications may be made but do not apply more than 2.0 lbs. per acre per year. NOTE: The current Astro label indicates that higher rates (up to 5.35 qts. of formulation in 100 gallons of water) may be used for coleopteran borers when the application is limited to trunks and larger branches.

4. Chemical: TalstarOne Multi-Insecticide (Bifenthrin) 7.9% (2/3 lbs. A.I. per gallon)

TalstarOne Multi-Insecticide, also from FMC, (EPA Reg. No. 279-3206) can be mixed with water and used as a bark spray with hydraulic equipment using 20 fluid ounces of formulation in 100 gallons of water. Label specifies applying product to foliage, twigs, and stems when treating ornamental plants for beetles. Additional applications can be made to the trees during the adult flight period. Do not apply to plants being grown for sale or other commercial purpose. Follow instructions as they relate to Tempo.

5. Chemical: DeltaGuard T&O 5 SC Insecticide (Deltamethrin) 4.75% (0.42 lbs. A.I. per gallon)

DeltaGuard T&O 5 SC Insecticide (Bayer Environmental Science, EPA Reg. No. 432-834) can be mixed with water and used as a bark spray with hydraulic spray equipment using 4 to 8 fluid ounces of formulation in 100 gallons of water. Do not apply to edible crops. Follow instructions as they relate to the treatment with Tempo. NOTE: The current label supports use on ornamental trees and shrubs, but does not specifically support use against wood borers on ornamentals.

3. General pesticide use:

When applying pesticides, phytotoxicity (damage to the target plant) can occur and should be checked on a limited number (1-3 plants per species) of specimens before treating large numbers of trees. The various species can react differently to the pesticide.

Before using any pesticide, always read the entire label and follow all instructions. Make sure the material is registered for your specific use in the area where you plan to treat – in some cases exemptions may be needed before using a product in ALB programs. Make sure all human and animal safety guidelines are strictly followed. Make sure all environmental guidelines are strictly followed and adhere to restrictions regarding the use of insecticides near wetlands and bodies of water. Adhere to state and local requirements. Dispose of any empty containers as per label instructions.

Definition: Diameter at Breast Height (DBH) - For trees, the DBH, measured at 4.5 feet above ground level, is used to estimate the amount of material needed for treatment. For multi-stem trees, such as crape myrtle or birches, the rate should be determined on cumulative stem diameter for all stems in the clump (see Appendix 7). DBH can be determined by using a specially designed measuring tape or tree caliper which measures tree diameter. Both the tape and caliper can be obtained from tree and nursery suppliers. If these tools are not available, an ordinary tape measure can be used to determine the tree trunk circumference at breast height. Once the circumference is known, the following equation can be used to calculate DBH: circumference (inches) x 0.32 = DBH (inches). Example: Tree circumference is 16 inches, 16 x 0.32 = 5.1, or approximately 5 inches DBH.

Sources:

- Merit products, Tempo SC Ultra, and DeltaGuard T&O 5SC Insecticide: Bayer Environmental Science, P.O. Box 12014, 2 T.W. Alexander Drive, Research Triangle Park, NC 27709
- Imicide capsules, Imicide HP: J.J. Mauget Company, 5435 Peck Rd., Arcadia, CA. 91006; contact 877-873-3457
- Arborjet VIPER and IMA-jet formulation: Arborjet, 70B Cross St., Winchester, MA 01890; contact 866-272-6758
- Pointer ALB Insecticide: ArborSystems, PO Box 34645, Omaha, NE 68134; contact 800-698-4641
- Demand CS: Syngenta Professional Products, Greensboro, NC 27409
- Davey Tree Injector: The Davey Tree Expert Co., 1500 Mantua St., Kent, OH 44240; contact 800-828-8312
- Wex suspension agent: Conklin Co., Inc., Agronomics Division, 551 Valley Park Dr., PO Box 155, Shakopee, MN 55379

D. Data collection

1. When ALB host material is treated the following data will be recorded:
    a. Date and time of treatment.
    b. Type of treatment (Mauget, pressurized trunk injection, soil injection, bark spray).
    c. Type and amount of chemical applied.
    d. Location of host material, street address, or GPS coordinates.

e. Host Species.
f. DBH of host species.
g. Tree type (private, street, or park). If private ownership, a release will be obtained, and the name, address, and phone number of the owner will be documented.
h. Tree location on property.
i. Contracting company and applicator conducting the treatment.
j. Work order number.
k. Weather conditions.
l. Name of inspector supervising treatment.

