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New Chemical Treatment Study within the Worcester, Massachusetts, Quarantine Zone for the Asian Longhorned Beetle Eradication Program

Environmental Assessment, September 2009

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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.

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.

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 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 County, Massachusetts. This infestation appears to be 8 to 10 years old. The infested area is being treated according to the new pest response guidelines (USDA–APHIS, 2008). This consists of cutting, chipping and disposing (either by burning or mulching) of infested trees and other host trees in close proximity to the infested ones. Uninfested host trees beyond the cutting zone are treated with either trunk injections or soil injections at the base of the tree using the insecticide imidacloprid. The imidacloprid is taken up and distributed throughout the tree, and has been found to be effective against adult ALB as it feeds on small twigs, the female when depositing eggs, and young larvae (USDA–APHIS, 2008).

A. 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), *Plantanus* (sycamore and London planetree), *Sorbus* (mountain ash), and *Populus* (poplar) (USDA–APHIS, 2008; Commonwealth of Massachusetts, 2009).

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 other diseases and insects.

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

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.). It is important that APHIS implement a quarantine and eradicate ALB from Massachusetts to prevent damage to hardwood trees in North America. To eliminate ALB, the program utilizes removal of host trees, intensive tree surveys, insecticide injections into trees or soil, and herbicides. Activities undertaken in the Massachusetts eradication effort have been the subject of a previous environmental assessment (EA) (USDA–APHIS, 2008). Links to this EA, as well as other EAs that are pertinent to ALB eradication, can be found at: http://www.aphis.usda.gov/plant_health/ea/alb.shtml.

Currently, APHIS has only one insecticide to use for soil treatment or trunk injection, and this is applied in the spring to ensure effectiveness. Additional chemicals and treatment schedules are being evaluated to determine if fall applications can be used, thereby significantly increasing the amount of time available to conduct eradication treatments, which could help hasten eradication given the large size of the Worcester infestation. The soil and trunk injections will be evaluated to determine if they result in effective levels of insecticides in tree tissues that beetles feed upon.

This 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.

II. Alternatives

This EA analyzes the potential environmental consequences associated with the proposed study of new treatment insecticides for use in the ALB eradication program for treatments during the fall and spring.

Two alternatives are being considered: (1) no action by APHIS, and (2) the preferred alternative, to study the residue levels of both fall and spring insecticide treatments not currently used in the ALB eradication program.

A. No Action

Under the no action alternative, APHIS would continue to implement the ALB eradication program in Worcester County, Massachusetts. APHIS would not explore the use of additional chemicals for use in the program during either spring or fall.

B. Preferred Alternative

Under the preferred alternative, APHIS would also continue to implement the ALB eradication program in Worcester County. In addition, APHIS would actively seek information on the use of other insecticides, as well as their potential for use in the fall. APHIS wants to study three insecticides for potential incorporation into the ALB eradication program, including clothianidin, emamectin benzoate, and dinotefuran.

Initially, the work would gather information on the fall and spring applications using a basal soil injection with Arena® at the rate of 2.4 grams (g) clothianidin per DBH (diameter at breast height, approximately 54 inches above ground level) inch and 1 cup of water per DBH inch; fall and spring trunk injections with Tree-age™ at the rate of 5 to 10 milliliters (ml) emamectin benzoate per DBH inch, and spring only (per manufacturer's guidance) trunk injections with Dino-jet at the rate of 2 ml dinotefuran per DBH inch. (Dino-jet would be used according to EPA's FIFRA implementing regulations found in 40 CFR § 172.3. This allows for experimental field uses of unregistered and registered products so that data can be generated to support a registration of the product or a new use on the label.) Because the treatment area is very small, approximately 41 trees, no special permit is required for the study. The results of these applications will be compared with the residues found after spring and fall soil and trunk injections of imidacloprid, and from residues found in control trees. Residue analysis of pesticides will be from foliage collections made at the end of June (expected emergence of first ALB adults) and late August (near end of flight season). The residue levels will indicate if enough insecticide remains in the tree to kill larval and adult ALBs. It will also provide information on the potential for impacts to bees and other nontarget species.

Individual trees will only receive one treatment. Applications will be made according to table 1.

Table 1. Number and Type of Trees to be Treated.

