United States
Department of
Agriculture

Marketing and
Regulatory
Programs

Animal and
Plant Health
Inspection
Service

Chemical Treatment Study in New York City, New York, and Central New Jersey for the Asian Longhorned Beetle Eradication Program

Environmental Assessment, September 2010

United States Department of Agriculture

Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

APHIS

Chemical Treatment Study in New York City, New York, and Central New Jersey for the Asian Longhorned Beetle Eradication Program

Environmental Assessment September 2010

Agency Contact
Julie Spaulding, Coordinator
National Asian Longhorned Beetle Program
USDA, APHIS, PPQ
ALB Eradication Program
4700 River Road, Unit 137
Riverdale, MD 20737

Table of Contents

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, 2010).

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 insects and diseases.

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.

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 more than 10 years old and 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, as of August 9, 2010, only six infested trees have been detected in this area.

Infested areas are being treated according to the new pest response guidelines (USDA–APHIS, 2008a). This consists of cutting, chipping and disposing (either by burning or mulching) of infested trees and select host trees in close proximity to the infested ones. Uninfested host trees that are not cut 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. Imidacloprid has been found to be effective against females as they are depositing eggs, adult ALB as they feed on leaves and small twigs, and young larvae in the tree (USDA–APHIS, 2008a).

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 at the earliest opportunity after it has been found in a new location in order 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 ALB eradication efforts have been the subject of previous environmental assessments that 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 they could be useful in eradication efforts. The proposed study would test fall applications of two formulations of imidacloprid to determine if they can be used successfully at that time of year. A successful fall pesticide application would significantly increase the amount of time available to conduct eradication treatments and could help hasten the eradication of infestations. Fall soil and trunk injections will be evaluated to determine if they result in effective levels of insecticides in tree tissues that beetles feed upon. In addition, another chemical, dinotefuran, will be tested as a spring trunk application to determine if it can be used in preventative treatments for ALB.

There have been three previous studies that investigated the potential of fall treatments for the ALB program. The first such study was done on ash and Norway maple trees in Chicago from 2003 to 2004. Two groups of trees were soil injected with Merit (imidacloprid) in the fall (pre and post leaf-drop) and a third group received a typical spring application. Residue levels from xylem sap collected during the summer of 2004 indicated that both fall treatments yielded less chemical residue on average as compared to the spring treatment, but the differences were not significant. Issues with consistency and reliability of xylem sap as an indicator of true pesticide residue levels resulted in the use of leaf tissue for future studies.

A second study on fall treatment was conducted in New York beginning with an October treatment in 2007. Bandit (imidacloprid) was soil injected into Norway maples and London plane trees. Foliage samples were taken three times during the summer of 2008 to determine the amount of imidacloprid present within the trees. Residue levels for the maple trees were on a par with what is typically seen for same-year spring applications. However, residue levels throughout the sampling period were unacceptably low for London plane trees. The London plane trees were all growing on an earthen berm, which is not a typical growing situation encountered. The proposed study would repeat this 2007 study to verify the findings for both tree species. Furthermore, the proposed study is much more comprehensive (i.e. sampling four species of trees, includes a honeybee component, and will continue for three years).

In addition, a third study was conducted in Massachusetts in 2009; however, the residue data is not yet available. Norway maples, red maples, and birch were soil and trunk injected with imidacloprid in mid-September; however, the study is incomplete due to limitations outside the program's control and will be replaced by the proposed study.

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 fall application of the insecticide currently used for the ALB eradication program and the spring application of another insecticide.

Two alternatives are being considered: (1) no action by APHIS, and (2) the preferred alternative, to study the residue levels of imidacloprid applied in the fall and of dinotefuran applied in the spring for use in the ALB eradication program.

A. No Action

Under the no action alternative, APHIS would continue to implement ALB eradication programs without the addition of new chemical treatments. APHIS would not explore fall treatments or new chemicals for spring use.

B. Preferred Alternative

Under the preferred alternative, APHIS would continue to implement the ALB eradication programs and search for additional pesticides and application methods that are effective against ALB. APHIS would actively explore the potential for fall soil and trunk injections of imidacloprid, the current program insecticide, and test an alternate trunk injected insecticide, dinotefuran, in the spring to determine if acceptable levels of pesticide are present in the treated trees the following summer when ALB are active (USDA-APHIS, 2010b).