2. When ALB host material is removed the following data will be recorded:
a. Date of removal.
b. Date(s) of chemical treatment, if applicable.
c. If tree is infested or high risk.
d. If infested, damage to tree in regards to number of egg sites and exit holes.
e. Location of host material, street address, or GPS coordinates.
f. Host Species.
g. DBH of host species.
h. Tree type (private, street, or park). If private ownership, a release will be obtained, and the name, address, and phone number of the owner will be documented.
i. Tree location on property.
j. Hazardous conditions at the location.
k. Contractor conducting the removal.

VII. PUBLIC OUTREACH

An effective Public Outreach Program is essential to the success of an ALB eradication program. An informed and supportive public will serve as the best survey tool available to the program as new ALB sights have repeatedly been identified and reported by the general public.

A. Public Meetings

Public meetings should be scheduled in the impacted communities as soon as possible after ALB has been confirmed. The purpose of these meetings is to inform the public of the need and plans for an eradication and quarantine program in order to secure their support. Prior to the meeting, any specific political, social, economic, and environmental concerns of the community should be identified.

Public meeting notifications should, at a minimum, be posted in the local news media. If possible, direct mailings to the residents of the impacted community should be conducted.

The public meetings should include the following:

1. A moderator who can insure orderly conduct of the meeting and direct questions to the appropriate persons for answers.
2. Political representatives who are familiar with local concerns.
3. Representatives from State Regulatory Agencies who can answer questions about the detection of ALB, quarantine restrictions, control measures, and their impact.
4. Representatives from state and local universities who can answer questions about the biology of ALB, its host range, and potential impact in the United States.
5. Representatives from PPQ and all federal, state, county, city, and local cooperators to answer questions about their role in the upcoming eradication and quarantine program.
6. Adequate informational material (handouts, fact sheets, informational posters, etc.).

Public meeting sites should be centrally located within the impacted community. They should be well ventilated and have adequate seating, electrical outlets, lighting, and audio equipment.

Additional meetings for small groups with specific concerns can be scheduled after public meetings have been held. These meetings are generally attended by representatives from the cooperating agencies directly involved in the ALB eradication program. The intent of these meetings is to address the specific needs of these groups.

B. Phone Banks

A toll-free telephone number will be set up to serve as an ALB hotline. The hotline number is staffed by personnel trained to answer questions from the public about the ALB eradication program. Written material is provided for anticipated common questions and details the history and protocols of the project as well as the biology of ALB. Forms will be developed locally to document complaints, threats, and sightings of ALB. Past experience has shown that three to five individuals on staggered shifts between 7:00 a.m. to 7:00 p.m. can handle calls from a community of 30,000. In large metropolitan areas, additional staffing may be required to answer calls in a timely manner. When the initial high demand tapers off, staffing can be reduced. A phone answering machine will be installed to take calls after office hours.

C. Notification

The purpose of notification is to comply with state or local laws and provide accurate information in an understandable and non-threatening format to residents within the regulated area for ALB. Any resident who will have ALB-positive host material removed from their property will be notified in writing prior to the removal being conducted. These notices will include the ALB hotline number and the opportunity for the property owner to witness the removal of ALB-positive host material if they desire to do so.

Notification can be accomplished by direct mailing or door-to-door contact. Staff conducting notifications should avoid the following:

1. Negative or facetious comments about the project.

2. Misinformation about regulatory and control protocols.
3. Speculation about the progress of control measures.
4. Special arrangements with individual property owners.

