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Marketing and
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Animal and
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Inspection
Service

Asian Longhorned Beetle Cooperative Eradication Program in Essex, Norfolk and Suffolk Counties, Massachusetts

Environmental Assessment
March 2011

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I. Introduction

Asian longhorned beetle (*Anoplophora glabripennis*) (ALB) is a foreign wood-boring beetle that threatens a wide variety of hardwood trees in North America. The native range of ALB includes China and Korea. ALB is believed to have been introduced into the United States from wood pallets and other wood packing material accompanying cargo shipments from Asia.

A. Asian Longhorned Beetle

1. Biology

ALB is in the wood-boring beetle family Cerambycidae. Adults are 1 to 1½ inches 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 various hardwood tree species in which they lay (oviposit) their eggs. There are 12 known genera of host trees: *Acer* (maple and box elder), *Aesculus* (horsechestnut), *Salix* (willow), *Ulmus* (elm), *Betula* (birch), *Albizia* (mimosa), *Celtis* (hackberry), *Cercidiphyllum* (katsura tree), *Fraxinus* (ash), *Platanus* (sycamore and London planetree), *Sorbus* (mountain ash), and *Populus* (poplar) (USDA–APHIS, 2008).
Once the eggs hatch, small white larvae bore into the tree, feeding on the vascular layer beneath. The larvae continue to feed deeper into the tree's heartwood, forming tunnels (or galleries) in the trunk and branches. This damage cuts off nutrient flow and weakens the integrity of the tree, which will eventually die if the infestation is severe enough. Sawdust debris and insect waste and excrement (or frass) is commonly found on the base of afflicted trees, as well. Infested trees are also prone to secondary attack by diseases and other insects.

Over the course of a year, a larva will mature and then pupate. From the pupa, an adult beetle emerges chewing its way out of the tree, forming characteristic round holes approximately three-eighths of an inch in diameter. The emergence of beetles typically takes place from June through October with adults then searching for mates and new egg-laying sites to complete their life cycle.

2. History of ALB in United States

ALB was first discovered in August 1996 in the Greenpoint neighborhood of Brooklyn, New York. Within weeks, another infestation was found on Long Island in Amityville, New York, after officials learned that infested wood had been moved from Greenpoint to Amityville. ALB was also found in Queens and Manhattan, New York.

In July 1998, due to 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 USDA's Animal and Plant Health Inspection Service (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 2006, these restrictions were expanded to imports from all countries.

In October 2002, ALB was discovered in Jersey City, New Jersey, 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, New Jersey. It was subsequently found in 2007 in Richmond County, New York (Staten Island), across the Arthur Kill River from the New Jersey infestation sites.

In August 2008, ALB was discovered in Worcester, Massachusetts. This infestation includes the City of Worcester and the Towns of Holden, West Boylston, Boylston, and Shrewsbury. In July 2010, an infestation was reported in the Jamaica Plain area of Boston, Massachusetts; however, to date, only six infested trees have been detected in this area.

B. Purpose and Need

APHIS has the responsibility for taking actions to exclude, eradicate, and/or control plant pests under the Plant Protection Act (7 United States Code (U.S.C.) 7701 et seq.). APHIS is proposing an eradication and quarantine program for ALB in Essex, Norfolk and Suffolk Counties in Massachusetts. This action is necessary to eradicate ALB from the area to prevent the spread of ALB to other states and to prevent damage to hardwood trees in North America.

This environmental assessment (EA) has been prepared consistent with the National Environmental Policy Act of 1969 (NEPA) and APHIS' NEPA implementing procedures (7 Code of Federal Regulations (CFR) part 372) for the purpose of evaluating how the proposed action, if implemented, may affect the quality of the human environment.

APHIS has prepared five other EAs that are relevant to this current EA: Asian Longhorned Beetle Control Program (December 1996), Asian Longhorned Beetle Program (February 2000), Asian Longhorned Beetle Cooperative Eradication Program, Hudson County, New Jersey (March 2003), Asian Longhorned Beetle Cooperative Eradication Program in the New York Metropolitan Area (May 2007), and Asian Longhorned Beetle Cooperative Eradication Program in Worcester and Middlesex Counties, Massachusetts (September 2008).

II. Alternatives

This EA analyzes the potential environmental consequences associated with the proposed action to eradicate ALB from Essex County, Norfolk County, and Suffolk County, Massachusetts. To date, within this 3-county area only 6 ALB infested trees have been found at one site near Faulkner Hospital outside of Boston, Massachusetts. A treatment area in Suffolk County, Massachusetts has been identified for this infestation. This EA considers this treatment area, as well as any other future ALB treatment sites that may be found within the 3-county area, should additional ALB infestations be found there. Two alternatives are being considered: (1) no action by APHIS to treat new infestations of ALB, and (2) the preferred alternative to eradicate ALB from Suffolk County and from Norfolk or Essex County, should it be found there. Eradication efforts include chemical injections into the soil or truck of host trees and possible cutting.

A. No Action

Under the no action alternative, APHIS would continue to implement the quarantine restrictions in the area as defined in the quarantine order for Norfolk and Suffolk County, Massachusetts. No eradication efforts would be undertaken by APHIS. Some control measures could be taken by other Federal or non-Federal entities; however, these measures would not be controlled nor funded by APHIS.

The current quarantine restricts the movement of firewood, green lumber, and other living, dead, cut, or fallen material including nursery stock, logs, stumps, roots, and branches from potential host trees. These articles may not move outside the quarantine zone unless each article is issued a certificate or limited permit by an APHIS or State cooperating inspector.