Norway maple (*Acer platanoides*), red maple (*Acer rubrum*), London plane (*Platanus* spp.) and elm (*Ulmus spp.)* will be selected for treatment in New York City and/or Central New Jersey. These species were chosen because they are common in the treatment area and are susceptible to ALB infestation and thus would provide relevant information to the ALB program for effectively treating an ALB infestation. Other host genera or species may be substituted if suitable numbers of the aforementioned species are not available. Park or public trees will be the preferred target of the study; however, private trees may be used with property owner permission. The site(s) for the study will not overlap the current program treatment areas (Section III: Figures 1 and 2).

Fifteen trees of average diameter breast height (DBH) for each species will be randomly assigned to each of three chemical treatments. Treatments will be applied either in the early fall, late fall or spring (see Table 1 below). Individual trees will only receive one treatment per year, and treatments will be repeated in a similar manner for three consecutive years. The chemical treatments will consist of the following:

1) basal soil injection with Merit (1.42 g imidacloprid per DBH inch, 1 cup of water per DBH inch)
2) trunk injection with Imicide HP (2 mL imidacloprid per DBH inch)
3) trunk injection with dinotefuran (experimental formulation; 2 mL dinotefuran per DBH inch); this application will only take place in the spring, per manufacturer's instructions.

Depending upon weather conditions and logistical considerations, the early fall treatments would take place prior to leaf drop (mid-September), and late fall treatments would be post-leaf drop (early November). All fall treatments would be conducted between the Labor Day and Thanksgiving holidays. Spring applications in mid-April will be the baseline against which the two fall treatments are compared. A maximum of 420 trees will be chemically treated and an additional 60 trees will be used as controls for this study (480 trees total). The tree species selected for this study, including quantity, approximate DBH, and treatment information, is summarized in Table 1.

Table 1. Trees to be included in study.

Tree Species	DBH	Number of Trees x Number of Treatments				
		Early Fall[1]	Late Fall[1]	Spring[2]	Control	Total
Norway Maple	10-16"	15 x 2	15 x 2	15 x 3	15	120
Red Maple	10-16"	15 x 2	15 x 2	15 x 3	15	120
London Plane	15-20"	15 x 2	15 x 2	15 x 3	15	120
Elm	12-18"	15 x 2	15 x 2	15 x 3	15	120

[1] 15 trees of each species to receive imidacloprid trunk injection; 15 trees of each species to receive imidacloprid soil injection

[2] 15 trees of each species to receive imidacloprid trunk injection; 15 trees of each species to receive imidacloprid soil injection; 15 trees of each species to receive dinotefuran trunk injection

Analysis of pesticide residues from foliage collections made at the end of June (the expected first emergence time of ALB adults) and late August (near the end of the flight season) will be conducted under supervision by the Otis Methods Laboratory. Sampling will be done by collecting leaves from terminal branches located within the lower 1/3 to 1/2 of each tree canopy, selecting eight samples from all sides of the tree. The analytical goal is to determine whether the residues from these treatments will be sufficient to kill ALB during the following emergence period.

If the results of this study appear promising, additional studies may be done. Continuation of the research could involve minor adjustments in techniques, use of different pesticides or formulations, or different application techniques. However, prior to any such activity taking place, the potential for environmental impact would be considered and any additional required NEPA analysis would be undertaken.

III. Affected Environment

The potential study area includes the boroughs of New York City, New York, and Central New Jersey (i.e. the area of New Jersey in and around Middlesex and Union Counties). Queens, Brooklyn, and Staten Island, New York, are the preferred areas for the study; however, areas of Manhattan, New York, or Central New Jersey may also be utilized. Available data indicates New York City's most numerous street trees include London planes (about 15% of street trees) and Norway maples (14% of street trees) (NYCDP&R, 2006). Since these trees make up a large percentage of trees in the area, they are suitable subjects for the treatment study. In addition, elms are a preferred host tree for ALB and therefore of interest for residue analysis. Red maples are frequented by bees in early spring so are being included as part of a study of the ALB treatment program's effect on honeybees.

