Finding of No Significant Impact
Gypsy Moth Cooperative Eradication Program in
Hennepin County, Minnesota
Environmental Assessment
March 2009

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), in cooperation with the Minnesota Department of Agriculture propose to eradicate the North American gypsy moth infestation located in Hennepin County, Minnesota. APHIS has prepared an environmental assessment (EA) that analyzes potential environmental consequences of eradicating gypsy moth in Hennepin County. This EA is tiered to the "Final Environmental Impact Statement for the Gypsy Moth Management in the United States: A Cooperative Approach." This EA is available at http://www.aphis.usda.gov/plant_health/ea/downloads/gypsymoth-mn.pdf or from:

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

or

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
900 American Blvd East, Suite 204
Bloomington, MN 55420

The EA analyzed two alternatives consisting of (1) APHIS would not aid in the treatment of gypsy moth in Hennepin County and (2) Treatment of gypsy moth in Hennepin County using three aerial applications of *Bacillus thuringiensis kurstaki* (Btk) applied with approximately a 10 to 14 day interval between applications. This will be followed by trapping when the gypsy moths are adults to ensure that the eradication was successful (proposed action). The analysis evaluated ecological and human impacts under each alternative. The proposed action was preferred because of its ability to achieve the eradication objective in a way that minimizes potential environmental consequences and provides the most opportunity for successful eradication.

Based on the proposed ground application of Btk, the rate of application and persistence of Btk in the environment, nontarget exposure is expected to be low. Label requirements will further reduce risk to sensitive organisms. Impacts to human health are not anticipated. The use of traps will not be likely to result in impacts to human health or the environment. The traps contain disparlure, a gypsy moth pheromone. Laboratory studies and field experience has demonstrated a lack of toxicity for disparlure and similar compounds.

A notification of the environmental assessment was posted in a local newspaper with a 30-day public comment period ending on Tuesday, April 28, 2009. No comments were received on the environmental assessment.

APHIS determined that the Higgins eye pearlymussel (*Lampsilis higginsi*) is the only federally listed threatened or endangered species that occurs in Hennepin County. The Higgins eye pearlymussel makes its home in the Mississippi River which is approximately 4 miles away from the proposed treatment. After reviewing information on the ecology of the Higgins eye pearlymussel and locations of its critical habitat, APHIS has determined that the proposed action will have no effect on the Higgins eye pearlymussel or it's critical habitat.

APHIS has determined that there is not a potential for disproportionately high and adverse human health or environmental effects on any minority or low-income populations consistent with the Executive Order (EO) 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." APHIS has also determined that there would not be any disproportionately high or adverse environmental health and safety risks to children consistent with the EO 13045 "Protection of Children from Environmental Health Risks and Safety Risks."

The implementation of the preferred alternative will not significantly impact the quality of the human environment. I have considered and based my finding of no significant impact on the analysis of the program's characteristics and its anticipated environmental consequences, as analyzed in the EA. An environmental impact statement (EIS) must be prepared if implementation of the proposed action may significantly affect the quality of the human environment. I have determined that there would be no significant impact to the human environment from the implementation of the preferred alternative and, therefore, no EIS needs to be prepared.

Kevin Connors

Kevin Connors
Plant Protection and Quarantine
Animal and Plant Health Inspection Service

4/29/09

Date

United States Department of Agriculture

Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

Gypsy Moth Cooperative Eradication Program in Hennepin County, Minnesota

Environmental Assessment
March 2009

Gypsy Moth Cooperative Eradication Program in Hennepin County, Minnesota

Environmental Assessment, March 2009

Agency Contact:
Weyman Fussell
National GM Program Manager
USDA/APHIS/PPQ
4700 River Road, Unit 134
Riverdale, MD 20737-1236

Table of Contents

I. Introduction

The Gypsy Moth (GM), *Lymantria dispar* L., is one of the most destructive pests of trees and shrubs in the United States. There are two types of GMs, the European (also known as North American) and the Asian. The North American GM was originally imported into Massachusetts from Europe in 1869 for silk production experiments. However, some moths were accidentally released and became established. The GM infestation spread relentlessly and now covers the entire northeastern part of the United States from Maine south to North Carolina and west to parts of Michigan and Wisconsin. The North American GM has a host range of over 300 species of trees and shrubs; however, they have a preference for oaks and aspen. GM hosts are located through most of the continental United States.