B. Preferred Alternative

The ALB eradication program (preferred alternative) is a cooperative effort among APHIS, the U.S. Forest Service (USFS), State cooperators, impacted municipalities, and local residents. The Massachusetts cooperators currently include the Department of

Conservation and Recreation, and the Department of Agricultural Resources, the Town of Brookline, and the City of Boston. APHIS and the cooperators share responsibility for survey; regulatory; tree removal, destruction, and restoration; and public outreach. APHIS has the lead responsibility in the areas of survey, chemical control, environmental monitoring, data management, public outreach, and technology enhancement. USFS helps communities recover from tree loss with replanting efforts, works with APHIS on technology enhancement issues and public outreach, and helps APHIS detect infestations.

Under the preferred alternative, APHIS and its cooperators would implement an eradication program to rid ALB from any sites where it may be found in Essex, Norfolk and Suffolk Counties, Massachusetts. The eradication program will consist of maintaining the current ALB quarantine as defined in the no action alternative, soil or trunk injections with imidacloprid, selective tree removal of infested and/or exposed host trees; stump grinding of removed host trees; and the application of herbicide triclopyr (Garlon®) on stumps that cannot be removed to eliminate regrowth, and chipping or burning of cut trees.

Surveys are made of all host trees within a designated area surrounding an infested tree to ensure that they are not infested with ALB. The surveyors look for signs of infestation, such as round ALB exit holes and heavy sap flow from damaged sites on the trees. ALB inspectors utilize many methods and resources to conduct tree surveys. Inspectors conduct visual surveys from the ground using binoculars to look for signs of infestation. Aerial tree inspections are performed by trained professionals using bucket trucks to peer into trees from above. Tree climbers also survey trees to search for signs of an infestation. Many interest groups and organizations voluntarily assist inspectors by searching trees from the ground.

The eradication program will consist of establishing a quarantine zone, cutting infested trees and treating potential host trees with imidacloprid trunk and/or soil injections up to ½ mile of an ALB find. Some host trees may be cut rather than being chemically treated depending on circumstances. Stumps of infested cut trees will either be removed, grinded, or treated with herbicide to stop resprouting. For control purposes, hosts include *Acer* spp., *Aesculus* spp., *Albizia spp.,*, *Betula* spp., *Celtis* spp., *Cercidiphyllum spp.*, *Fraxinus* spp., *Platanus* spp., *Populus* spp., *Salix* spp., *Sorbus* spp., and *Ulmus* spp.

All host trees that are removed from within the quarantined area must be chipped inside the quarantine zone to a size 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 in any way. Host material that is not chipped may be moved to an approved burning site. It is recommended that the roots of infested host trees be removed to a minimum of 9 inches below ground level using a stump grinder. Any aboveground roots of a diameter ½-inch or more should also be removed. Because of limitations in moving equipment into certain areas, the program may apply a cut-stump herbicide treatment instead of using a stump grinder. For this, the herbicide Garlon® 3A (triclopyr) is applied after the ALB-infested tree has been cut down. Program or contract personnel will spray or paint the root collar area, sides of the stump, and the outer portion of the cut surface including the cambium until thoroughly wet, but not to runoff. A handheld wand sprayer or brush is used to apply the herbicide to the stump to prevent it from resprouting and becoming reinfested with ALB. Stump grinding or application of Garlon® 3A will *only* be conducted on trees that are infested with ALB.

Imidacloprid trunk and/or soil injections will be applied to host trees found up to ½-mile of an ALB find. Imidacloprid treatments are typically made in early spring in order to allow the insecticide to be distributed throughout the tree and, therefore, be most effective during the active ALB adult and emergence and flight period. Chemical treatments of imidacloprid are made through direct injection either into the tree trunk or into the soil immediately surrounding the tree. The rate of imidacloprid depends on the application method, as well as diameter at breast height (dbh) of the host tree.

For soil injection, imidacloprid is injected at a minimum of 4 injection sites placed evenly around the base of the tree. It is applied using 1.42 grams (g) of imidacloprid diluted in ½ cup of water for each inch of dbh. The insecticide is applied under the soil around the base of the tree, normally no more than 12 inches from the base. No material may puddle or run off-site. Soil injection treatments can take up to 3 months before sufficient quantities of imidacloprid are observed in target plant tissues.

For trunk injections, holes are drilled around the trunk, 2 to 6 inches above the soil-wood line. For Mauget (non-pressurized) injection capsules, the capsules are seated in each hole in the tree at a rate of one capsule per 2 inches dbh for host trees measuring between 2 and 24 inches dbh. Host trees measuring more than 24 inches dbh are treated with 2 capsules per every 2 inches of dbh. The injection capsules are removed from the tree after 4 hours to ensure that the imidacloprid has emptied out of the unit and into the tree. During the 4-hour injection period, project personnel safeguard each tree to ensure capsules are not disturbed or removed during application.

Safeguarding ensures treatment efficiency and safety from exposure to people and animals.

For pressurized injection, a tree can be treated in 5 minutes because there is no need to wait for passive uptake of the insecticide into the tree. Trunk injections are applied at a rate of 0.22 g of imidacloprid for each inch of dbh for host trees measuring 24 inches or less dbh, and 0.44 g of imidacloprid for each inch of dbh for host trees over 24 inches dbh. For both trunk injection methods, the insecticide is distributed throughout the tree in 1 to 3 weeks.

The ALB eradication program proposed for use is an adaptive integrated response program that is based upon the recently revised new pest response guidelines for Asian longhorned beetle (USDA, APHIS, 2008). As experience dictates the need for minor changes in the program, the changes will be incorporated to maximize the effectiveness of the eradication efforts without completing additional environmental documentation. If, however, the changes are not minor, such as a change in chemicals or use of a different technology, additional environmental documentation will be required.

III. Affected Environment

The potential treatment area contains ALB host trees within Essex, Norfolk and Suffolk Counties in Massachusetts. Essex County is located in Northeastern part of Massachusetts. As of the 2000[1] U.S. census, the population has 723,419 people and a population density of 1,445 people per square mile which is very high. There is a 500 square mile area designated by Congress in 1996 as the Essex National Heritage Area. This area includes 34 cities and towns, 2 National Parks, National Historic Sites including Salem Maritime and Saugus Iron Works, thousands of historic sites and districts that illuminate colonial settlement, development of shoe and textile industries, and highlight the maritime industries.