Spring treatments of imidacloprid have been ongoing in New York City and Central New Jersey since 2001 and 2005, respectively. Figures 1 and 2 reflect past and current treatment areas. Treatment trials will not occur in any area that has received standard program treatments.

Figure 1. Manhattan, nd Queens, New York, ALB treatment areas.

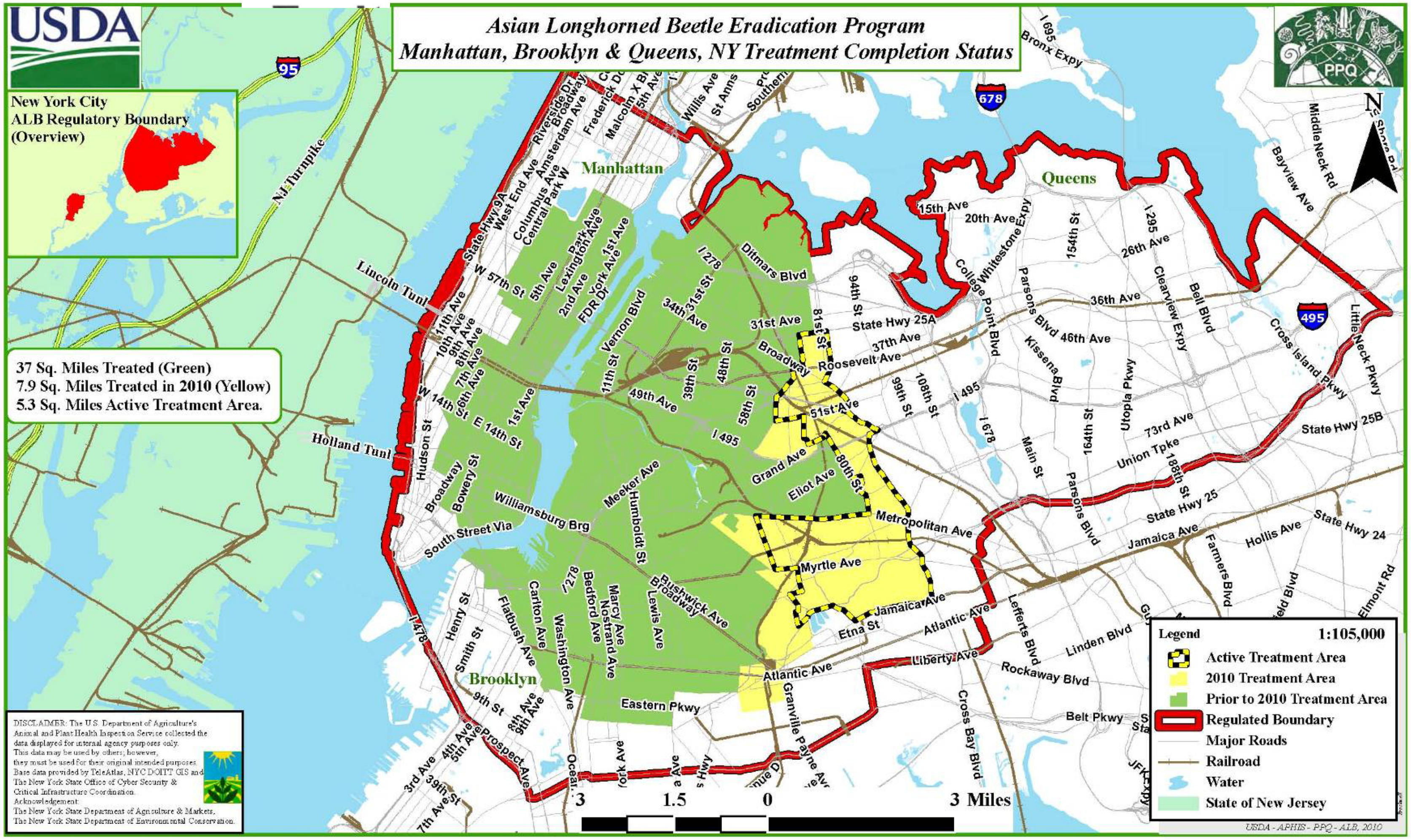
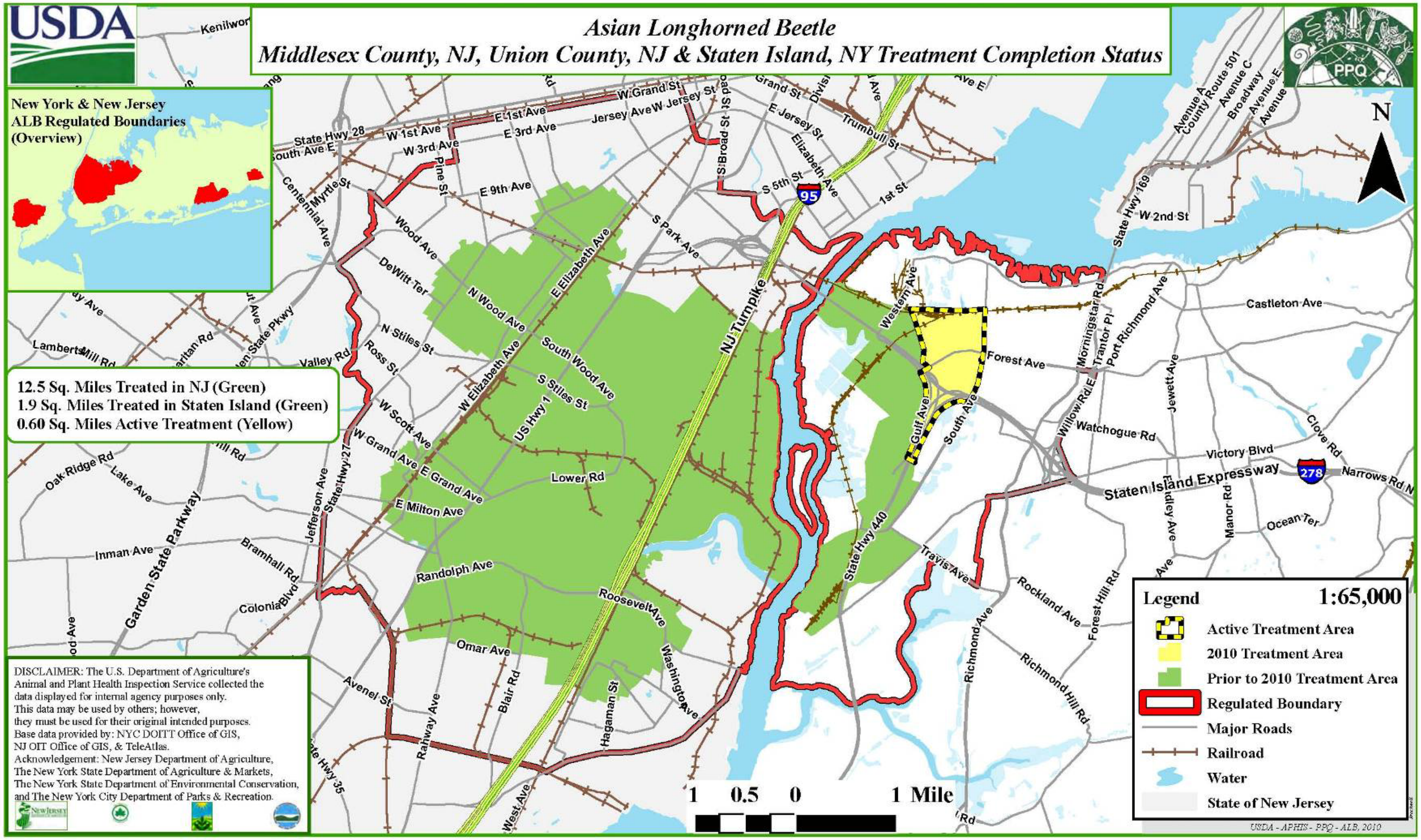


Figure 2. Central New Jersey (Union and Middlesex Counties) and Staten Island, New York, ALB treatment areas.



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 ALB infestations, thus saving both time and money.

