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Spotted Lanternfly Eradication Program in Frederick County, Virginia

Environmental Assessment March 2018

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Agency Contact:
John Crowe
National Policy Manager
Plant Protection and Quarantine – Plant Health Programs
Animal and Plant Health Inspection Service
U.S. Department of Agriculture
4700 River Road, Unit 134
Riverdale, MD 20737

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I. Purpose and Need

The spotted lanternfly (SLF) is an invasive pest, primarily known to affect tree of heaven (*Ailanthus altissima*) and can spread rapidly. It has been detected on many host plants, including apples, plums, cherries, peaches, nectarines, apricots, almonds, and pine. It also feeds on oak, walnut, poplar, and grapes. The insect will change hosts as it goes through its developmental stages. Nymphs feed on a wide range of plant species, while adults prefer to feed and lay eggs on tree of heaven (*A. altissima*).

Both nymphs and adults of SLF cause damage when they feed, sucking sap from stems and leaves. This can reduce photosynthesis, weaken the plant, and eventually contribute to the plant's death. In addition, feeding can cause the plant to ooze or weep, resulting in a fermented odor, and the insects themselves excrete large amounts of fluid (honeydew). These fluids promote mold growth and attract other insects.

Adult spotted lanternflies are approximately 1 inch long and one-half inch wide, and they have large and visually striking wings (see figures 1 and 2). Their forewings are light brown with black spots at the front and a speckled band at the rear. Their hind wings are scarlet with black spots at the front and white and black bars at the rear. Their abdomen is yellow with black bars. Nymphs in their early stages of development appear black with white spots and turn to a red phase before becoming adults. Egg masses are yellowish-brown in color, covered with a gray, waxy coating prior to hatching.

The SLF lays its eggs on smooth host plant surfaces and on non-host material, such as bricks, stones, and dead plants. Eggs hatch in the spring and early summer, and nymphs begin feeding on a wide range of host plants by sucking sap from young stems and leaves. Adults appear in late July and tend to focus their feeding on *A. altissima* and grapevine (*Vitis vinifera*). As the adults feed, they excrete sticky, sugar-rich fluid similar to honeydew. The fluid can build up on plants and on the ground underneath infested plants, causing sooty mold to form.

Spotted lanternfly adults and nymphs frequently gather in large numbers on host plants. They are easiest to spot at dusk or at night as they migrate up and down the trunk of the plant. During the day, they tend to cluster near the base of the plant if there is adequate cover or in the canopy, making them more difficult to see. Egg masses can be found on smooth surfaces on the trunks of host plants and on other smooth surfaces, including brick, stone, and dead plants. Spotted lanternflies are invasive and can spread rapidly when introduced to new areas. While the insect can walk, jump, or fly short distances, its long-distance spread is facilitated by people who move infested material or items containing egg masses.

In February 2018 the Virginia Department of Agriculture and Consumer Services announced that the SLF had been detected in January outside Winchester, VA.

The detection was thought to have occurred from a shipment that originated in Pennsylvania where SLF has been detected and eradication activities are in progress.

APHIS has the responsibility for taking actions to exclude, eradicate, and/or control plant pests under the Plant Protection Act of 2000 (7 United States Code (U.S.C.) 7701 et seq.). The SLF has a variety of host plants that it can attack. If allowed to spread, this pest could pose a risk to the country's grape, apple, stone fruit, and logging industries in Virginia and other states.

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.

II. Alternatives

This EA analyzes the potential environmental consequences associated with the proposed action to eradicate the SLF from Frederick County, Virginia.

A. No Action

Under the no action alternative APHIS would not provide funding or other support to eradicate the SLF. Other government agencies and private landowners may work to eradicate SLF but there would be no cooperative or coordinated effort between APHIS and other stakeholders.

B. Preferred Alternative

The SLF eradication program is proposing several measures to address the recent detection in Frederick County, Virginia. Eradication efforts may include any or all of the following: surveys, egg mass scraping, sanitation, tree removal, and insecticide and herbicide applications.

Detection Survey

Detection survey will use visual inspection and sweep netting to determine if SLF is present. Immature SLF crawl up trees each day and can be observed visually or can be collected by sweep netting. Tree bands (discussed below) will also be used to detect infestations.