Norfolk County is located south and west of Boston. As of 2000, the population was 650,308 people. The county has a total area of 444 square miles with a population density of 1,628 people per square mile.

Suffolk County is located on the eastern side of Massachusetts and includes the City of Boston. As of 2009, the population was estimated by the U.S. Census Bureau as 757,318 people. Suffolk County has a total area of 120 square miles, of which, 59 square miles is land and

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[1] US Census Data for 2010 by county has not been released to date for Massachusettes.

62 square miles is water. As of the last census, the population density was 11,788 people per square mile (4,551/km²) which is even higher than Norfolk and Essex Counties combined.

A treatment area has been defined around the original ALB finds which includes portions of Suffolk county. This portion also includes a section of Arnold Arboretum that is adjacent to the hospital where the original ALB were found. The Arnold Arboretum of Harvard University is the oldest public arboretum in North America and one of the world's leading centers for the study of plants. The Arnold Arboretum occupies 265 acres (107 hectares) of land. As of January 2000, the living collections consisted of some 7,082 accessioned plants representing 4,544 botanical and horticultural taxa, with particular emphasis on the woody species of North America and eastern Asia (PFHC, 2010). It has been designated a National Historic Landmark.

This potential treatment area is within the New England and Eastern New York Upland major land resource area (USDA, NRCS, 2006). The majority of the land in this area (about 50 percent) consists of private hardwood and pine forested areas (USDA, NRCS, 2006). These forested areas are mainly used for wood production and/or hunting (USDA, NRCS, 2006).

In Massachusetts, there were 250 maple sugaring taps in the 2010 season (NEAS, 2010). The maple production is concentrated in Berkshire, Franklin, Hampden, Hampshire, Middlesex, and Worcester Counties. However, there are a few sugar farms and possible private residents that tap maple trees in Essex, Norfolk, and Suffolk Counties. Maple production season usually starts in mid- to late February in the eastern part of the State and may not start until the first week of March for the western parts of the state. Most producers are finished boiling by mid-April.

There are many beekeepers in Essex and Norfolk Counties of Massachusetts. Beekeepers will bring their hives to agricultural fields to help pollinate various crops such as apples, pears, blueberries, cranberries, and pumpkins. In addition, beekeepers harvest honey, beeswax, and other hive products. Massachusetts ranks second in New England for honey production.

IV. Environmental Impacts

A. No Action

Environmental impacts from the no action alternative are related to the damage caused by the establishment and spread of ALB and impacts from the quarantine. The potential establishment would cause damage to and loss of valuable ornamental and commercial trees, as well as naturalized and forested areas. If ALB were allowed to spread to other parts of the country, it could result in damage to commercial trees, as well as products such as maple syrup and hardwood lumber.

The wide distribution of host plants suggests the danger that ALB could spread across much of the country with increases in damage and losses commensurate with the spread. The damage and losses could result in reduction of private property value. There would be changes in composition and age structure of forests which could have long-term effects on the ecological relationships in the naturalized and forested areas.

The quarantine restricts the movement of firewood, green lumber, and other living, dead, cut, or fallen material including nursery stock, logs, stumps, roots, and branches from potential host trees to prevent human aided spread. This can result in losses to industries that rely on transporting host trees and their products outside the quarantine zone. No chemical treatments have been approved to allow for the interstate movement of host material.

As ALB continues to spread, other Federal agencies or non-Federal entities may try to control or eradicate ALB through the use of chemical treatments. There are elevated environmental risks from the uncoordinated application of pesticides to limit the damage from ALB.

B. Preferred Alternative

Under the preferred alternative, areas found to have ALB will be quarantined, infested host trees will be removed and destroyed,and exposed host trees will be treated with chemical treatments and possible cutting. The impacts from the quarantine are the same as the impacts examined under the no action alternative above.

1. Imidacloprid

Imidacloprid is used in a wide variety of sites to control many pests including certain beetles, leafhoppers, and whiteflies. It is a commonly available product for both consumers and commercial pesticide applicators for the purposes described below and, therefore, it is difficult for APHIS to estimate the quantity of imidacloprid applied in Norfolk, Suffolk and Essex Counties, Massachusetts. The use of imidacloprid to treat host trees within a defined radius from an ALB find is discussed in detail in appendix A. Imidacloprid will be applied according to label directions by injection into soil at a rate of 1.42 g of active ingredient, diluted in ½ cup of water per inch of tree dbh, or directly into susceptible trees as either a 5 or 10 percent solution.

Based on the proposed method of application and available effects data, exposure and risk to terrestrial vertebrates is expected to be minimal. Imidacloprid exposure to terrestrial invertebrates, particularly honey bees, is expected to be minimal based on expected residues from the proposed method of application, the presence of other nontreated flowering plants, and the available acute and chronic honey bee toxicity data for imidacloprid (see appendix A). There is some uncertainty in this assumption since nectar and pollen imidacloprid levels in trees using this application method are not well understood. Other treatment methods with crops demonstrate low imidacloprid residues in nectar and pollen. APHIS is currently working with USDA Agriculture Research Service in conducting research to determine potential exposure and impacts to honeybees from these types of applications.

The method of application eliminates the potential for drift and, in the case of tree injections, eliminates the probability of off-site transport via runoff that may affect aquatic species. There is a potential for subsurface transport of imidacloprid to aquatic habitats for applications made directly into soil; however, this type of exposure will be minimized by only making applications where the ground water table is not in proximity to the zone of injection, and in soil types that would minimize the probability of pesticide transport. Any residues that could reach aquatic environments would be below effect levels for aquatic biota and not pose a significant risk.