B. Preferred Alternative

Under the preferred alternative, the potential to use imidacloprid, the only currently approved insecticide in the ALB program, in fall treatments will be explored. In addition, the potential to use an additional insecticide, dinotefuran, in the spring will also be explored. The potential environmental risks from the proposed use of each of the insecticides are discussed below.

1. Imidacloprid

Imidacloprid is a systemic, neonicotinoid insecticide that is currently used for spring treatment applications in the ALB eradication program. It is being evaluated for use in fall treatments in order to extend the treatment window. Two formulations, Merit 75 WSP and Imicide Hp, will be used to evaluate efficacy under field conditions. Soil treatments will consist of injecting the Merit formulated product approximately 6 inches below the ground around the base of each tree. Approximately 180 trees including Norway maple, red maple, London plane, and elm will be treated at a rate of 1.89 g of product per inch of DBH. Stem or trunk injections consist of injecting the Imicide product into the base of each tree at a rate of 2 ml per DBH inch. Approximately 180 trees of the 4 tree species will be treated with the trunk injection method. Treatments of both types will occur in the fall and spring on individual trees (i.e. only one treatment per year per tree).

a. Toxicity

Technical and formulated imidacloprid has low to moderately acute oral mammalian toxicity with median toxicity values ranging from 400 to greater than 2,000 mg/kg. The technical material, as well as several formulations, are 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 cases, the noted effects were observed at doses above maternal effects, in the case of developmental studies, and at concentrations and durations not expected in the ALB eradication program (USFS, 2005).

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 at 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 not expected to occur under realistic exposure scenarios (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).

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 part per billion range to greater than 100 mg/L depending on the test species (USDA-APHIS, 2002a; EPA, 2008; USFS, 2005).

b. Environmental Quality

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.

c. Exposure and Risk

The use of imidacloprid, in the form of a soil or trunk injection, in this study 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 limited number of trees in this study reduces exposure and risk to applicators, the public, and terrestrial and aquatic nontarget organisms.

There is the potential for dietary exposure to the public if residues leach into groundwater supplies that are used as a drinking water source. Exposure to groundwater is expected to be minimal, based on the proposed methods of application and monitoring data that has been collected in association with ALB eradication efforts in other States. Previous imidacloprid groundwater sampling from trunk injections 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 (USDA-APHIS, 2007a). 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.

Exposure and risk to terrestrial vertebrates 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, based on the use patterns for imidacloprid in the ALB eradication program. There is the possibility of some imidacloprid exposure to mammals and birds that may feed on insects or vegetation from treated trees; however, under worst-case-exposure scenarios, the risk is considered minimal.

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. In addition, flowering structures are not present in all of the ALB host tree species. The potential 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. The ALB program is working with the USDA Agricultural Research Service (ARS) to analyze the effects of the ALB program's treatments on bees. The ARS study is expected to last three or four years, depending on success in obtaining required samples. Data from this multi-year study will be used, as it becomes available, to plan future ALB treatment efforts.

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 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 the environmental monitoring program, USDA-APHIS analyzed for 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 are 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.

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.

Imidacloprid exposure in aquatic environments is also expected to be minimal and 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.

2. Dinotefuran

Dinotefuran is a neonicotinoid insecticide that is being evaluated for use in the ALB eradication program. The formulated product will be used to evaluate efficacy under field conditions. Treatments will consist of injecting the formulated product into approximately 60 trees including Norway maple, red maple, London plane, and elm at a rate of 2 ml per DBH inch. Injections will occur in the spring, as opposed to the spring and fall applications that are proposed for the efficacy work using imidacloprid.

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. 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. 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 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, 2008b).

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 as part of the aforementioned ARS bee study to analyze the effects of ALB treatments. Data from this multi-year study will be used to help plan future ALB treatment efforts. 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 that are in proximity to surface water will not be selected for injection.