Tree Species	Location	DBH	Early Fall Treatment	Late Fall Treatment	Spring Treatment	Control	Total Trees Needed
Norway maple	Street	9–11"	17 x 2	17 x 4	17 x 5	17	204
Red maple	Street	14–16"	8 x 2	8 x 4	8 x 5	8	96
Birch	Stand/lot	8–10"	8 x 2	8 x 4	8 x 5	8	96
Sugar maple	Stand/lot	18–20"	8 x 2	8 x 4	8 x 5	8	96

Early fall treatments (pre-leaf fall) will be made using imidacloprid soil and trunk injections only; they will be done in mid-September. Late fall treatments (post-leaf drop) would be done in early November and consist of imidacloprid soil and trunk injections, soil injection with clothianidin, and trunk injections of emamectin benzoate. Spring treatments, to occur in mid-April, would include the same treatments as late fall, plus trunk injections of dinotefuran. Sampling would be done by collecting leaves from terminal branches located within the lower one-third to one-half of each tree canopy, selecting eight samples from all sides of the tree. Sap from the sugar maple trees will be collected in mid-March for pesticide residue analysis. The analytical goal is to determine whether application timing influences residue levels in the canopy and in sugar maple sap. In addition, sampling will include the collection of residue data from plant parts (such as flowers, nectar, and pollen) that will help to better understand the potential for impacts to pollinators, such as bees.

All trees selected for the study will be located within the Massachusetts ALB quarantine area, which is currently 66-square miles; the study trees will be outside, and not a part of, regular ALB treatment program trees. Figure 1 displays a map of the quarantine area with the general treatment sites (infested trees).

The trees to be treated will represent the most common street trees (Norway and red maple) in the Worcester quarantine area. Birch and sugar maple trees are representative of woodlot trees in the area.

If the results of the initial study with the various insecticides appear promising, additional studies may be done, particularly to gain information about the efficacy of early fall treatments with the insecticides. Continuation of the research could involve minor adjustments in techniques, use of different formulations or different application techniques. If experience from the initial year's work indicates that such changes might yield promising results, additional study could be initiated. However, prior to any such activity taking place, the potential for environmental impact would be considered and any required NEPA analysis would be undertaken.