Potential exposure to humans will be primarily for applicators and workers. Human health effects associated with the application of imidacloprid will be mitigated through adherence to pesticide label requirements and standard operating procedures. The required protective gear and safety precautions will minimize exposure and risk.

There is a potential for dietary exposure to humans through the consumption of products from maple trees that may be treated. Chemical injections of imidacloprid are anticipated in early spring prior to the emergence of ALB. Maple sugaring is usually started in February to March and ends by the middle of April. Trees that have been treated with imidacloprid should not be tapped. All sugar maples that are treated with imidacloprid by the ALB program will be tagged with a warning sign – do not tap, treated with imidacloprid.

2. Cutting

The cutting and removal of ALB host trees may have adverse effects on local wildlife that depend on vegetation for food, cover, and related needs. This is particularly true for some invertebrates and other animals that have a limited foraging range. The primary issue to humans from loss of trees is aesthetic. However, the impacts on environmental quality from the removal of host trees are expected to be negligible. Only trees that are known to be hosts for ALB could be tagged for cutting and chipping or burning. This will limit the environmental effects in the cutting area.

3. Triclopyr

Triclopyr, which is marketed as Garlon®, is commonly used for control of woody and broadleaf plants under a variety of use patterns ranging from poison ivy control by homeowners to maintenance of rights-of-way. It is a widely used and commonly available product for both consumers and commercial herbicide applicators for the purposes described above and, therefore, it is difficult for APHIS to estimate the the quantity of triclopyr applied in Essex, Norfolk, and Suffolk Counties, Massachusetts. For this program, it will be applied only to the stumps of cut trees in specific areas, thus limiting exposure of humans and other plant and animal wildlife to Garlon®. Toxicity is considered low with the exception of terrestrial plants. Drift and runoff will be limited because of the application method (direct hand application to infested trees). The method of application and adherence to label requirements will minimize the exposure and risk to human health, as well as aquatic and terrestrial nontarget organisms (see appendix B).

C. Cumulative Effects

Cumulative effects from the preferred alternative are not anticipated. Imidacloprid and triclopyr are both labeled for home use and are available at local home gardening centers. These products are can be used for a wide variety of purposes making it difficult to quantify the cumulative impacts of these chemicals in the potential treatment areas. Because of this, APHIS will work with the state, county, city, land owners, and residents to have a cooperative eradication approach to limit duplicative treatments.

For example, APHIS is working with the Arnold Arboretum in the application of imidacloprid to host trees within the ¼ mile radius from the infested trees near Faulkner Hospital. APHIS is aware that Arnold

Arboretum uses imidacloprid to treat hemlocks for woolly adelgid and a borer in the birch population. However, in the current treatment zone, there were no applications of imidacloprid in 2010 (S. Schneider, personal communications, February 24, 2011). Treatments for 2011 will be coordinated between the Arboretum and APHIS to ensure there are no duplicative treatments.

APHIS' use of triclopyr will also be localized. It is an alternative option that is applied to individual stumps of host trees that have been cut down to prevent them from resprouting. The primary action taken on stumps is to grid them to 9 inches below soil level. If triclopyr is applied, the application is targeted to the stumps and should not result in drift or runoff. Due to the limited nature of impacts from the use of triclopyr on stumps of removed host trees and the lack of drift or runoff, the use of triclopyr in the ALB program is unlikely to add cumulatively to impacts of other uses of triclopyr.

In addition, the chemicals used in this program are short-lived and treatment applications are designed to limit any off-site movement. Because there is little or no environmental exposure, other than inside the targeted tree and surrounding soil, little to no environmental loading or cumulative impacts are anticipated.

C. Threatened and Endangered Species

Section 7 of the Endangered Species Act and its implementing regulations require Federal agencies to ensure their actions are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat.

APHIS has prepared a biological assessment that considers the impact of the proposed program on federally listed threatened and endangered species and designated critical habitat in Essex, Suffolk, and Norfolk Counties in Massachusetts. APHIS has determined that with the implementation of certain protection measures, the program may affect, but is not likely to adversely affect either the small whorled pogonia or piping plover. APHIS has submitted the biological assessment to the U.S. Fish and Wildlife Service and has requested concurrence with these determinations.

D. Other Considerations

Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations," focuses Federal attention on the environmental and human health conditions of minority and low-income communities, and promotes community access to public information and public participation in matters relating to human health and the environment. This EO requires Federal agencies to conduct their programs, policies, and activities that substantially affect human health or the environment in a manner so as not to exclude persons and populations from participation in or benefiting from such programs. It also enforces existing statutes to prevent minority and low-income communities from being subjected to disproportionately high or adverse human health or environmental effects. The human health and environmental effects from the proposed applications are expected to be minimal and are not expected to have disproportionate adverse effects to any minority or low-income family.

EO 13045, “Protection of Children from Environmental Health Risks and Safety Risks,” acknowledges that children, as compared to adults, may suffer disproportionately from environmental health and safety risks because of developmental stage, greater metabolic activity levels, and behavior patterns. This EO (to the extent permitted by law and consistent with the agency’s mission) requires each Federal agency to identify, assess, and address environmental health risks and safety risks that may disproportionately affect children. The program applications are made directly to trees which may occur in parks and residential areas where children would be expected to play and climb trees; however, the program applicators ensure that the general public is not in or around areas being treated, minimizing exposure from trunk or soil injection applications. Based on the lack of significant exposure, no disproportionate risks to children are anticipated as a consequence of implementing the preferred alternative.

Consistent with the National Historic Preservation Act of 1966, APHIS has examined the proposed action in light of its impacts to national historic properties. The Arnold Arboretm is a national historic site that may be impacted by the action or inaction of the treatment of Asian Longhorned Beetle. APHIS is cooperating with the State Historic Preservation Officer and the management of the Arnold Arboretum to reduce any risks to the arboretum.