VIII. MEDIA RELATIONS

The APHIS, PPQ, and LPA staff should be notified as soon as possible after ALB is confirmed and routinely notified of any media requests. All national media calls must be coordinated with APHIS/LPA.

One primary media spokesperson should be designated for the cooperative eradication program. The spokesperson is to be thoroughly briefed and current on particular aspects of the program such as control, regulatory, and survey activities. Creating a rapport with local media people results in more accurate and favorable coverage of the project. To avoid conflicting and confusing statements, all outgoing information should be processed through the designated spokesperson.

The amount of media attention given to ALB eradication programs in the past has been very high. If personnel at the local level do not have adequate media experience to deal with the requests, the APHIS, PPQ, and LPA staff should be notified so they can provide experienced media representation to the program.

IX. COOPERATIVE RELATIONS

It is essential that PPQ notify all of the primary cooperators of the ALB infestation prior to making a public announcement. This will include City, County, and other local governments as well as our traditional Federal and State Cooperators. Additionally, all of the cooperating parties should hold orientation and programmatic meetings to clearly establish their roles in the pending ALB eradication program prior to holding public meetings and dealing with the media.

The examples listed below are based on the cooperative ALB eradication programs in New York and Chicago. The actual roles taken on by cooperators in the program will vary by location.

- USDA/APHIS/PPQ-Survey, Regulatory, Control, Media Relations, and Public Outreach.
- State Departments of Agriculture-Survey, Regulatory, Control, Media Relations, and Public Outreach.

- City/Local Governments-Media Relations, Public Outreach, and Tree Removal and Replanting. Some city/local governments have provided office space and data entry during program startup.
- USDA Forest Service-Tree planting, program assistance and Tree Climbers.

A. Primary Cooperators

Primary Cooperators include:

1. APHIS: PPQ and Otis Methods Development.
2. USDA Forest Service: State and Private Forestry, Urban and Community Forestry, and Forest Health Protection.
3. State Government: State Plant Regulatory Agency/State Department of Agriculture, State Forestry, State Natural Resource Agencies, State Urban Forestry Agencies, State Environmental Departments, Department of Transportation and Highway Patrol.
4. Local and City Government: City or County Forester, County Cooperative Extension Service, Mayor or City Manager, City Engineering, Transportation, Parks and Sanitation Departments, City or County Commissioners, City Police and County Sheriff Offices.
5. State Universities and Colleges: These entities can assist with Education and provide technical expertise.

B. Secondary Cooperators

Secondary Cooperators include:

1. State Chapter of Arboriculture.
2. Home Owner Associations.
3. Birding/Ornithological Groups.
4. Telephone and Electrical Companies.
5. Environmental/Forestry Groups.

Cooperative eradication programs are traditionally a cost share between APHIS PPQ and the primary cooperators involved.