C. Cumulative Effects

This study of chemical treatments for potential use in the ALB eradication program is unlikely to result in significant cumulative impact to the environment. While the trees being considered have not been identified for immediate eradication treatment (either treatment with imidacloprid or removal), all of the potential study trees are located within or near 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 May 2007 for ALB eradication in the New York metropolitan area (USDA–APHIS, 2007b). Over 18,000 host trees have been removed from the quarantine area. In addition, current plans call for the chemical treatments of approximately 40,000-60,000 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 one percent of the total trees that are scheduled for treatment next year, and much less when considering treatment of trees over successive years. Use of imidacloprid outside of the ALB eradication program is likely to occur on some golf courses and lawns, or by other private applications. However, the program intends to use trees that will not be treated by other entities for the duration of the study since such overlap would affect the residue results. While trees used in this study are likely to be clustered in groups, there will not be large concentrations of treated trees. The experimental treatment of approximately 420 trees is unlikely to result in significant cumulative environmental impacts to the area.

If sufficient residues are found for fall applications of imidacloprid or spring applications of dinotefuran, the ALB program will likely adopt these methods. Adding additional treatment types could accelerate the treatment program and, therefore, eradication. However, before new treatment methods are added to program activities, additional environmental documentation would be created and reviewed.

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.

APHIS prepared a biological assessment that considered the effects of the proposed program on listed species in specific sites in Kings, Queens, and Richmond Counties in New York. These species include the seabeach amaranth, shortnose sturgeon, roseate tern, piping plover, and the green, hawksbill, leatherback, and loggerhead sea turtles. Based on the locations of the study sites and the method of insecticide application, APHIS has determined that the proposed study will have no effect on any of the listed species in Kings, Queens, or Richmond Counties.

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
1398 W. Trunk Road
Buzzards Bay, MA02542-1329

VI. References

Bonmatin, J.M., Marchand, P.A., Charvet, R., Moineau, I., Bengsch, E.R., and Colin, M.E., 2005. Quantification of imidacloprid uptake in maize crops. J. Agric. Food Chem. 53:5336–5341.

Bortolotti, L., Montanari, R., Marcelino, J., Medrzycki, P., Maini, S. and C. Porrini. 2003. Effects of sub-lethal imidacloprid doses on the homing rate and foraging activity of honey bees. Bull. Insect. 56(1):63-67.

CA DPR—See California Department of Regulation

California Department of Pesticide Regulation, 2006. Environmental fate of imidacloprid. Environmental Monitoring: Department of Pesticide Regulation. 16 pp.

Chauzat, M.P., Faucon, J.P., Martel, A.C., Lachaize, J., Cougoule, N., and Aubert, M., 2006. A survey of pesticide residues in pollen loads collected by honey bees in France. J. Econ. Entomol. 99(2):253–262.

EPA—See U.S. Environmental Protection Agency.

Franklin, M.T., Winston, M.L., and L.A. Morandin, L.A., 2004. Effects of clothianidin on *Bombus impatiens* colony health and foraging ability. J. Econ. Entomol. 97(2):369–373.

Kreutzweiser, D., Thompson, D., and Scarr, T.A., 2009. Imidacloprid in leaves from systemically treated trees may inhibit litter breakdown by non-target invertebrates. Ecotox. And Environ. Safety 72:1053–1057.

Kreutzweiser, D., Good, K., Chartrand, D., Scarr, T., and Thompson, D., 2008. Are leaves that fall from imidacloprid-treated maple trees to control Asian longhorned beetles toxic to non-target decomposer organisms? J. Environ. Qual. 37:639–646.

Kreutzweiser, D., Good, K., Chartrand, D., Scarr, T., and Thompson, D., 2007. Non-target effects on aquatic decomposer organisms of imidacloprid as a systemic insecticide to control emerald ash borer in riparian trees. Ecotox. and Environ. Safety 68:315–325

Laurent, F.M., and Rathahao, E., 2005. Distribution of [14C] imidacloprid in sunflowers (*Helianthus annuus* L.) following seed treatment. J. Agric. Food Chem. 51:8005–8010.

Maus, C., Cure, G., and Schmuck, R., 2003. Safety of imidacloprid seed dressings to honey bees: a comprehensive overview and compilation of the current state of knowledge. Bull. Insect. 56(1):51–57.

Morandin, L.A., and Winston, M.L., 2003. Effects of novel pesticides on bumble bee (Hymenoptera: Apidae) colony health and foraging ability. Environ. Entomol. 32(3):555–563.

New York City Department of Parks & Recreation, 2006. Trees Count! Street Tree Census. [Online] Available: http://www.nycgovparks.org/sub_your_park/trees_greenstreets/treescount/index.php., [2010, July 13].