IV. Listing of Agencies and Persons Consulted

Massachusetts Department of Agricultural Resources
Crop Inspectional Services and Pest Management
251 Causeway Street
Boston, MA 02114–2151

Massachusetts Department of Conservation and Recreation
251 Causeway Street
Boston, MA 02114–2119

U.S. Department of Agriculture
Animal Plant Health Inspection Service
PPQ–Emergency and Domestic Programs
4700 River Road, Unit 26
Riverdale, MD 20737

U.S. Department of Agriculture
Animal Plant Health Inspection Service
PPQ–Environmental Compliance
4700 River Road, Unit 150
Riverdale, MD 20737

U.S. Department of Agriculture
Animal Plant Health Inspection Service
PPD–Environmental Services
4700 River Road, Unit 149
Riverdale, MD 20737

U.S. Department of Agriculture
Animal Plant Health Inspection Service
PPQ–ALB Eradication Program
920 Main Campus Drive, Suite 200
Raleigh, NC 27606

U.S. Fish and Wildlife Services
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301

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Appendix A. Imidacloprid

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) is proposing the use of imidacloprid, that is available in various formulations, as a means to control Asian longhorned beetle (ALB) in susceptible tree species. The product will be applied according to label requirements by injection into soil at a rate of 1.42 g active ingredient diluted in ½ cup of water per inch of tree diameter, or directly into susceptible trees at a rate of 0.22g active ingredient per inch of tree diameter for host trees measuring 24 inches or less, and 0.44 g of active ingredient per inch of tree diameter for host trees over 24 inches.   Imidacloprid is a systemic insecticide in the neonicotinoid insecticide class which is used on a variety of crops to control a large number of pests including certain beetles, leafhoppers, and whiteflies.

I. Effects

A. Human Health

Technical and formulated imidacloprid has low to moderate acute oral mammalian toxicity with median toxicity values ranging from 400 to greater than 2,000 mg/kg. The technical material, and several formulations, are also considered practically nontoxic from dermal or inhalation exposure (USFS, 2005; USDA, APHIS, 2002a). Acute lethal median toxicity values are typically greater than 2,000 mg/kg and 2.5 mg/L for dermal and inhalation exposures, respectively. Available data for imidacloprid and associated metabolites suggest a lack of mutagenic, carcinogenic, or genotoxic effects at relevant doses. Developmental, immune, and endocrine related effects have been observed in some mammal studies. In all developmental studies the effects to the offspring occurred at doses that were maternally toxic (FS, 2005).

B. Terrestrial Nontarget Organisms

Imidacloprid has low to moderate acute toxicity to wild mammals based on the available toxicity data. Imidacloprid is considered toxic to birds with acute oral median toxicity values ranging from 25 to 283 mg/kg (USDA, APHIS, 2002a; EPA, 2008; USFS, 2005). Reproduction studies using the mallard and bobwhite quail have shown no effect concentrations of approximately 125 ppm for both species.

Technical and formulated imidacloprid is considered acutely toxic to honey bees and other related bee species by oral and contact exposure. Median lethal toxicity values range from 3.7 to 230 nanograms (ng)/bee (Schmuck et al., 2001; Tasei, 2002; USFS, 2005; EPA, 2008). Acute sublethal effects in laboratory studies have shown that the no observable effect concentrations (NOEC) may be less than 1 ng/bee (USFS, 2005). Imidacloprid metabolite toxicity to honey bees is variable with some of the metabolites having equal toxicity to imidacloprid while other metabolites are considered practically nontoxic (USFS, 2005). Due to concerns regarding the potential sublethal impact of imidacloprid to honey bees, several studies have been conducted to determine potential effects in laboratory and field situations. Studies to assess the effects of imidacloprid on homing behavior, colony development, foraging activity, reproduction, wax/comb production, colony health, as well as other endpoints, revealed that there was a lack of effects, or effects were observed at test concentrations above those measured in nectar and pollen in the field under various application methods (Tasei et al., 2000; Tasei et al. 2001; Tasei, 2002; Bortolloti et al., 2003; Maus et al., 2003; Morandin and Winston, 2003; Stadler et al., 2003; Schmuck, 2004).

C. Aquatic Nontarget Organisms

Imidacloprid has low toxicity to aquatic organisms including fish, amphibians, and some aquatic invertebrates. Acute toxicity to fish and amphibians is low with acute median lethal concentrations typically exceeding 100 mg/L (EPA, 2008; USFS, 2005). Chronic toxicity to fish is in the low parts per million range depending on the test species and endpoint. Aquatic invertebrates are more sensitive to imidacloprid when compared to fish with acute median toxicity values in the low parts per billion range to greater than 100 mg/L depending on the test species (USDA, APHIS, 2002a; EPA, 2008; USFS, 2005).

II. Exposure and Risk

Imidacloprid is soluble in water and is considered to have moderate mobility based on soil adsorption characteristics for several soil types. Based on field dissipation studies, the foliar half-life is less than 10 days while the persistence in soil can range from 27 to 229 days, (CA DPR, 2006; USFS, 2005). In water, imidacloprid is stable to hydrolysis at all relevant pH values but breaks down rapidly in the presence of light with aqueous photolysis half-life values typically less than 2 hours. The low volatility and proposed method of application in this program minimizes the potential for exposure to imidacloprid by air.

A. Human Health Exposure and Risk

Based on the expected use pattern for both types of imidacloprid applications, potential exposure will be primarily for applicators and workers. Exposure to applicators will be reduced by following label directions, including recommendations for personal protective equipment, resulting in minimal risk to applicators.