Visual Reconnaissance Survey and Egg Mass Scraping

Visual reconnaissance surveys identify locations that have feeding damage or presence of SLF on plants. The program is working with the local agricultural extension office to train local citizens to identify egg masses. The visual surveys will occur from October through May and volunteers and program personnel will scrape egg masses from plants with a stiff plastic card into bags with an alcohol solution to cause mortality.

Sanitation

Sanitation of all other greenwaste within 1/4 mile of SLF detections may include chipping or grinding the debris, and disposal through incineration or burning. Steaming, composting, and burial of greenwaste are options under consideration for the future.

Tree Banding

The program will place self-adhesive paper bands around *A. altissima* trees from SLF hatch in May to death of the adult population in November to capture SLF while they move up the trunk or congregate to feed and mate. Volunteers or program personnel will replace tree bands on a bi-weekly basis and report the number of SLF captured to develop data on the infestation and control achieved. Used bands will be bagged and placed in a landfill.

Tree Removals

Contractors for APHIS and its cooperators will remove *A. altissima* trees up to a quarter-mile radius from infested trees. When possible, APHIS prefers to physically remove host trees along with the stumps to prevent reinfestation. When it is impractical to move stump removal equipment into an area APHIS would have the option to apply herbicides to treat the remaining stumps and associated sprouts. APHIS needs a range of herbicide options to treat stumps and control vegetation sprouting from stumps of SLF-host species. In the Asian Longhorned Beetle (ALB) program, APHIS gained experience with using a combination of the herbicides triclopyr, imazapyr, and metsulfuron-methyl, and finds these same chemicals and methods of application would be useful for the SLF program. The SLF program is also proposing to use aminopyralid and glyphosate to treat stumps and sprouting vegetation. Not all herbicides would be used at one site but depending on whether stumps or sprouts need treatment, one or a mixture of herbicides may be used. These herbicide treatments are needed as a way to prevent reinfestation of host tree stumps and sprouts that have been removed as part of the SLF program. All applications will be made either by hand painting undiluted material on the stump or directly spraying stumps and/or sprouting foliage using a backpack sprayer.

Insecticide Treatments

The program will use backpack-mounted or ground vehicles to apply dinotefuran or imidacloprid to clusters of *A. altissima* host trees. No aerial applications are proposed. Allowable application, protective equipment, exclusion, dosage, and entry restrictions will follow the label instruction of the insecticide specified. Only licensed applicators or persons working under the supervision of a licensed applicator shall apply insecticides. Dinotefuran or imidacloprid would be used in conjunction with tree removal and banding which are the two other primary non-chemical treatment options. The use of dinotefuran or imidacloprid would only occur through landowner consent.

The products, bifenthrin, pymetrozine and *Beauveria bassiana strain GHA* are only proposed for use in small experimental plots to evaluate the efficacy of each product in controlling SLF. Experimental treatments would only occur on private properties within the current quarantine area, and only with landowner permission.

Dinotefuran/Imidacloprid

Dinotefuran and imidacloprid are systemic neonicotinoid insecticides that are taken up by the root system, foliage, or through the bark and translocated upward throughout the plant. Their mechanism of action involves disruption of the insect's nervous system by inhibiting nicotinic acetylcholine receptors.

The SLF program will apply either dinotefuran through a basal trunk spray or Imidacloprid through trunk injection to approximately 10 trap trees at a given site. Trap trees would be created by leaving a number of live male *A. altissima* (generally 10 inches in diameter at breast height (dbh)) on a property after host tree reduction. Removal of most potential hosts in an area means that when the late instar and adult SLF start searching for *A. altissima* to feed on, their only nearby option is one of the insecticide-treated trap trees (PA DOA, 2017). Treatments will wet the bark just to the point of saturation and avoid run off of the chemicals into adjacent soil. Dinotefuran treatments will not occur when the tree bark is wet, during rainfall, or if rain is expected within 12 hours after application. Currently only one application of the pesticide of 0.54 pounds active ingredient (lbs. a.i.) per acre will occur at a treatment site per year. A Section 24 (c) Special Local Needs registration that will allow an increase in the application rate may be used to increase efficacy, if needed in the future. A similar registration was obtained in Pennsylvania for SLF use on trap trees. The program will not apply dinotefuran when trees are dormant, flowering, under drought stress, or while not actively taking up water from the soil.