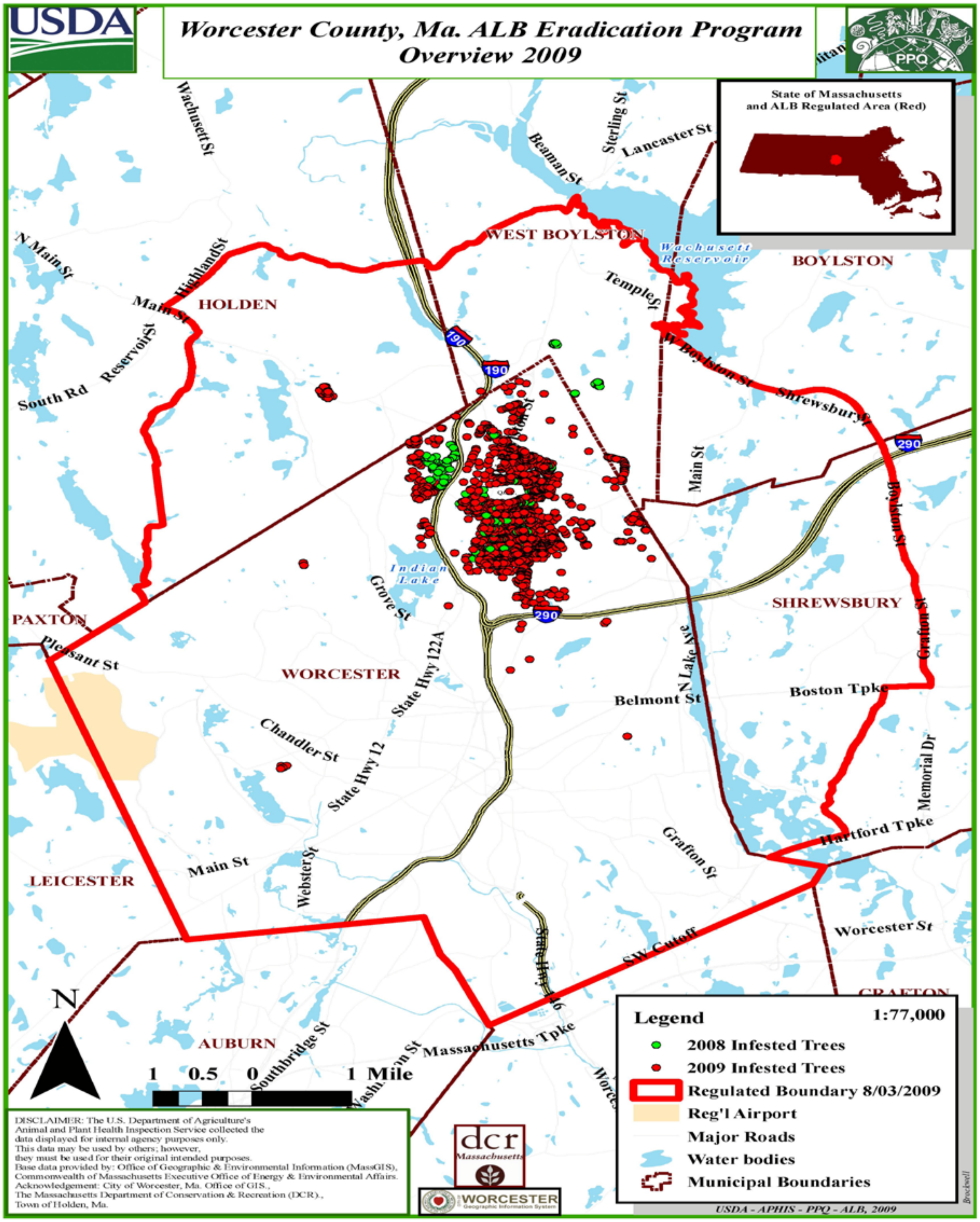

Figure 1. Quarantine area and infested trees.

III. Affected Environment

The affected environment for the Massachusetts ALB quarantine area was described in the ALB Cooperative Eradication Program EA that was completed in 2008 (USDA—APHIS, 2008). That information will not be repeated here, as it is still readily available.

Norway maple (*Acer platanoides*) street trees will be selected for treatment within the Worcester quarantine area. Maple tree species make up about 68 percent of the trees surveyed in the quarantine area, with the most common tree species being Norway maple (45 percent). Silver, red, and sugar maples are a minor component of the stands and make up only 2 to 3 percent each; the next most common species are ash and birch. Norway maple and red maple were selected for the street tree component of this study in order to facilitate treatments and to provide the most relevant information to the Worcester ALB program. A smaller component of the study will look at the most common species of trees in woodlots and stands, which are sugar maple, red maple, and birch trees. Sugar maple trees are also being investigated to determine how treatment impacts pesticide residue present during spring sap flow.

All the trees will be selected from the areas within the quarantine area that are outlined in figures 2 and 3. The three areas are approximately 606 acres, 103 acres and 201 acres in size.

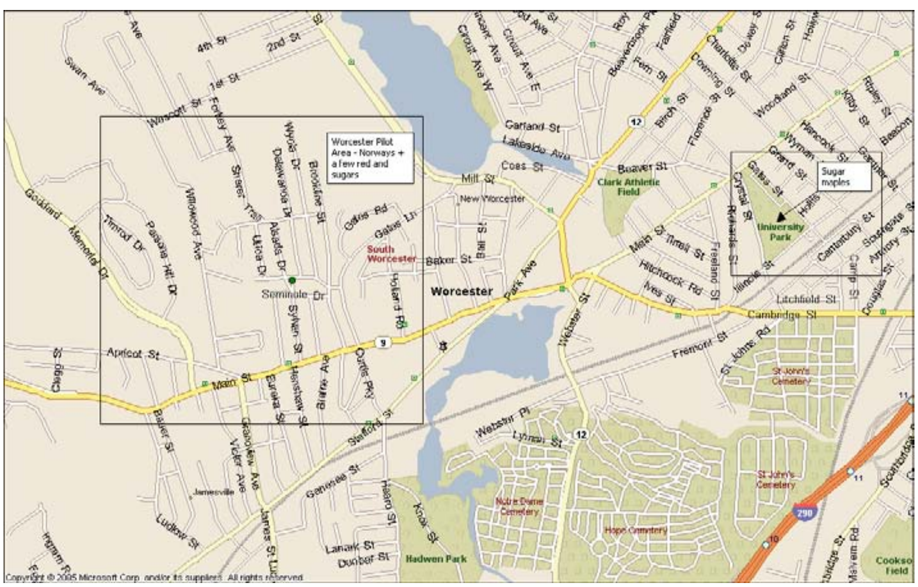

Figure 2. Sites from which Norway maples, sugar maples, and red maples will be selected for the study.