APPENDIX 1: ANNOTATED CATEGORIZATION OF ALB HOSTS

Revised February 22, 2008

Alan Sawyer, USDA-APHIS-PPQ, Otis Plant Protection Laboratory

Genus[1]	Common Name	Host Abundance and Other Notes[2]	Treated, surveyed[3]
Preferred host in US[4]			
Acer	Maple, boxelder	Very common trees. Many US records, all species: Norway, red, silver, sugar, sycamore maple and boxelder especially favored; Amur maple less favored; Japanese maple seldom attacked.	**yes**
Aesculus	Horsechestnut, buckeye	Fairly common trees. Several US records, some heavily infested.	**yes**
Betula	Birch	Fairly common trees. Several US records: gray, paper, river and European white birches. Some gray birches with many exits. Birches are apparently less preferred than maple.	**yes**
Salix	Willow	Fairly common trees. Several US records: weeping, pussy and white willows highly favored; black willow (oviposition only) less favored.	**yes**
Ulmus	Elm	Very common trees. Many US records: American, Siberian and Chinese elms. Elms are apparently less preferred than maple.	**yes**
Occasional to rare host in US[4]			
Albizia	Mimosa, silk tree, *A. julibrissin*	Occasional ornamental. Exit holes: 2 records from field in NY with additional emergence in laboratory. No Chinese record.	**yes**
Fraxinus	Ash (especially green ash, *F. pennsylvanica*)	Very common tree, but injury infrequent relative to host abundance. Several US records, all from IL, most of these unverified (but at least two exit holes confirmed). Host in Chinese literature. Exit hole in green ash in Chinese field test.	**yes**
Platanus	London plane tree, *P. acerifolia*	Common urban trees. Eight US records (including 2 with exit holes, NY); no record for *P. occidentalis*, American sycamore. Host in Chinese literature. Exit holes observed in China.	**yes**
Populus	Poplar	Fairly common trees. Diverse group. Suitability apparently varies; some species and hybrids are prime hosts in China. Just 7 US records (NY, NJ), including balsam popular, *P. balsamifera*, Balm-of-Gilead (a hybrid cultivar), eastern cottonwood, *P. deltoides*, quaking aspen, *P. tremuloides* and unidentified *Populus sp*. Exit hole on quaking aspen, adults reared in lab from field-collected cottonwood.	**yes**
Sorbus	European mountain-ash, *S. aucuparia*	Occasional ornamental. Exit hole: 1 record from field in IL with additional emergence in laboratory. No Chinese record. Note: this is not a true ash; *Sorbus* is a member of the rose family.	**yes**

- continued next page -

Genus[1]	Common Name	Host Abundance and Other Notes[2]	Treated, surveyed[3]
Questionable US records[4]			
Celtis	Hackberry, *C. occidentalis*	Fairly common tree. Oviposition: 1 record from IL, with small/medium-sized larva identified as ALB. No Chinese record.	**yes**
Hibiscus	Rose-of-Sharon, *H. syriacus*	Common ornamental shrub. Exit: 1 unverified report, NY; Oviposition: several records, NY, but no larval development, possibly incidental to heavy damage on nearby hosts. No Chinese record.	no
Malus	Apple, crab apple	Common ornamental. Oviposition: 1 questionable record, IL. Host in Chinese literature. Oviposition observed in China.	no
Morus	Mulberry	Very common tree. Oviposition: 1 record, NY. No Chinese record.	no
Prunus	Cherry, plum	Very common ornamental. Oviposition: 2 records, NY & IL, but no survival. Host in Chinese literature.	no
Pyrus	Pear	Common ornamental. Exit: 1 questionable record, IL. Host in Chinese literature.	no
Quercus	Oak, (pin oak, *Q. palustris*)	Very common tree. Oviposition: 1 record, NY (incidental to heavy damage on nearby hosts). No Chinese record.	no
Robinia	Black locust, *R. pseudoacacia*	Common tree. Exit: 2 doubtful records, IL. Host in Chinese literature. Egg sites observed in China.	no
Tilia	Linden (little-leaf linden, *T. cordata*)	Common tree. Oviposition: 2 records (IL & NY) but no survival. Host in Chinese literature.	no
No US record[4]			
Alnus	Alder	Locally common tree or shrub. No US record. Host in Chinese literature. Exit hole observed in gray alder, *A. incana*, in cage study in China.	no
Elaeagnus	Russian olive (Oleaster), *E. angustifolia*	Widely-planted ornamental shrub. No US record. Host in Chinese literature; Heavy feeding damage and exit hole observed in China.	no
Koelreuteria	Goldenraintree, *K. paniculata*	Occasional ornamental. No US record. Heavy feeding, oviposition sites and 2 exit holes observed in cage study in China.	no
Melia	Chinaberry, *M. azedarach*	Uncommon shrub. No US record; reported *not* to be a host in Chinese literature but damage observed.	no
Non-host[4]			
Ailanthus	Tree of heaven, *A. altissima*	Common tree. No US record; reported *not* to be a host in Chinese literature.	no