Another insecticial option to treat trap trees as part of the SLF eradication program would be the use of imidacloprid. There are several different imidacloprid formulations available for trunk, soil, seed, and foliar applications. In the SLF eradication program imidacloprid would be applied through trunk injection at the base of the tree, which is then translocated upward (USDA APHIS, 2015). These application methods were previously used in the ALB eradication programs and are incorporated by reference (USDA APHIS, 2015).

Bifenthrin/ Beauveria bassiana strain GHA/Pymetrozine

Experimental applications for each of the three insecticides are proposed to evaluate the efficacy of each product for SLF control. Current label rates will be used for each insecticide to make treatments to a small number of trap trees in areas where the SLF has been detected. Applications may occur to the bark or foliage of trap trees. Expanded use of any of the three insecticides may occur in cases where it’s proven to be effective against SLF however, similar to dinotefuran, the use would be restricted to trap trees that would typically not exceed 10 trees per site.

III. Affected Environment

This chapter describes general information regarding Frederick County, Virginia that is considered in this EA.

A. Land Characteristics and Agricultural Production

Frederick County, VA contains a diversity of land uses ranging from urban, residential, natural areas, and agriculture. A variety of agriculture production occurs in the county; however, the top four crops in acreage are forage, soybeans, corn, and wheat (USDA, 2012).

In addition to urban and residential development there are city and county parks that contain plants and trees that could serve as hosts for the SLF. In addition, state parks and a national forest lie within the county. *Ailanthus altissima* may occur in any of these areas due to its ability to become established under a variety of conditions, including highly disturbed areas, such as those that may occur in developed areas. Other host trees such as oak, walnut, and pine as well as other host plants may also occur in natural and managed areas throughout Frederick County.

B. Air Quality

The Clean Air Act (42 U.S.C. §§ 7401 et seq.) is the primary Federal legislation that addresses air quality. In any given region or area of the United States, air quality is measured by the concentration of pollutants in the atmosphere, and is influenced by surface topography and prevailing meteorological conditions. The EPA established National Ambient Air Quality Standards (numerical concentration-based standards) for six criteria pollutants that impact human health and the environment (40 CFR § 50). These pollutants are common and accumulate in the atmosphere as a result of natural processes and normal levels of human activity. They include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), small particulate matter, and lead (Pb). Recent reporting by the Virginia Department of Environmental Quality (VA DEQ) has shown good air quality throughout the county with only an exceedance of the small particulate matter air standard in 2016 (VA DEQ, 2106a).

C. Water Quality

Frederick County lies within four watersheds including Cacapon-Town, Conococheague-Opequon, North Fork Shenandoah, and Shenandoah. These watersheds contain various lakes, rivers and streams, several of which have good water quality while others may be impaired by various activities. Impaired waterways are required to be reported and submitted to the EPA under section 303 (d) of the Clean Water Act (CWA). States identify all waters where required pollution controls are insufficient to attain water quality standards, and establish priorities for development of total maximum daily loads (TMDLs). The VA DEQ has identified several waterbodies that are listed as impaired under Section 303 (D) of the CWA within the state, including those in Frederick County (VA DEQ, 2016b). The primary reasons listed for impairment are agriculture and other non-point sources. The causes for impairments to these streams is primarily from the bacterium *Escherichia coli* and other fecal coliform bacterial contamination.

D. Vegetation and Wildlife

Vegetation types vary within the county based on natural site conditions as well as man made changes that have occurred over time. Vegetation types range from row crops, grass grown as hay and forested areas. Forested areas are dominated by deciduous forests followed by evergreen and then a mixture of both types.

The diversity of habitat types results in a variety of terrestrial and aquatic plant and animal species that may occur in the county. Many of these species are very common throughout the state and region; however, several species are rare and are state species of concern or federally protected under the Endangered Species Act (VA DGIF, 2017). Several invasive species, including plants occur in Frederick County and have altered plant composition in natural and managed settings. The invasive *A. altissima* is one of those species and it may occur in a range of environmental conditions in natural and developed areas.

IV. Environmental Impacts

A. No Action

A lack of a cooperative eradication effort between APHIS and other agencies would result in further spread of the SLF. As the insect spreads the likelihood of eradication would become more difficult to accomplish. Increased pesticide use would also be anticipated and could result in increased risk to human health and the environment, especially in cases where less qualified persons are making applications.