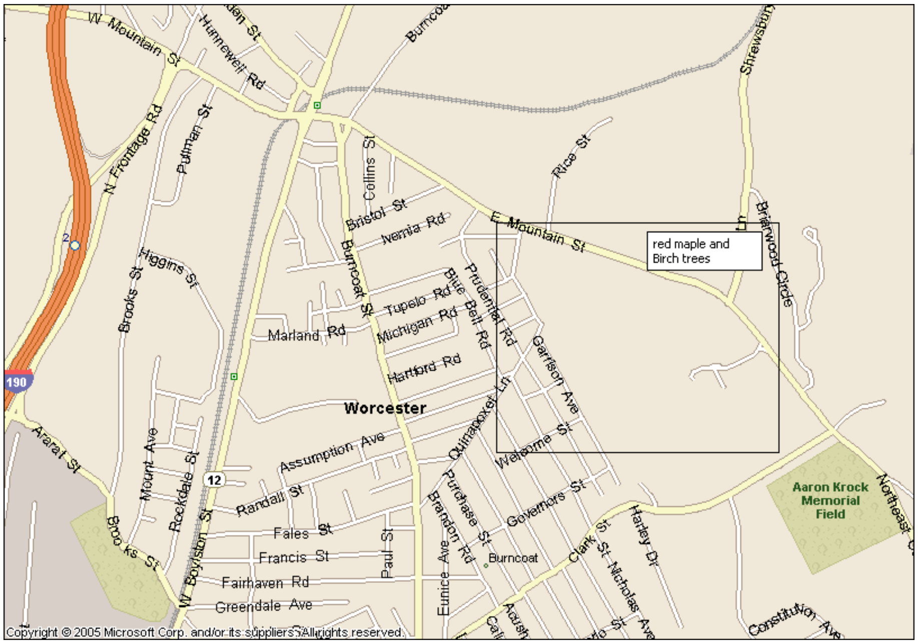

Figure 3. Sites from which red maples and birch trees will be selected for the study.

IV. Environmental Impacts

A. No Action

Environmental impacts that could result from choosing the no action alternative would likely be related to preventing the eradication program from fully utilizing the information and experience that could be gained from carrying out research to improve the efficacy and efficiency of the program. Information that could be gained from the proposed action could lead to more effective or quicker eradication of the Worcester ALB infestation, thus saving both time and money. Choosing the no action alternative could result in increased costs by extending the time to complete eradication.

B. Preferred Alternative

Under the preferred alternative, the potential to use three different insecticides in fall and/or spring treatments will be explored. The potential environmental risks from the proposed use of each of the insecticides are discussed below.

1. Clothianidin

Clothianidin belongs in the neonicitinoid group of insecticides and is registered for several agricultural and non-agricultural uses to control a variety of insect pests. Arena® is the clothianidin formulation proposed for use within the current ALB quarantine zone to determine its efficacy against ALB under field conditions. Clothianidin will be applied as a basal soil injection at a rate of 2.4 g clothianidin per DBH inch to approximately 82 trees including Norway, sugar and red maple as well as birch (USDA–APHIS, 2009).

a. Toxicity

The clothianidin formulation proposed for use in this program has low acute mammalian oral, dermal and inhalation toxicity. The median lethal toxicity values for oral exposure range from 3,900 to 4,700 milligram per kilogram (mg/kg) and the dermal and inhalation toxicity values are greater than 5,000 mg/kg and 3.2 milligram per liter (mg/L), respectively. The formulation proposed for use in this program is moderately irritating to the eye and is a slight skin irritant (Valent, 2007). Clothianidin is not considered to be teratogenic, mutagenic, or carcinogenic and, based on the range of sub-chronic and chronic studies that are available, the no observable effect levels (NOEL) range from 9.8 mg/kg/day in reproduction studies to 1,000 mg/kg/day in sub-chronic dermal toxicity studies (EPA, 2003).

Clothianidin also has low toxicity to birds based on available toxicity values for surrogate test species. Acute oral and dietary median lethality concentrations (LC_{50}) are greater than 2,000 mg/kg in oral testing and greater than 5,000 parts per million (ppm) in dietary studies. Chronic studies using birds show low toxicity with a no observable effect concentration (NOEC) of 205 ppm (EPA, 2009).

Clothianidin is highly toxic to honeybees with an acute contact median lethal concentration of 0.0439 micrograms (µg) per bee (EPA, 2003). Sublethal impacts such as colony health and foraging ability have been evaluated for other pollinators such as the bumble bee with no impacts observed at pollen residue values up to 36 parts per billion (Franklin et al., 2004).