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) in cooperation with the U.S. Forest Service has established a national program to help slow the spread of the current North American GM population and eradicate any new populations of GM that may exist outside this area. This program is an effective federal-state partnership that prevents the establishment of GM in areas of the United States that are not contiguous to current regulated states and counties.

The GM life cycle begins in the early spring with the hatching of first instar larvae from eggs laid the previous summer. Newly hatched larvae hang by silken threads and are caught by the wind and thereby dispersed to other trees in the forest. Small larvae begin feeding on leaves. GM larvae go through 5 or 6 feeding stages. Between stages the GM larvae molt by shedding their skin. Larvae typically feed at night and rest in bark crevices during the day. In areas with high caterpillar densities, feeding may occur all day which can result in defoliation and in severe cases cause tree mortality.

Pupation generally occurs about 8 weeks after egg hatch. Once they emerge as adults, the female GM emits a pheromone that the males can detect through their antennae. The males locate the female and mate. After mating, the female lays eggs in a single mass on any solid object including tree trunks, shrubs, nursery stock, vehicles, camping equipment, and outdoor household articles.

Heavy infestations of GM can alter ecosystems and disrupt people's lives. The larval life stage can cause defoliation and can in extreme cases, cause tree mortality. Defoliated trees are vulnerable to other insects and diseases. Repeated or widespread defoliation events from larvae feeding can alter wildlife habitat, change water quality, reduce property and esthetic value, and reduce the recreational value of forested areas. When present in large numbers, GM caterpillars can be a nuisance as well as a hazard to health and safety (USDA, 1995).

II. Purpose and Need

APHIS, in cooperation with Minnesota Department of Agriculture (MDA), proposes to eradicate the GM infestations located in Hennepin County, Minnesota (within the Minneapolis/St. Paul metro area). The alternatives being considered have been analyzed in detail in the 1995 Final Environmental Impact Statement (EIS) for GM Management in the United States (USDA, 1995). The findings of that EIS regarding these alternatives will be summarized and incorporated by reference into this environmental assessment (EA). The need for this proposed action is based on the potential adverse ecological and economic impacts of GM infestations on the infested and surrounding areas.

MDA has been tracking the GM population in two areas of Hennepin County since 2007. In August of 2008, there was evidence of reproducing females in both areas. One area consists of a 382-acre area in Richfield, Minnesota. The other area is a 303-acre site in Minnetonka, Minnesota. Both areas contain preferred host plants that are susceptible to defoliation by the GM and which could support successful reproduction and spread of the pest. These populations in Minnesota need to be eradicated to avoid potential ecological, economic, or human impacts.

GM egg masses and pupae have been known to attach to items that people bring with them when they enter and leave Minnesota. Therefore, if GM were to become established and allowed to spread throughout this area it could not only spread to other areas within Minnesota but other parts of the country including the surrounding states. The associated damage, defoliation, and mortality of host plants from such an occurrence in the absence of timely eradication action, could be devastating.

This EA is tiered to USDA's 1995 Final EIS for GM Management in the United States. We propose eradication because of the isolated nature of these infestations and the threat that a reproducing population of GMs would pose to the vegetation resources of this area. MDA has participated in 28 similar eradication projects on nearly 5,000 acres throughout Minnesota, including the eradication of GM populations in other metro areas such as Brooklyn Park, Edina, South Minneapolis and Golden Valley.

This site-specific EA is designed to examine the environmental consequences of a range of treatment options under the 1995 Final EIS for

GM Management in the United States that may accomplish the program's goals. The goal of this project is to eliminate GMs from the identified areas.

This EA is prepared consistent with National Environmental Policy Act (NEPA) (42 U.S.C. § 4231 et. seq.), the Council of Environmental Quality NEPA regulations (40 CFR part 1500 et. seq.) and APHIS' NEPA implementing regulations (7 CFR part 372), for the purpose of evaluating how the proposed action and alternatives described in the following sections, if implemented, may affect the quality of the human environment. This EA is being made available to the general public and comments are requested from any interested party.

MDA has already conducted public meetings at both sites. The schedule was as follows: Richfield, January 13, 2009 6-8pm, and Minnetonka, January 15, 2009 6-8pm. A bulletin was mailed to residents and local officials in and around the proposed treatment areas notifying them of the public meeting as well as of the proposed treatment plans. Press releases were sent to local media advertising the events, and a televised appearance in front of the Richfield City Council provided further community outreach.