The SLF has a wide host range of trees, many of which are native to Virginia. For example, trees in the genus that includes oak, pine, and walnut could all be impacted with the spread of the SLF. The level of tree mortality is unknown; however, the stress from attack by SLF could predispose native host trees and other plants to other pests and pathogens.

B. Preferred Alternative

Survey, egg mass scraping, and tree banding activities are not expected to have significant impacts to human health and the environment. Impacts to environmental quality such as air, soil, and water quality would not be anticipated.

Tree removal activities will only occur for *A. altissima* trees within a ¼-mile radius of a positive SLF detection. These trees are non-native and are able to become established under a variety of conditions. They compete with native hardwoods and are considered allelopathic to 35 species of hardwoods and 34 species of conifers (Miller, undated). Allelopathy refers to the ability of a plant to inhibit establishment and growth of another plant species. In addition, cut stems or stumps from *A. altissima* are able to sprout from the stump or roots, making complete removal difficult. Stump and sprout treatments will be used to ensure that any cut stems will not resprout. This is an effective means of control for *A. altissima* when applied between June and August. Applications are made by hand to sprouts using a backpack sprayer or to cut stumps using injection, hack and squirt, or other hand applied methods directly to the stump. The risk to human health and the environment is expected to be low for the proposed herbicides based on the available toxicity data, potential exposure pathways, and the proposed methods of application which would suggest minimal risk (USDA FS, 2007; USDA FS, 2011; USDA APHIS, 2015). There would be some risk to non-target terrestrial plants from herbicide treatments. However, the potential for effects would be restricted to areas immediately adjacent to any application. Any activities on private property related to SLF, including *A. altissima* removal, will only occur with landowner permission.

Risks related to insecticide use are summarized below for dinotefuran and imidacloprid, which are the primary insecticides proposed for use at this time. Summaries of insecticide risk for the experimental applications of *Beauveria bassiana*, bifenthrin, and pymetrozine are also discussed. Proposed insecticide applications on private property will only occur with landowner permission and proper notification. Applications of insecticides will occur to trap trees that are left in areas where SLF has been detected. Trap trees that occur at a given site will typically be no more than 10 trees that could receive a treatment. Therefore, the amount of insecticide that will be used is reduced when compared to broadcast applications.

Dinotefuran and Imidacloprid

APHIS evaluated the potential human health and ecological risks of the proposed use of imidacloprid for the ALB Eradication Program, and finds the same risk types and exposures would apply to the SLF program. The potential impacts reported in Appendix F of the Final ALB EIS are incorporated by reference.

Insecticide use will only occur on a small number of *A. altissima* trap trees in a given area. Commodities for human consumption will not be harvested from dosed trees. Consequently, there will be no dietary risk to humans. The risks to human health from these chemcials are expected to be negligible based on limited exposures from the proposed use pattern of trunk and soil injection. The risk of exposure would be greatest for the workers applying the product, but properties of the formulation and the requirement to use protective equipment result in a low potential for worker exposure.

Dinotefuran has low to moderate acute and chronic toxicity to nontarget wildlife, such as mammals and birds. Direct risk to nontarget wildlife is not expected based on conservative estimates of exposure and the available toxicity data. An increase in the acreage containing treated hosts does not change the toxicity; however, animals migrating through areas with treated acreage have the potential for more exposure incidents.

Indirect impacts to wildlife populations through the loss of invertebrate prey are also not expected to be significant because only sensitive terrestrial invertebrates that feed on treated trees will be impacted while other insects remain available as prey items. An increase in the acreage containing treated hosts does not change this balance; it only increases the acreage where this may occur. Although it has not been observed, there is a potential for migrating or foraging animals to alter their patterns or expand their ranges if invertebrate prey becomes limited in their current areas.

The proposed program's use pattern will minimize potential impacts to honeybees based on the use of basal trunk sprays or trunk injections that minimize drift. There will be no pesticide applications to seeds during planting operations, so dust is not a source of bee exposure. The program will avoid applying insecticides when foliage is in bloom to decrease the potential for effects to beneficial insects associated with pollination.