Clothianidin has low acute toxicity to freshwater and marine vertebrates with LC_{50} values greater than 94 ppm. Chronic toxicity to fish using the fathead minnow report a NOEC of 9.7 ppm (EPA, 2009). Toxicity to aquatic invertebrates is variable with EC/LC_{50} values ranging from highly toxic with an median effective concentration (EC_{50}) value of 0.022 ppm for the midge, to practically non-toxic with EC/LC_{50} values greater than 100 ppm for the freshwater crustacean *Daphia magna* and eastern oyster (EPA, 2003).

b. Exposure and Risk

Human exposure and risk to clothianidin is expected to be minimal based on the method of application and available toxicity data. The pesticide will be injected directly into the soil; the active ingredient will be translocated upward in the tree. None of the treated trees will be used to yield products that would be used for human consumption; therefore, dietary exposure would not be expected. Exposure through contaminated drinking water is also not expected because treated trees will not be in proximity to surface water. The greatest chance for exposure to clothianidin will occur with applicators; however, risk will be minimal based on the low oral, dermal and inhalation toxicity. In addition exposure will be low based on the method of application and adherence to label recommendations regarding personal protective equipment recommendations.

Exposure and risk to most nontarget organisms is expected to be minimal. Toxicity to terrestrial vertebrates is low, and exposure to clothianidin would only occur through ingestion of soil under treated trees or by consuming leaves, twigs, or seeds from treated trees. Using the available toxicity data and the unrealistically conservative assumption that only items from treated trees are fed upon, residue data for these types of treatments using similar insecticides show that levels in various parts of the tree would not pose a risk to terrestrial vertebrates. Actual exposure and risk would be less based on the different types of food items that terrestrial vertebrates use and the relatively small number of trees that will be treated within the area. Indirect effects to terrestrial vertebrates through the loss of invertebrate prey is also not expected because only certain insects would be impacted by feeding on treated trees, and terrestrial vertebrates would be able to forage, in the area, on insects that are present on untreated trees and other vegetation.

Some insects that feed on treated trees could be impacted. However, based on the method of application, no drift would be expected and impacts would be restricted only to those insects that are sensitive to clothianidin and feed on treated trees. Similar to other neonicitinoid insecticides, there are concerns regarding clothianidin risk to honey bees. Treatments will occur in the fall and, based on the systemic nature of clothianidin, the potential exists for exposure to honey bees the following spring. For this class of insecticides, residue data from nectar and pollen have been measured in several crops and, to date, residues have typically been below levels that would suggest impacts (Franklin et al., 2004; USDA–APHIS, 2008). There is some uncertainty in this assessment because the potential residues from clothianidin applications using this method of application have not been characterized. To address this uncertainty, nectar and pollen samples will be collected from treated trees during this study and analyzed for clothianidin to better understand exposure and risk to honey bees. The study, itself, is not anticipated to result in major impact to honey bees because of the small number of trees that will be treated relative to the available sources for bees to choose from.

Applications of clothianidin, as proposed in this program, are not expected to impact aquatic organisms. Although toxicity to fish is low, clothianidin is toxic to some aquatic invertebrates. The method of application will eliminate the potential for off-site drift. and runoff is not expected because soil injections will not occur in proximity to waterbodies. There is the potential for leaf litter from treated trees to be washed into surface water during leaf drop the following fall. Studies using another neonicitinoid insecticide, imidacloprid, have demonstrated some impacts on decomposition rates in aquatic systems, as well as sublethal impacts to some aquatic invertebrates that feed on leaf litter (Kreutzweiser et al., 2009; Kreutzweiser et al., 2008; Kreutzweiser et al., 2007). Clothianidin applications in this study are proposed after leaf drop in the fall; therefore, any residues that could occur would appear the following fall. The time interval between application and leaf drop, the relatively small number of trees treated, the leaf litter contributions from plants that have not been treated in the area, and not treating trees that are in proximity to surface water will reduce the potential for clothianidin leaf litter residues in surface water.

c. Environmental Quality

Clothiandin is considered stable in soil with metabolic half lives of 148 to 1,155 days, and dissipation half-lives of 277 to 1,386 days. Impacts to some soil invertebrates could occur; however, those impacts would be restricted to invertebrates sensitive to clothianidin and in areas immediately under treated trees. In aquatic environments, clothianidin breaks down rapidly in the presence of light with a half-life of 1 day, but is considered stable to hydrolysis. Clothianidin is soluble in water and considered mobile to highly mobile in soil (EPA, 2003). Impacts to water quality are not anticipated based on the method of application which reduces the potential for runoff and drift. In addition, applications will not occur to trees that are in proximity to surface water. Based on the method of application and low potential to volatilize into the atmosphere, clothianidin applications are not expected to impact air quality (EPA, 2003).