There is the potential for dietary exposure to the public in cases where sugar maple trees that may be treated are used in the production of maple syrup, or if residues leach into groundwater supplies that are used as a drinking water source. In regard to treatment of sugar maple trees, USDA, APHIS will tag each sugar maple tree to inform the public not to tap these trees since they were treated with imidacloprid. Exposure to groundwater is expected to be minimal, based on the proposed method of application and monitoring data that has been collected in association with ALB eradication efforts in other states. Groundwater sampling between 2003 and 2006 in Suffolk County, New York, demonstrated that approximately half of the samples had no detectable levels of imidacloprid and, of those where detections occurred, the average concentration was 3.2 ppb which is below levels of concern for human health. Samples with detectable levels of imidacloprid do not suggest a contribution from the ALB eradication program because other uses of imidacloprid occurred in these areas, and there did not appear to be a significant correlation between ALB related treatment activities and increased residues.

B. Terrestrial Nontarget Organisms

Exposure and risk to terrestrial vertebrates such as birds and mammals is expected to be minimal, based on the proposed method of application and available effects data. Exposure from drift is not expected, nor is any significant runoff, since applications are made as direct tree injections or soil applications. There is the possibility of imidacloprid exposure to mammals and birds that may feed on insects or vegetation from treated trees. Imidacloprid leaf and twig residue values measured from previous monitoring studies demonstrate that most birds and mammals would have to consume several times their daily intake to reach an acute or chronic toxicity threshold value. Residues in insects that may be consumed from contaminated trees are currently unknown; however, they are expected to be low since insects would not forage exclusively on treated trees without mortality occurring and being unavailable as a prey item. Imidacloprid is also specific to certain groups of insects and would not be expected to have broad spectrum effects on all insects that may be present on treated trees. Applications are made to individual trees so insects on other surrounding vegetation would not be impacted and would be available for consumption by insectivores since their home range would typically be larger than the area around an individual tree.

Imidacloprid exposure to terrestrial invertebrates, especially honey bees, is also not expected to result in significant risk to pollinators. Pollinator exposure to imidacloprid will be minimized by the fact that only treated trees and their associated flowers and pollen could have residues while other flowering plants in the area of treatment will not contain residues. The level of imidacloprid in pollen from trees that have been treated for ALB is unknown; however, it is expected to be low, based on the available data for other plants. Previous studies have shown that imidacloprid levels in pollen and flowers are low compared to other parts of the plant. Schmuck et al. (2004) found that levels of imidacloprid and associated metabolites were below the level of detection (0.001 mg/kg) in sunflowers. Laurent and Rathahao (2005) found average imidacloprid residues from sunflower pollen of 13 micrograms (µg)/kg, while Bonmatin et al. (2005) found average imidacloprid levels of 6.6 and 2.1 µg/kg in flowers and pollen , respectively, from treated maize seed. These reported sunflower and corn pollen residues are within the range of values from other studies and are similar to imidacloprid residue levels found in the nectar and pollen for rape (Maus et al., 2003). Chauzat et al. (2006) found that approximately 50 percent of the pollen samples collected from pollen traps in apiaries contained measurable levels of imidacloprid with an average concentration of 1.2 µg/kg. As part of its environmental monitoring program, USDA, APHIS analyzed imidacloprid residues in flowers collected from imidacloprid-treated willow, horse chestnut, and maple trees from New York during and after ALB eradication efforts (USDA, APHIS, 2002b; USDA, APHIS, 2003). With the exception of one maple flower sample (0.13 mg/kg), all residues were below the level of quantification or detection (level of detection = 0.03 mg/kg) over a 2-year sampling period. Residues in flowers were lower than in twig and leaf residues, which is similar to observations in other plant species, such as corn and sunflowers. The risk to honey bees and other pollinators is expected to be minimal, based on expected residues from the proposed method of application and the presence of other nontreated flowering plants, both of which minimize exposure, and the available acute and chronic honey bee toxicity data for imidacloprid referenced in the toxicity section of this summary risk assessment.

Exposure of imidacloprid to soil invertebrates, in cases of soil injection, is possible. However, the impacts would be localized to the areas of treated soil and would be transient, based on available data (USFS, 2005). In cases where imidacloprid is tree-injected, the exposure and risk to soil-dwelling terrestrial invertebrates would be minimized.

C. Aquatic Nontarget Organisms

Imidacloprid exposure in aquatic environments is also expected to be minimal and to not pose a significant risk to aquatic biota. The method of application eliminates the potential for drift, and in the case of tree injections eliminates the probability of off-site transport via runoff. Another potential pathway of exposure to aquatic organisms is imidacloprid residues in leaf litter in the fall from treated trees that can be transported to aquatic environments. Sublethal impacts to some aquatic invertebrates that feed on leaf litter containing imidacloprid have been observed as well as impacts on decomposition rates (Kreutzweiser et al., 2009; Kreutzweiser et al., 2008; Kreutzweiser et al., 2007). This type of exposure and risk to aquatic organisms is expected to be minor because there will be leaf litter contributions from plants that have not been treated with imidacloprid, and trees that are in proximity to surface water will not be selected for the study. There is a potential for subsurface transport of imidacloprid to aquatic habitats for applications made directly into soil. This type of exposure will be minimized by only making applications where the ground water table is not in proximity to the zone of injection and avoiding soils that have a high leaching potential. Any aquatic residues that could occur would be below effect levels for aquatic biota due to the low probability of off-site transport and environmental fate for imidacloprid.

III. Summary

The use of imidacloprid in the ALB program does not pose significant risk to human health and the environment based on the available effects and environmental fate information. Adherence to the label and the proposed use pattern for select trees in this program reduces exposure and risk to applicators, the public, and terrestrial and aquatic nontarget organisms.