Neonicotinoid insecticide toxicity is high for honeybees yet there is uncertainty regarding the impacts of residues from this class of systemic insecticides in pollen and nectar. The main dinotefuran metabolites in plants are toxic to bees, and exhibit higher mobility and durability (Li et al., 2017). The main imidacloprid metabolite in plants is also toxic to honeybees and mice, while another metabolite (6-chloronicotinic acid) may induce plant defenses against plant disease or drought (Simon-Delso et al., 2015). Studies measuring pollen and nectar imidacloprid residues in crops show sublethal effects occuring above residues measured in the field. Sublethal effects from low-level chronic exposures to neonicotinoid pesticides in bee species vary with the species' sensitivity, life cycle, foraging behaviors, and colony development (Arce et al., 2017; Li et al., 2016); however, there are significant knowledge gaps concerning the impacts of neonicotinoids on bees (Lundin et al., 2015). Chronic exposure to imidacloprid at the higher range of field doses in pollen of certain treated crops could cause negative impacts on honeybee colony health and reduced overwintering success (Dively et al., 2015). Recent data suggest bees reduce total food consumption even though they cannot taste neonicotinoids in nectar, and chronic neonicotinoid exposures may impair olfactory learning and memory in honeybees leading to reductions in foraging efficiency (Kessler et al., 2017). Toxicological interactions with dinotefuran indicate risk assessments based on individual neonicotinoid pesticides may underestimate the realistic toxicity based on the observation of synergistic and additive effects (Liu et al., 2017). In general, declines in bees are due to chronic multiple interacting stressors that may act synergistically (David et al., 2016; Goulson et al., 2017; Lundin et al., 2015).

Neonicotinoid insecticides exhibit high water solubility and low soil adsorption, leading to movement of these chemicals in runoff and long half-lives in soil and water, even though individual metabolites may be shorter-lived and the presence of decreased pH and low turbidity can reduce chemical persistence (Morrissey et al., 2015). For example, dinotefuran is very sensitive to photolysis, and its degradates are less toxic to aquatic organisms than imidacloprid (USDA FS, 2009; EPA, 2018). In addition to agricultural factors such as the application rate, non-agricultural factors that affect soil persistence – and therefore the likelihood of movement into waters – include temperature, presence of plant cover, soil type, and organic content at the site. There are reports of measurable and ecotoxicologically relevant concentrations of imidacloprid stable in water for more than one year (Morrissey et al., 2015). The acute toxicity of neonicotinoids to mammals, fish, and birds generally is lower than other insecticides, but extremely low water concentrations (below 1μg/L) can induce short-term lethal effects to some sensitive crustaceans (Branchiopoda) and insects, such as mayflies (Ephemeroptera), caddisflies (Trichoptera), and midges (Diptera) (Morrissey et al., 2015).

Drift of these chemicals into sensitive aquatic habitats and impacts to air quality are not expected based on the direct application to tree trunks as a basal spray or injection which minimizes the potential for off-site transport. There may be an environmentally important concentration of neonicotinoids remaining in the leaves that drop in the autumn, are carried to water resources, and serve as a source of chemical leachate from the leaves (exposure) or are consumed (dietary) by aquatic organisms such as detritivorous macroinvertebrates (shredders) (Englert et al., 2017). The program's treatment of only trap trees effectively reduces the number of insecticide-bearing leaves that could follow this pathway.

Exposure and risk to aquatic organisms will be minimized by adherence to label requirements regarding applications near water. Risk is expected to be minimal to fish, with an increased risk to some sensitive aquatic invertebrates in very shallow water bodies immediately adjacent to treated trees. Ecological risks for terrestrial and aquatic non-target organisms also are expected to be low based on the method of application, toxicity, and environmental fate of these insecticides. The different species of host plants are not likely to vary these risks because they arise from the chemical properties of dinotefuran or imidacloprid.

There is some risk to sensitive terrestrial invertebrates that consume vegetation from treated trees. Terrestrial invertebrate populations may consume a wide range of host plants, which would limit the percentage of exposure through their diet. There are different terrestrial invertebrate populations at each location, and at the present time, areas that might be treated for ALB and SLF do not overlap. Risks to terrestrial invertebrates, including pollinators, are expected to be negligible based on available data collected from ALB-specific applications of imidacloprid. Impacts to susceptible insects that feed on treated trees are expected, but due to the method of application and the treatment of specific host trees, the effects are expected to be localized and not widespread.