2. Emamectin Benzoate

Emamectin benzoate is a broad spectrum avermectin insecticide that is used to control a variety of insects in agricultural and non-agricultural settings. The formulation proposed for use in this efficacy study is the Tree-age™ formulation which will be injected into approximately 82 trees, including Norway, sugar, and red maple, as well as birch trees, at a rate of 5 to 10 ml per DBH inch (USDA–APHIS, 2009).

a. Toxicity

The emamectin benzoate formulation proposed for use in this program has moderate acute oral toxicity, and low dermal and inhalation toxicity. The median lethal toxicity value for oral exposure is 3,912 mg/kg, and the dermal and inhalation toxicity values are greater than 5,000 mg/kg and 2.54 mg/L, respectively. The formulation proposed for use in this program is severely irritating to the eye, and is a slight skin irritant (Syngenta, 2007). Emamectin benzoate is not considered to be teratogenic, mutagenic, or carcinogenic. The range of sub-chronic and chronic effects studies that are available report the NOEC range from 0.075 mg/kg/day in neurotoxicity studies, to 6 mg/kg/day in developmental toxicity studies (EPA, 2008).

Acute toxicity of emamectin benzoate to birds is high to moderate with LD_{50} values ranging from 46 to 264 mg/kg, and dietary LC_{50} values ranging from 570 to 1318 ppm (EPA, 2009). Chronic toxicity to birds in reproduction studies report a NOEC range of 40 to 125 ppm. Emamectin is highly toxic to honey bees with a reported contact LD_{50} value of 0.0035 µg/bee (EPA, 2009). Emamectin benzoate is considered toxic to aquatic invertebrates and fish based on the available acute and chronic data (EPA, 2009). Acute LC_{50} toxicity values for fish range from 174 to 194 parts per billion (ppb), while aquatic invertebrate values range from 0.04 ppb for the mysid shrimp to 490 ppb for the eastern oyster.

b. Exposure and Risk

Significant exposure and risk to human health is not expected for the proposed use of emamectin benzoate in this study. None of the treated trees will be used to yield products that would be used for human consumption; therefore, dietary exposure would not be expected. The proposed method of application, which involves direct application into individual trees, will eliminate the potential for contamination of drinking water. Exposure and risk to humans will primarily be to workers who are injecting the formulated material into trees. Adherence to the personal protective equipment requirements on the label, such as protective eyewear, will reduce exposure and risk to applicators.

Terrestrial nontarget risks from exposure to emamectin benzoate are not expected to be significant based on the low potential for exposure and the available toxicity data. Emamectin benzoate exposure to terrestrial vertebrates will only occur for those organisms that feed on treated twigs, leaves, or seeds. Residue data for this group of insecticides in trees is not available; however, exposure would be expected to be low based on the small number of trees that are being treated in the area and the variety of different food materials that terrestrial vertebrates consume. Indirect impacts to birds and mammal populations that rely on insects for food would also not be significant because applications will be made to individual trees and the number of trees to be treated is small relative to the number of untreated plants that are in the study area.

Insects that are sensitive to emamectin benzoate and feed on treated trees may be impacted; however, these impacts would be restricted to those insects that feed on the trees that are part of the efficacy testing. Honey bee toxicity is high; however, the potential residues in pollen and nectar are unknown for this class of insecticides. To address this uncertainty, nectar and pollen samples will be collected from treated trees during this study and analyzed for emamectin benzoate. Residue data on pollen and nectar will allow for a more accurate characterization of exposure and risk to honey bees. The study itself is not anticipated to result in major impact to honey bees because of the small numbers of trees that will be treated relative to the available sources for bees to choose from. In addition, risk to honey bee populations from the use of emamectin benzoate will be reduced compared to conventional broadcast applications of insecticides and the presence of other flowering vegetation in the area that has not been treated.