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Appendix B. Triclopyr

USDA APHIS proposes the use of two triclopyr formulations in the treatment of stumps and their associated sprouts from host trees that have been removed as part of the Asian Longhorned Beetle (ALB) Eradication Program. As part of the ALB eradication effort host trees may be physically removed along with the stumps to prevent re-infestation however under certain circumstances physical removal of the stumps may not be possible. Areas where trees have been removed but the stumps cannot be physically destroyed may require herbicide applications to insure that stumps and associated sprouts do not allow for ALB re-infestation. In a previous environmental assessment, USDA APHIS evaluated the triclopyr formulation, Garlon® 3A, that contains the active ingredient triclopyr triethylamine salt (TEA), for the treatment of stumps from trees that have been removed to eradicate the ALB (USDA APHIS 2008). USDA APHIS is now also proposing an additional formulation, Pathfinder® II, that contains the active ingredient triclopyr butoxyethyl ester (BEE). This formulation allows more flexibility in being able to treat the bark instead of direct application to cut areas of the stem. In addition USDA APHIS is proposing some foliar applications of Garlon® 3A that will be tank mixed with two other herbicides, Arsenal® and Escort® XP, to treat sprouting foliage from stumps that that have been removed as part of the eradication efforts. This use is considered minor compared to physical removal and treatment of stumps and would only occur in areas where older stumps have not been removed or treated and have began to resprout.   All applications will be made by hand either by painting undiluted material on the stump or directly spraying stumps and/or sprouting foliage using a backpack sprayer.

The purpose of this assessment is to summarize the available response data for each triclopyr formulation, as well as other herbicides that may be used, and discuss the potential for exposure and risk to human health and the environment under the proposed use in the ALB program.

A. Herbicide Response Data

Garlon® 3A contains the active ingredient, TEA, which is a pyridine systemic herbicide commonly used for control of woody and broadleaf plants. This formulation can cause significant eye irritation but has low acute inhalation and dermal toxicity. Acute oral median lethal concentrations range from approximately 600 to 1000 mg/kg suggesting low to moderate toxicity (USFS 2003). Long term toxicity studies have shown that triclopyr TEA is not a carcinogen or mutagen and that toxicity in developmental and reproductive studies primarily occurs at high doses and at levels that are also maternally toxic (EPA 1998). The other proposed triclopyr formulation, Pathfinder ® II, can cause slight temporary eye irritation during application as well as some skin irritation in cases of prolonged exposure. Acute oral median lethal concentrations are 1000 mg/kg with acute inhalation and dermal toxicity median lethality values greater than the highest test concentration suggesting low acute mammalian toxicity under various exposure pathways. Triclopyr BEE is not considered carcinogenic or mutagenic, and in cases where developmental and reproductive studies demonstrate effects, doses were at levels considered to be maternally toxic.

The primary degradation product of triclopyr TEA and BEE is triclopyr acid, which has also been evaluated and found to have a similar mammalian toxicity profile to the amine and ester.

Triclopyr TEA toxicity to terrestrial non-target organisms is considered low with the exception of terrestrial plants. Toxicity to avian species is low for triclopyr TEA with oral and dietary median lethal toxicity values greater than 2,000 mg/kg and 10,000 ppm, respectively (USFS 2003, EPA 2008). Chronic toxicity to birds is also expected to be low with reproductive toxicity No Observable Effect Levels (NOEL) of 100 and 500 ppm for the mallard and bobwhite quail respectively, when exposed to triclopyr acid (EPA 1998). Triclopyr TEA is considered practically non-toxic to honeybees based on acute contact studies (EPA 1998). Triclopyr TEA does exhibit toxicity to terrestrial plants, as expected, based on results from seedling emergence, germination and vegetative vigor studies. The primary degradation product of triclopyr TEA, triclopyr acid, is similar in toxicity to terrestrial non-target organisms based on the available toxicity data. Available avian toxicity data for triclopyr BEE demonstrates slight toxicity with median lethal dose values ranging from 735 to 849 mg/kg for the bobwhite quail (EPA 1998).

TEA toxicity to aquatic organisms is low for fish and aquatic invertebrates. Available acute fish toxicity data demonstrates median lethal concentrations greater than 100 mg/L for Garlon® 3A and technical triclopyr TEA (EPA 2008, Wan et al. 1987). Triclopyr TEA is considered practically non-toxic to aquatic invertebrates in freshwater and marine environments with toxicity values exceeding 300 mg/L. Chronic toxicity to fish and aquatic invertebrates is also low with chronic toxicity NOEC ranging from approximately 80 mg/L to greater than 100 mg/L depending on the test organism and endpoint. Triclopyr BEE is considered slightly to highly toxic to aquatic invertebrates and fish with median lethal concentrations ranging from approximately 0.36 mg/L to 12.0 mg/L (USFS 2003). The primary metabolite of triclopyr TEA and BEE, triclopyr acid, is considered practically non-toxic to aquatic organisms based on available toxicity data (EPA 1998, 2010).

For foliar treatments, Garlon® 3A is proposed for use as a tank mix with the active ingredients imazapyr and metsulfuron-methyl. Imazapyr is an imidazolinone herbicide while metsulfuron-methyl is a sulfonylurea herbicide with both products being a common tank mix partner with triclopyr in the control of woody vegetation. The toxicity of imazapyr and metsulfuron-methyl is considered low for mammals. The formulation containing metsulfuron-methyl, Escort® XP, is considered practically non-toxic to mammals via inhalation, dermal and oral exposures. All toxicity values were reported as greater than the highest test concentration. In addition metsulfuron-methyl is not considered to be carcinogenic nor has it been shown to be a reproductive, teratogenic or developmental hazard (USFS, 2005). Escort® XP is considered a slight eye irritant but is not considered a skin irritant or sensitizer. The other tank mix partner, Arsenal®, containing the active ingredient imazapyr, has a similar mammalian toxicity profile to metsulfuron-methyl and is considered practically non-toxic in acute inhalation, dermal and oral exposures. Imazapyr is not considered to be a carcinogen or mutagen and is not known to be a reproductive, teratogenic or developmental hazard (USFS 2004).