Other Potential SLF Insecticides

Beauveria bassiana

Beauveria bassiana is a naturally occurring fungus that has been shown to be pathogenic to certain insects. Spores from the fungus come into contact with an insect where they germinate and enter the insect eventually resulting in death from the releas of enzymes that destroy insect tissues. This microbial insecticide has low toxicity to humans in oral, dermal, and inhalation exposures and is not pathogenic (EPA, 2000a). Formulations may result in some mild eye irritation however oral, dermal and inhalation toxicity is low. Proposed applications will be to small experimental plots within the infested area to determine the efficacy of treatments for SLF. Applications could be expanded to other areas pending results from the efficacy tests and expansion of SLF. Treatments are made to host material using ground based equipment with no treatments to crops that would be used for human consumption. Applicators would be the subgroup at greatest risk from applications of *B. bassiana*: however, the risk is negligible due to low toxicity and the use of personal protective equipment designed to minimize exposure. Contamination of drinking water is also not expected based on label requirements prohibiting applications directly to water and other label information designed to reduce the potential for off-site drift and runoff.

Beauveria bassiana is not expected to result in significant risks to non-target fish and wildlife. The fungus is specific to certain insects and has low toxicity to wild mammals, birds, fish, and plants (EPA, 2000a). Non-target insects that are sensitive to the effects of *B. bassiana* would be impacted; however, these effects would be localized to the areas of treatment which are up to 10 trees within a given site.

Impacts to soil, water, and air quality are not expected from the use of *B. bassiana*. Label restrictions and the environmental fate of the fungus demonstrate it would not persist in the environment and would not occur off-site in aquatic resources in quantities that could result in impacts to human health and the environment. The fungus is not expected to volatilize into the atmosphere and impact air quality. Any material that would occur in the atmosphere would only occur during application; however, based on the method of application this would be localized to the areas of treatment.

Bifenthrin

Bifenthrin is a synthetic pyrethroid insecticide that acts on the peripheral and central nervous system impacting axons, and is effective as a contact or ingested compound. Bifenthrin has moderate acute oral toxicity but low dermal toxicity. The reported median lethality value (LD_{50}) in mammals ranges from 53.8 to 70.1 mg/kg. Bifenthrin is not considered to be a dermal sensitizer or an eye or skin irritant (Wassell et al., 2008). Bifenthrin is not considered to be a reproductive or developmental toxicant; however, it is considered a potential carcinogen, based on the formation of urinary bladder tumors when administered at high doses to mice. Risk to ground and surface drinking water resources are not expected to be significant for the proposed use pattern, based on label restrictions regarding the protection of surface water and the environmental fate properties for bifenthrin which demonstrate low solubility and a high affinity for binding to soil.

Bifenthrin has low to slight toxicity to birds, and moderate acute toxicity to wild mammals. Significant exposure and risk to nontarget terrestrial vertebrates are not expected due to low toxicity and the direct application to the bark of approximately ten trees per site. Any incidental contact by terrestrial invertebrates in these applications could result in effects because pyrethroid insecticides are toxic to most terrestrial invertebrates but these impacts would be localized. Bifenthrin is considered highly toxic to honey bees by oral and contact exposure.

Similar to other pyrethroid insecticides, bifenthrin is considered highly toxic to fish and aquatic invertebrates. Toxicity values for both groups of organisms range from the low parts per trillion to the low parts per billion, depending on the test species and conditions (Solomon et al., 2001; Meléndez and Federoff, 2010). Significant offsite transport of bifenthrin to aquatic habitats is not expected to occur because treatments are restricted to a small cluster of trap trees within a given area where SLF has been detected. Bifenthrin binds tightly to soil and has very low solubility, reducing the potential for transport and exposure to aquatic organisms.

Bifenthrin impacts to soil are not anticipated under the current use pattern because applications are directed to the trunks of a select number of trees within a site. Due to the method of application bifenthrin is also not expected to runoff or drift from the point of application in quantities that could impact aquatic resources. Any bifenthrin that could move offsite would not be expected to impact surface or groundwater. Bifenthrin has extremely low solubility and mobility in soil, suggesting that it would not be a threat to ground water (Meléndez and Federoff, 2010). Bifenthrin does degrade slowly in soil and sediment, based on field terrestrial and aquatic dissipation data (Gan et al., 2008; Meléndez and Federoff, 2010). Dissipation half-lives range from approximately 80 days to greater than 1 year under different soil and sediment conditions. Impacts to air quality from volatilization are not expected due to the low vapor pressure for bifenthrin. Some bifenthrin could occur in the atmosphere during application, but will be restricted to the area of treatment because applications are made using ground sprayers with a large coarse droplet size that will minimize drift.