This study is not expected to result in exposure of aquatic organisms to emamectin benzoate. Emamectin benzoate is toxic to aquatic organisms; however, drift and runoff are not expected from the proposed applications because the material will be injected directly into the tree. Depending on the persistence of emamectin benzoate in foliage the following fall after treatment, there is the possibility that leaf litter from treated trees could be washed into surface water. The potential for water contamination through this pathway is expected to be minor because fall applications will occur after leaf drop, only a small number of trees will treated, and most of the leaf litter contributions will be from plants that have not been treated. Another mitigating factor is that treated trees are not anticipated to be in proximity to waterbodies.

c. Environmental Quality

Emamectin benzoate degrades slowly in soil and water, and adsorbs strongly to organic matter (Syngenta, 2007; EPA, 2008). The method of application, which involves direct injection into trees, will mitigate impacts to soil, water, and air.

3. Dinotefuran

Dinotefuran is a neonicitinoid insecticide that is being evaluated for use in the ALB eradication program. The formulated product, Dino-jet, will be used to evaluate efficacy under field conditions. Treatments will consist of injecting the formulated product into approximately 41 trees including Norway, sugar and red maple, as well as birch, at a rate of 2 ml per DBH inch. Injections will occur in the spring, as opposed to the fall applications that are proposed for the efficacy work using clothianidin and emamectin benzoate.

a. Toxicity

The available acute mammalian toxicity data suggest that technical dinotefuran has low oral, dermal, and inhalation toxicity (EPA, 2004). Irritation to the eye is classified as moderate, while skin irritation is considered low. Dinotefuran is not considered to be mutagenic, carcinogenic, or teratogenic based on the available mammalian toxicity data. Sub-chronic and chronic NOEL values for mammals range from less than 3 mg/kg/day in chronic dosing studies in mice to 5,414 mg/kg /day in a 90-day dosing study in mice (EPA, 2004).

The toxicity of dinotefuran to nontarget terrestrial vertebrates is low. Available mammalian toxicity data show low toxicity, and the toxicity to surrogate avian species is also low. Acute oral and dietary median lethality studies using the quail and mallard duck show toxicity to be greater than the highest test concentration (EPA, 2004; EPA, 2009). Chronic toxicity to birds is also low with reproductive NOEC values of 2,150 and 5,270 for the mallard and bobwhite quail, respectively. Toxicity to insects, such as the honey bee are high with oral and contact LD_{50} values of 0.023 and 0.047 µg/bee, respectively. The available acute freshwater and marine fish toxicity data suggest that dinotefuran is practically nontoxic with LC_{50} values greater than the highest test concentration. Acute and chronic toxicity to aquatic invertebrates is low for most test organisms with the exception of the mysid shrimp, which reports a LC_{50} of 0.79 ppm. Acute toxicity to other aquatic invertebrates is low, with acute and chronic toxicity values greater than 95 ppm (EPA, 2004; EPA, 2009).

b. Exposure and Risk

Dinotefuran applications proposed in this efficacy study are expected to have minimal impacts to human health based on the available toxicity data and low potential for exposure. Applications will be made as a direct injection into trees where the active ingredient will then distribute throughout the tree. None of the treated trees will be used to yield products that would be used for human consumption; therefore, dietary exposure is not be expected. The use of a direct tree injection application also mitigates concern regarding the contamination of drinking water. The potential for exposure is greatest for applicators; however, the low mammalian toxicity and adherence to label recommendations regarding personal protective equipment will reduce exposure and risk to applicators (EPA, 2004).

Exposure and risk of dinotefuran applications proposed in this study are expected to be low for most terrestrial nontarget organisms. Direct applications of dinotefuran to trees will result in exposure to terrestrial vertebrates that may feed on treated twigs, leaves, or seeds as part of their diet. Residue data for this group of insecticides in trees is available; the levels that have been measured would not pose a significant dietary risk to terrestrial vertebrates based on the available toxicity data and conservative assumption that feeding would occur only from treated trees. Indirect impacts to birds and mammal populations that rely on insects for food would also not be significant because the method of application is direct injection of dinotefuran into trees and the number of trees is small relative to the number of untreated plants that are in the area of treatment. There could be impacts to some terrestrial invertebrates that feed on treated trees, and are sensitive to dinotefuran. These impacts are not expected to have negative impacts to invertebrate populations due to the low number of trees being treated and the availability of other non-treated vegetation. Similar to other neonicitinoid insecticides, there are concerns regarding dinotefuran risk to honey bees. Treatments will occur in the spring and, based on the systemic nature of this class of insecticides, there is the potential for exposure to nectar and pollen. Residue data for this class of insecticides from nectar and pollen have been measured in several crops and, to date, residues have typically been below levels that would suggest impacts (Franklin et al., 2004; USDA–APHIS, 2008).