1. Host genera listed alphabetically within categories.
2. Host abundance based on (a) records and observations of infested areas in NY, IL and NJ; (b) on Nowack, D. J., 1994, "Urban Forest Structure: The State of Chicago's Urban Forest," pp. 3-18 *In:* E. G. McPherson et al., **Chicago's Urban Forest Ecosystem: Results of the Chicago Urban Forest Climate Project**. Gen. Tech. Rep. NE-186, USDA Forest Service, NE Forest Experiment Sta., Radnor, PA.; and (c) on descriptions of range and abundance in several field guides.
3. Included in surveys and chemical treatments by USDA Cooperative ALB Eradication Program in IL, NY and NJ.
4. Host status based on US records of infestation, field studies with North American trees planted in China and Chinese literature. Host range tests in laboratory and greenhouse settings not considered except as noted.

APPENDIX 2: INTENSIVE CORE & DELIMITING SURVEY PROTOCOLS

All host trees should be inspected for ALB damage. If additional ALB hosts are identified, then the host genera or species may be added to the inspection host list. If necessary, nonhost trees may require inspection. Survey crews shall inspect all host material (or any specifically identified nonhost material) for the evidence shown in Appendix 5.

All Inspection Crews

Start the inspection by first examining the lower portions of the tree, starting with exposed root areas and the root collar, and working upward to the height of the first scaffold branches. Infestations may be found at lower levels of the tree and this should not be ignored. Particular attention should be paid to the root collar area of small diameter trees including the necessity to pull back leaf litter to view the root collar area. Small diameter trees not suitable for bucket or climbing inspection should be checked initially from the ground and the upper surfaces completed from a higher point in an adjacent tree if at all possible. Ladders may be used as well to check the upper portions of trees unsuitable for climbing or bucket inspection.

Climbing Crews

Beginning with the main leaders, carefully examine all scaffold branches and branches. Climber shall move throughout the entire tree canopy examining all surfaces of the scaffold branches, branches, main leaders, crotches, and collars searching for any evidence of ALB infestation. The time required for inspection may increase when foliage is present.

Bucket Truck Crews

Take the bucket above the canopy of the tree. Whenever possible the bucket should be positioned with the sun at the back of the bucket operator. Carefully examine the branches visually, using the naked eye, and with binoculars. Begin with the main leader, working your way out from the crotches and collars along the scaffold branches to the smallest branches, crotches, and collars. Examine any suspicious area with binoculars at first, and then maneuver the bucket right up near the site as necessary to get a closer look. Move to the inside center of the canopy and continue to examine upper and lower surfaces of the scaffold branches, branches, main leaders, crotch and collars. Continue the inspection of the tree by moving to all sides of the canopy as necessary to complete a thorough inspection. The time required for inspection may increase when foliage is present.

APPENDIX 3: RECOMMENDED EQUIPMENT

1. Bucket Trucks: Two-person Bucket Trucks should be used initially in the program. These trucks have the capability to lift two individuals at a time in the bucket so that experienced survey personnel can train bucket operators in the identification of ALB damage to host trees.

2. Tree Chippers: At a minimum, a standard 11- or 12-foot tub grinder should be used for the project. This equipment can process an adequate amount of material to provide for timely destruction of regulated articles. If a high percentage of large trees in excess of 25 inches DBH are found to be infested, a 14-foot tub grinder with the capacity to chip wood at rate up to 400 cubic yards, or 75 to 100 tons, per hour are recommended.

3. Pressurized Injectors: Currently the ALB eradication program has two such devices approved for use by the treatment contractor, the Davey Beetle Buster Tree Injector and Arborjet's VIPER trunk injection device. Both are equipped with oil-filled pressure gauges and an injection tube approximately 2 to 3 feet long fitted with a USDA tip. Injection pressure is limited to no greater than 200 psi, to avoid excessive damage at the injection site.