The toxicity of imazapyr and metsulfuron-methyl is low to all non-target organisms with the exception of some aquatic and terrestrial plants. Both products are considered practically non-toxic to wild mammals, birds and terrestrial invertebrates based on the available acute and chronic toxicity data (EPA 2010, USFS 2004, 2005). Toxicity to fish and aquatic invertebrates is very low with median lethal acute concentrations typically exceeded 100 mg/L for both chemicals (EPA 2010, USFS 2004, 2005). Chronic toxicity to fish and aquatic invertebrates is also considered low based on the available NOECs that have been reported from standardized toxicity studies.

B. Herbicide Exposure and Risk

Exposure to humans and the environment from the triclopyr amine or ester is expected to be minimal based on the environmental fate and use pattern proposed in this program. Triclopyr TEA is considered mobile based on the available information regarding water solubility and soil adsorption, but breaks down in soil (~12 days) and water (< 1 hr) to triclopyr acid, and to a lesser extent triethanolamine. Triclopyr BEE has low water solubility and adsorbs more strongly to soil when compared to the amine. Triclopyr BEE also breaks down quickly to triclopyr acid in soil and water with hydrolysis half lives of less than one day (CA DPR 1997). Triclopyr acid is considered slightly mobile based on soil adsorption values however the mobility appears to decrease with time (CA DPR 1997). Half-lives of the acid in water are short ranging from 0.5 to 2.5 days, while in soil half lives range from 8 to 18 days (EPA 1998a). The other minor metabolite, triethanolamine, also has a short half life in the environment under most conditions with soil and water half-lives ranging from 5.6 to 13.7 days in soil, and 14 to 18 days in water under aerobic conditions (EPA 1998a). The acid can break down to 3,5,6-trichloro-2-pyridinol (TCP) in soil and water, and available toxicity data suggests TCP is more toxic to aquatic non-target organisms than either triclopyr TEA, BEE or the acid. Although this metabolite is more toxic than the parent, its rate of development is such that environmental concentrations will not reach levels that would pose a risk to non-target organisms. Triethanolamine is less toxic than the parent or acid to aquatic organisms based on limited toxicity data. Volatilization is not expected to be a significant exposure pathway due to the low vapor pressure that has been measured for triclopyr TEA, BEE, and the associated acid (CA DPR 1997).

Imazapyr and metsulfuron-methyl, which are proposed for use as a tank mix with Garlon® 3A to treat some foliage from sprouting host plant stumps, will also result in minimal exposure in the environment. Imazapyr is water soluble and does not appear to bind readily to soil based on soil adsorption coefficient values that range from 30 to 100 (USFS 2004). Imazapyr degradation and dissipation half-lives are variable, ranging from approximately 25 days to greater than 300 days. Metsulfuron-methyl half-lives in soil range from 17 to 180 days. Reported soil adsorption and water solubility values suggest that metsulfuron-methyl has some mobility. Off-site transport of these two herbicides, as well as Garlon® 3A, is not expected since the products are being directed by hand specifically to small sprouts originating from the host plant stumps. Material is applied using a large droplet size under low volume to minimize drift and insure application and uptake directly to the sprouting plants. In addition, this use is minor and will only be used in larger wooded areas where physical removal of the stump is not possible. Based on the proposed use pattern and rate for these products, and their favorable toxicity profile, no significant risk to surface water or groundwater resources is expected.

Significant risk to human health from applications of Garlon® 3A alone, or as a tank mix, as well as Pathfinder® II is not expected based on the available use pattern and mammalian toxicity data.

Exposure will be limited to applicators since treatments are made directly to stumps or sprouting foliage. Adherence to required personal protective equipment and other label directions will minimize exposure and risk to workers as well as the environment. Risk is not expected to be significantly greater from the proposed foliar applications that may be made using the tank mix of Garlon® 3A with formulations containing the active ingredients imazapyr and metsulfuron-methyl. This use pattern is minor compared to physical removal of the stumps or the treatment of stumps since they are the preferred method of stump treatment. This application will occur to those stumps that have re-sprouted in areas where physical removal was not possible or a previous stump treatment with an herbicide did not occur. Exposure to humans is limited to applicators; however, adherence to label requirements regarding personal protective equipment will minimize exposure and risk. The low potential for exposure and favorable mammalian toxicity profile for each active ingredient suggests that significant risk to applicators is not expected.

Exposure to terrestrial and aquatic non-target organisms is also expected to be minimal from each proposed formulation and tank mix. Significant drift or runoff is not expected since applications are not broadcast applied but are made using either a backpack sprayer to deliver a coarse droplet size or by painting the material on individual stumps and associated sprouting vegetation. The low probability of off-site transport for any of the products is expected to result in very low exposure to non-target organisms. The low probability of exposure and the favorable available effects data demonstrate that all products have a very low risk of causing adverse ecological risk. Risk to non-target organisms is greatest for plants since they are the most sensitive group to each application; however, impacts to terrestrial plants is expected to be minimal and will only potentially occur for those plants that are immediately adjacent to treated stumps or sprouts. Impacts to terrestrial plants immediately adjacent to treated stumps will be minimized by following label directions for each herbicide treatment. Significant exposure to aquatic plants is not expected based on the method of application and adherence to label restrictions regarding applications near aquatic areas. Exposure in aquatic systems is not expected to occur at levels that could result in any direct impacts to aquatic plants or at levels that would suggest indirect impacts to aquatic organisms that depend on aquatic plants as a food source or as habitat.

C. Summary

The selective use of herbicides that are proposed for this program will have minimal human health and environmental risks. Applications are directed specifically at stumps or sprouting vegetation from cut stumps using methods that minimize off-site transport of the proposed formulations. All products proposed for use in the program demonstrate potential effects at levels that are orders of magnitude above any potential residue values that could occur off-site from these types of applications.

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