NYCDP&R –See New York City Department of Parks & Recreation

Schmuck, R., 2004. Effects of a chronic dietary exposure of the honeybee, *Apis mellifera* (Hymenoptera: Apidae) to imidacloprid. Arch. Environ. Contam. Toxicol. 47:471–478.

Schmuck, R., Schoning, R., Stork, A., and Schramel, O., 2001. Risk posed to honeybees (*Apis mellifera* L, Hymenoptera) by an imidacloprid seed dressing of sunflowers. Pest Manag. Sci. 57:225–238.

Stadler, T., Gines, D.M., and Buteler, M., 2003. Long-term toxicity assessment of imidacloprid to evaluate side effects on honey bees exposed to treated sunflower in Argentina. Bull. Insect. 56(1):77–81.

Tasei, J.N., Lerin, J., and Ripault, G., 2000. Sublethal effects of imidacloprid on bumblebees, *Bombus terrestris* (Hymenoptera: Apidae), during a laboratory feeding test. Pest Manag. Sci. 56:784–788.

Tasei, J.N., Ripault, G., and Rivault, E., 2001. Hazards of imidacloprid seed coating to *Bombus terrestris* (Hymenoptera: Apidae) when applied to sunflower. J. Econ. Entomol. 94(3):623–627.

Tasei, J.N., 2002. Impact of agrochemicals on non-*Apis* bees. *In*: Honey bees: estimating the environmental impacts of chemicals. Ed. J. Devillers and M.H. Pham-Delegue. Taylor and Francis Publishing. pp. 101–131.

USDA-APHIS—See U.S. Department of Agriculture, Animal and Plant Health Inspection Service

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2010a. Asian Longhorned Beetle: Annotated Host List. 2010 [Online] Available: http://www.aphis.usda.gov/plant_health/plant_pest_info/asian_lhb/downloads/hostlist.pdf. [2010, July 13]

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2010b. Potential of Fall Prophylactic Treatments for the ALB eradication program. 3 pp.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2008a. New Pest Response Guidelines: Asian Longhorned Beetle (*Anoplophora glabripennis)*. 2008. [Online.] Available: http://www.aphis.usda.gov/plant_health/plant_pest_info/asian_lhb/downloads/alb_response_guidelines.pdf. [2010, July 13]

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2008b. Asian Longhorned Beetle Cooperative Eradication Program in the Worcester County, Massachusetts environmental assessment. September 2008. [Online] Available: http://www.aphis.usda.gov/plant_health/ea/downloads/ALB-EA-Worcester.pdf. [2010, July 28].

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2007a. Environmental monitoring report: 2006 Asian Longhorned Beetle Cooperative Eradication Program for the active eradication region in Suffolk County, New York. 36 pp.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2007b. Asian longhorned beetle cooperative eradication program in New York Metropolitan Area environmental assessment—May 2007. [Online.] Available: http://www.aphis.usda.gov/plant_health/ea/downloads/alb-fonsi.pdf. [2010, July 13]

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2003. Environmental monitoring report: Asian Longhorned Beetle Cooperative Eradication Program in New York and Illinois. 51 pp.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2002a. Use of imidacloprid formulations for the control and eradication of wood boring pests: assessment of the potential for human health and environmental impacts. 68 pp.

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2002b. Environmental monitoring report: 2000–2001 Asian Longhorned Beetle Cooperative Eradication Program. 87 pp.

U.S. Department of Agriculture, Forest Service, 2005. Imidacloprid: Human health and ecological risk assessment (Final Report). SERA TR 05-43-24-03a. 28 pp.

U.S. Environmental Protection Agency, 2009. EPA one-liner database. [Online.] Available: http://www.ipmcenters.org/Ecotox/DataAccess.cfm.

U.S. Environmental Protection Agency, 2008. EFED Pesticide Ecotoxicity Database. [Online]. Available: http://www.ipmcenters.org/pesticides.cfm., [2008, September 17].

U.S. Environmental Protection Agency, 2004. Dinotefuran pesticide fact sheet. 63 pp.

USFS—See U.S. Department of Agriculture, Forest Service