Pymetrozine

Pymetrozine is a selective insecticide that acts by interfering with the feeding mechanism in insects that are similar to the SLF. The selective mode of action results in low mammalian toxicity in oral, dermal, and inhalation exposures. Acute oral, dermal, and inhalation median lethality values are greater than the highest concentration tested suggesting pymetrozine is practically non-toxic from these types of exposures (EPA, 2000b). Pymetrozine is not mutagenic or teratogenic. There is some evidence to suggest it may be carcinogenic due to the formation of liver tumors in mice dosed in long term studies. These types of exposures are not expected to occur in the SLF cooperative eradication program.

Available terrestrial and aquatic ecological toxicity data shows that pymetrozine is practically non-toxic to wild mammals, birds, and fish based on acute exposures (EPA, 2000b). Acute median lethality values were typically higher than the highest test concentration tested in various studies. The toxicity to aquatic invertebrates is considered moderate to slight depending on the test organism (EPA, 2000b). Pymetrozine is considered practically non-toxic to the honeybee based on acute exposure studies. Impacts to terrestrial invertebrates that share a similar feeding mechanism to the SLF would be anticipated; however, these impacts would be localized because no more than 10 trap trees would be treated at a given site.

Effects to air, water, and soil quality are expected to be negligible for pymetrozine due to its favorable environmental fate profile and proposed method of application. Primary half-life values in soil and water are short but secondary half-lives may be much longer (EPA, 2000b). Mobility is expected to be low based on available soil partitioning studies. The low application rate and environmental fate of pymetrozine in soil and water are not expected to have significant impacts to water quality. Air quality impacts are expected to be negligible since pymetrozine does not volatilize. Pymetrozine would occur in the atmosphere during applications from drift, but the method of treatment, small number of trees being treated, and label requirements regarding the minimization of drift will not result in significant impacts to air quality.

C. Cumulative Effects

Cumulative impacts are those impacts on the environment that result from the incremental impact of a proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The cumulative impacts from the selection of the preferred alternative are considered incrementally negligible and would be less than those from the selection of the no action alternative. The quarantine, survey, tree banding, egg mass scraping would not result in any cumulative effects while tree removals and pesticide use would not be expected to result in significant impacts to human health and the environment. In the case of tree removals, the cumulative impacts would be positive because *A. altissima* is a non-native tree that has negative impacts to natural flora. Proposed pesticide use is directed to clumps of trap trees that typically would number no more than ten trees per site. Label recommendations to protect human health and the environment and notification of the public and landowners prior to any treatments would further reduce potential cumulative impacts to human health.

Cumulative impacts from the no action alternative would allow for the spread of the SLF into other areas of Virginia over time as well as other states because it has a wide variety of hosts. The spread of SLF to other areas would have economic and environmental impacts that would be expected to be greater than those that would occur under the preferred alternative. The SLF would impact stonefruit and grape production as well as logging industries. These impacts would be in addition to other pests and diseases thay may impact these industries. The spread of SLF to natural habitats would provide an additional stressor and could impact the management of these areas (Gandhi and Herms, 2010). In cases where a SLF host tree may be a keystone species (i.e., one that defines forest structure and controls ecosystem dynamics), the impacts from invasive forest pests will be more significant (Ellison et al., 2005). The spread of SLF could also result in increased insecticide use and depending on the toxicity and use patterns could result in greater risk to human health and the environment.

D. Threatened and Endangered Species

Section 7 of the Endangered Species Act (ESA) 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 prepared and submitted to the U.S. Fish and Wildlife Service (FWS) a biological assessment, as part of its Section 7 requirements under ESA, that evaluates the potential for impacts to listed species that may occur in Frederick county. The current list of federally listed species in the county includes the endangered Indiana bat (*Myotis sodalis*) and the threatened northern long-eared bat (*Myotis septentrionalis*). APHIS determined that the proposed program is not likely to adversely affect these bat species and has requested concurrence with this determination from the FWS.

E. Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668–668c) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle…[or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

Eagle nests have been identified within Frederick County, VA based on available data from the Center for Conservation Biology database (CCB, 2018; IPaC, 2018). Golden eagles are also reported in Frederick County but they do not breed there (IPaC, 2018)

FWS has recommended buffer zones from active nests which require different levels of protection (FWS, 2007). They are as follows:

1. Avoid clearcutting or removal of overstory trees within 330 feet of a nest at any time. (It should be noted that clearcutting will not be used under any alternative discussed in this document.)