APPENDIX 4: HOST TREE IDENTIFICATION AIDS

1. *Audubon Society Field Guide To North American Trees*. Eastern or Western Addition. Elbert Luther Little, Sonja Bullaty (Photographer), Angelo Lomeo (Photographer), June 1998.

2. A *First Guide To Trees*. Publisher: George A. Petrides, Roger Tory Peterson/ Paperback/ Houghton Mifflin Company/ May 1998

3. *Tree Finder*. A Manual for the Identification of Trees by their Leaves. May Theilgaard Watts/ Paperback/ Publisher Nature Study Guild January 1998.

4. *Simon & Schuster Guide to Trees*. Mariella Pizzettii, Paola Lanzara, Stanley Schuler (Editor)/ Paperback/ Simon & Schuster Trade/April 1978.

5. *The Tree Identification Book*. George W. D. Symonds, Stephen V. Chelminski (Photographer) /Paperback/ Morrow,William & Co./ December 1972.

APPENDIX 5: WHAT TO LOOK FOR

Female beetles chew oval to round pits in the bark of trunks and large branches and deposit a single egg in each niche.

The eggs hatch in 10-15 days. The larvae tunnel through the bark and into the heartwood of the tree to pupate. This action results in an accumulation of coarse sawdust around the base of infested trees, where branches meet the main stem, and where branches meet other branches.

Oozing sap and small piles of sawdust may indicate an ALB infestation.

The adult ALB is ¾ to 1 ¼ inches long, with a shiny jet black body mottled with white spots on the back. Its black-and-white striped antennae are 1 ½ to 2 ½ times as long as the beetle's body. The adult beetles are usually present from May through October.

Adult beetles emerge from the pupation sites by boring through the wood, leaving an approximately 3/8-inch diameter exit hole on the trunk and branches. The adults usually remain on the same tree and feed on twig bark.

APPENDIX 6: SAMPLE COMPLIANCE AGREEMENT

FORM APPROVED
OMB NUMBER 0579-0064

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
PLANT PROTECTION AND QUARANTINE

COMPLIANCE AGREEMENT

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0579-0054. The time required to complete this information collection is estimated to average 1.25 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

1. NAME AND MAILING ADDRESS OF PERSON OR FIRM	2. LOCATION

3. REGULATED ARTICLE(S)

4. APPLICABLE FEDERAL QUARANTINE(S) OR REGULATIONS

5. *I/We agree to the following:*

6. SIGNATURE	7. TITLE	8. DATE SIGNED
		9. AGREEMENT NO.
The affixing of the signatures below will validate this agreement which shall remain in effect until canceled, but may be revised as necessary or revoked for noncompliance.		10. DATE OF AGREEMENT

11. PPQ OFFICIAL *(Name and Title)*	12. ADDRESS
13. SIGNATURE	
14. STATE AGENCY OFFICIAL *(Name and Title)*	15. ADDRESS
16. SIGNATURE	

PPQ FORM 519
(FEB 2002)

APPENDIX 7: DBH MEASURING STANDARDS

Written by C. Caris, G. Rentschler, and E. Olson

Diameter at Breast Height (DBH) is ordinarily measured at 4.5 feet (54 inches, approximately 1.3 meters) above the ground, perpendicular to the direction of growth. There are several instances where this must be modified:

1. On sloping ground, measure (4.5 ft) on the uphill side of the tree.
2. If a tree is leaning over, use the "underside" of the trunk to determine 4.5 feet. This means measure 4.5 ft from the base of the tree along the trunk, not straight up from the ground. Should there be a conflict, measuring on the uphill side of the tree takes precedence to measuring on the underside of the tree.
3. If a disruption (a branch, wound, nodal swelling, etc.) is in the way, measure just above the disruption. If the disruption extends more than two inches above DBH (beyond 56" above ground) try to measure just below the disruption. If the disruption also extends more than two inches below DBH (disruption spans entire area from 52" to 56" from ground) measure beyond the disruption as near as possible to 54 inches.
4. Each stem of a multi-stem tree should be individually measured. If no single stem is greater that 2" in DBH, then the tree should not be treated. If any stem of the tree is greater than 2"in DBH then all stems measuring over 1" in DBH should be added together to calculate a total DBH. Any stems measuring less than 1" in DBH should be disregarded.