There is some uncertainty in this assessment because the potential residues from dinotefuran applications using this method of application have not been characterized. To address this uncertainty, nectar and pollen samples will be collected from treated trees during this study and analyzed for dinotefuran. Residue data on pollen and nectar will allow for a more accurate characterization of exposure to honey bees. This data can then be compared to the available toxicity data for dinotefuran, and related insecticides, to provide a more accurate representation of risk to honey bees from these types of treatments. The study itself is not anticipated to result in major impact to honey bees because of the small numbers of trees that will be treated relative to the available sources for bees to choose from. In addition, dinotefuran exposure to honey bee populations, from these types of treatments, will be reduced compared to conventional broadcast applications of insecticides and the presence of other flowering vegetation in the area that has not been treated.

Exposure and risk of dinotefuran to aquatic organisms is not expected. Dinotefuran has low toxicity to most aquatic organisms, and significant exposure from drift and runoff are not expected because the material will be injected directly into the tree. There is the potential for leaf litter from treated trees to be washed onto surface water during leaf drop the following fall. Studies using another neonicitinoid insecticide, imidacloprid, have demonstrated some impacts on decomposition rates in aquatic systems, as well as sublethal impacts to some aquatic invertebrates that feed on leaf litter (Kreutzweiser et al., 2009; Kreutzweiser et al., 2008; Kreutzweiser et al., 2007). There is uncertainty whether this type of impact could result from dinotefuran applications. However, the potential for contamination through this pathway is expected to be minor in this study because there will be leaf litter contributions from plants that have not been treated in the area, and trees will not be selected for injection that are in proximity to surface water.

c. Environmental Quality

Dinotefuran degrades slowly in soil with a reported aerobic soil metabolism half-life of 138 days. Degradation in water is rapid in the presence of light with a half-life of 1.8 days, but is stable to hydrolysis. Dinotefuran is highly soluble in water, and does not absorb well to soil; therefore, it could be susceptible to runoff (EPA, 2004). The method of application of dinotefuran is injection directly into the tree; this will mitigate any impacts to soil and water, as well as any transport of the insecticide into the atmosphere.

C. Cumulative Effects

The Worcester, Massachusetts, study of new chemical treatments for potential use in the ALB eradication program is unlikely to result in significant cumulative impact to the environment. While none of the trees being considered have been identified for immediate eradication treatment (either treatment with imidacloprid or removal), all of the potential study trees are located within the quarantine area. This means these trees are at some risk of future infestation and treatment, the effects of which were considered in the previous EA of mid-September, 2008 (USDA–APHIS, 2008). Over 25,000 trees have been removed from the quarantine area, and an additional 1,300 are known to be infested and will be removed in the near future. In addition, current plans call for the chemical treatments of approximately 5,100 trees over the next year and for each year in the foreseeable future. The addition of the proposed trees for chemical treatment in this study results in less than 10 percent of the total trees that are scheduled for treatment next year, and much less when considering treatment of trees over successive years.

The three areas where the trees will be tested are approximately 606 acres for testing Norway maples and a few red and sugar maples, 103 acres for sugar maples, and 201 acres for red maples and birch. In each of these areas, the average concentration of treated trees will be less than 1 tree per acre. While trees are likely to be clustered in pockets within each of the three areas, there will not be large concentrations of treated trees.

The experimental treatment of less than 500 trees is unlikely to result in significant cumulative environmental impacts to the quarantine area.

D. Threatened and Endangered Species

Section 7 of the Endangered Species Act and its implementing regulations require Federal agencies to ensure that 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. There are no federally listed species within the Federal quarantine area where the proposed action will take place. Therefore, the proposed action will have no effect on federally listed species.

E. 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 and 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.

V. Listing of Agencies Consulted

U.S. Department of Agriculture
Animal Plant Health Inspection Service
Plant Protection and Quarantine
Emergency and Domestic Programs
4700 River Road, Unit 137
Riverdale, MD 20737

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

U.S. Department of Agriculture
Animal Plant Health Inspection Service
Policy and Program Development
Environmental Services
4700 River Road, Unit 149
Riverdale, MD 20737

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

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Center for Plant Health Science and Technology
Insecticide and Applied Technology Section
Otis Pest Survey, Detection and Exclusion Laboratory
Buzzards Bay, MA

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