2. Avoid timber harvesting operations (including road construction, and chain saw and yarding operations) during the breeding season within 660 feet of the nest. The distance may be decreased to 330 feet around alternate nests within a particular territory—

    - including nests that were attended during the current breeding season but not used to raise young, and
    - after eggs laid in another nest within the territory have hatched.

According to FWS, the breeding season for bald eagles in Virginia is mid-December through mid-July. As such—

- APHIS will contact the FWS for the locations of eagle nests in the program area; and
- APHIS will contact FWS before tree removal begins during the breeding season within 660 feet of a nest to confirm that all eagles have left the nest.

Outside of the breeding season, cutting may occur within the buffer zone around nests.

F. Migratory Birds

The Migratory Bird Treaty Act of 1918 (16 United States Code (U.S.C.) 703–712) established a Federal prohibition, unless permitted by regulations, to pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird or any part, nest, or egg of any such bird.

Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds," directs Federal agencies taking actions with a measurable negative effect on migratory bird populations to develop and implement a memorandum of understanding (MOU) with the FWS which promotes the conservation of migratory bird populations. On August 2, 2012, an MOU between APHIS and the FWS was signed to facilitate the implementation of this Executive order.

Table 1. Migratory birds of conservation concern occurring in Frederick County, VA (IPaC, 2018)

Common Name	**Scientific Name**	Breeding Season
Bobolink	*Dolichonyx oryzivorus*	May 20 to July 31
Cerulean warbler	*Dendroica cerulea*	April 27 to July 20
Eastern whip-poor-will	*Antrostomus vociferus*	May 1 to August 20
Golden-winged warbler	*Vermivora chrysoptera*	May 1 to July 20
Kentucky warbler	*Oporornis formosus*	April 20 to August 20
Prairie warbler	*Dendroica discolor*	May 1 to July 31
Red-headed woodpecker	*Melanerpes erythrocephalus*	May 10 to Sept. 10
Rusty blackbird	*Euphagus carolinus*	Breeds elsewhere
Wood thrush	*Hylocichla mustelina*	May 10 to August 31
Yellow-bellied sapsucker	*Sphyrapicus varius*	May 10 to July 15

Acute and chronic toxicity to birds from insecticides (dinotefuron and imidacloprid) and herbicides (triclopyr, imazapyr, and metsulfuron-methyl) are as discussed in Appendices E and F of the Programmatic ALB Eradication EIS (2015), which are incorporated by reference. Aminopyralid and glyphosate risk to birds have been summarized in previously referenced U.S. Forest Service risk assessments.

Table 1 includes a list of migratory birds of concervation concern in Frederick County. Depending on the chemical, toxicities range from low to moderate, and program treatments to select *A. altissima* plants would not likely expose birds to these pesticides. Birds are unlikely to consume SLF, so dietary exposure from the consumption of SLF insects exposed to sub-lethal doses of the pesticides is highly unlikely. Therefore, these insecticides would not likely impact migratory birds. In general, the targeted spray of trap trees would not result in impacts on bird prey.

G. 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. The lack of effects to all population groups is related to the method of application and the lack of any dietary or drinking water exposure.

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 requires each Federal agency to identify, assess, and address environmental health risks and safety risks that may disproportionately affect children. The available risk assessments that have been referenced in this EA and the proposed use pattern for each pesticide in the SLF Eradication program suggests that the exposure and risk of herbicide or insecticide use to the public, including children will be low.

Consistent with the National Historic Preservation Act of 1966, APHIS has examined the proposed action in light of its impacts to national historic properties. Several historic sites exist within the county. Treatments for the SLF on historic properties are not anticipated at this time. In the event that future treatments could occur on historic properties they would be coordinated with the State Historic Preservation Officer and other appropriate contacts.

V. Listing of Agencies and Persons Consulted

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Plant Health Programs
4700 River Road, Unit 134
Riverdale, MD 20737

U.S. Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Field Operations 5657 South Laburnum Avenue
Richmond, VA 23231

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

U.S. Fish and Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Virginia Department of Agriculture and Consumer Services
102 Governor Street
Richmond, Virginia 23219

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