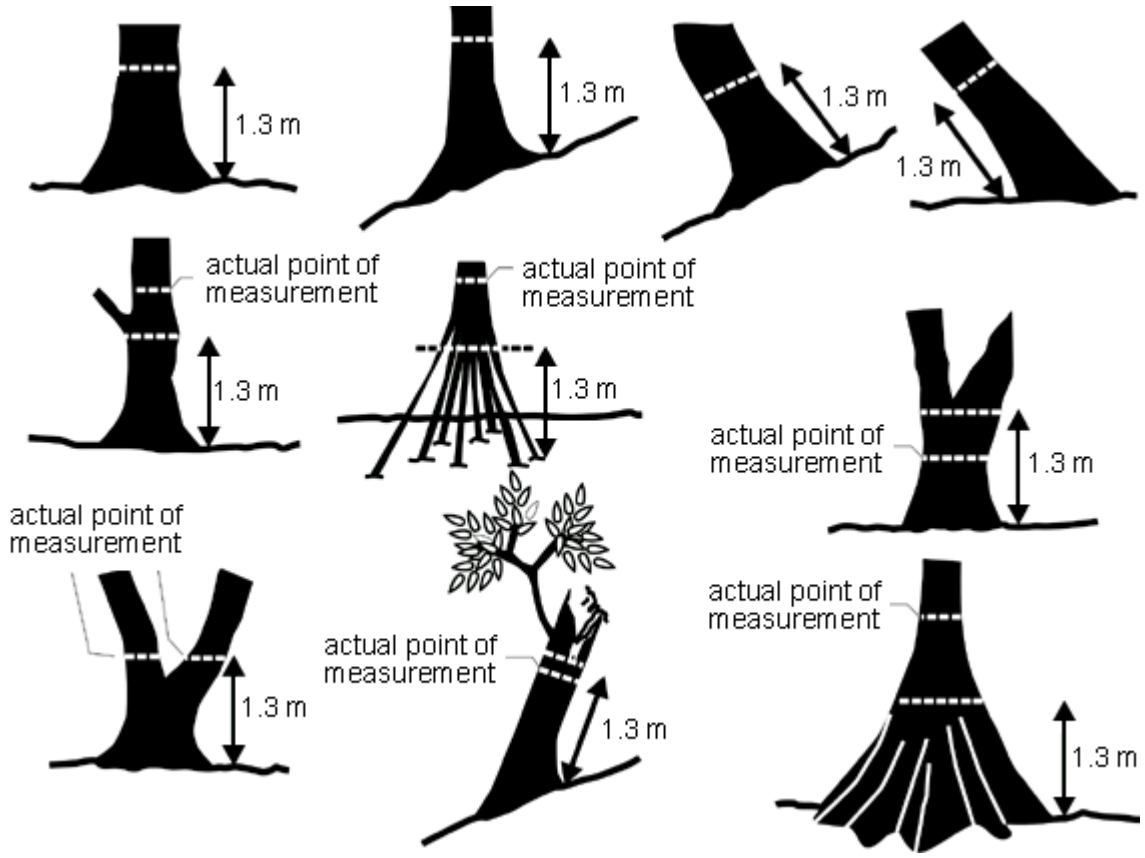

Figure taken from-http://eqb-dqe.cciw.ca/eman/ecotools/protocols/terrestrial/vegetation/page62.html
The Ecological Monitoring and Assessment Network

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1. Peng, J. and Liu Y. 1992. *Iconography of Forest Insects In Hunan China.* Hunan Forestry Department/Institute of Zoology, Academia Sinica.

2. USDA APHIS PPQ New Pest Advisory Group (NPAG) Report 1996.

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