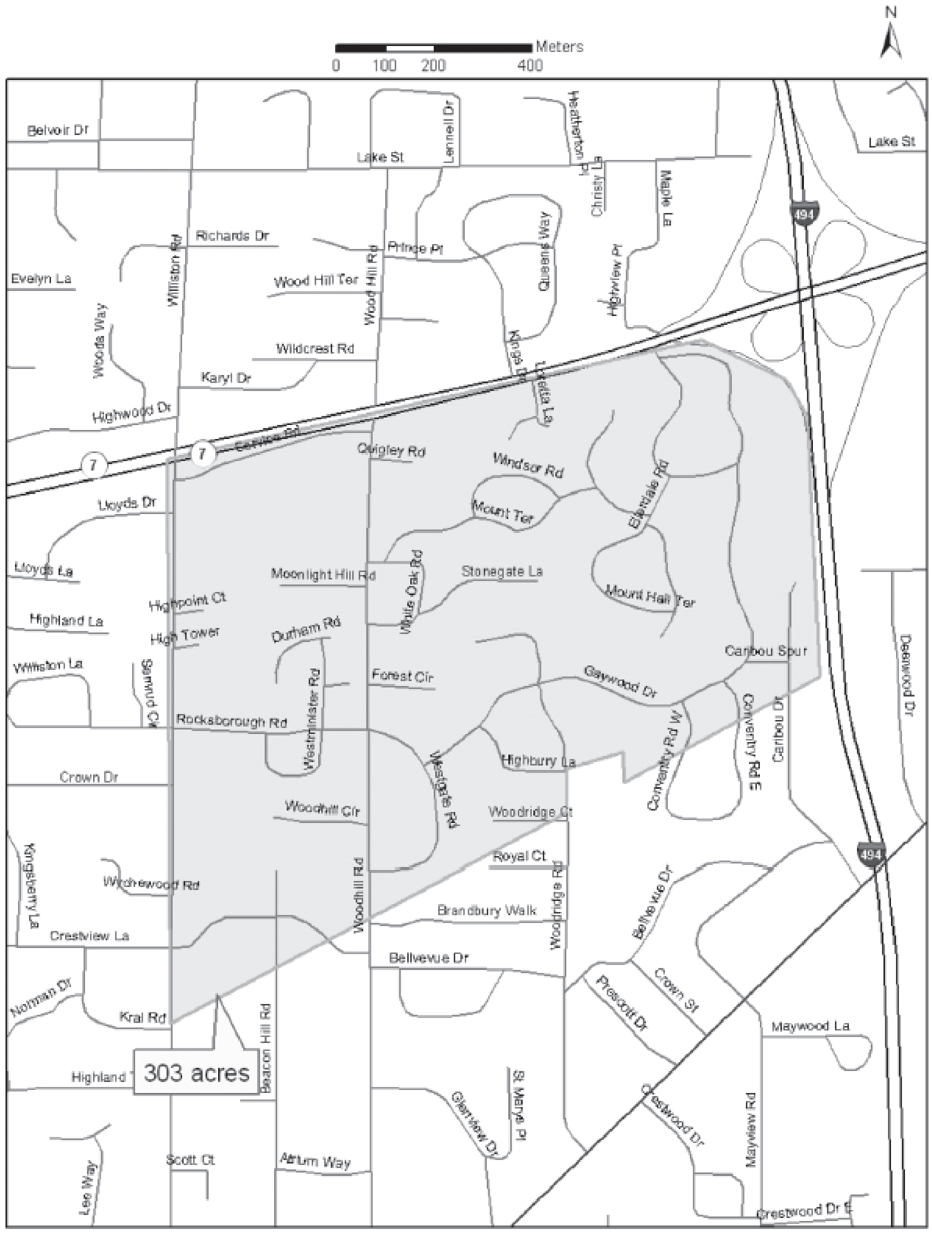
III. Affected Environment

There are two treatment sites proposed for GM eradication treatment in Hennepin County, Minnesota. . One of the treatment areas is a 382-acre area in Richfield, Minnesota (see Figure 1). Within this area, 13 GM egg masses were identified. This site is mostly residential and commercial with a cemetery in the southwestern area of the treatment block and three city parks in the northern portion of the block. No lakes, ponds, or other water bodies are within this treatment area

Figure 1. GM Treatment Area in Richfield, MN

The second area is a 303-acre area site located in Minnetonka, Minnesota (see Figure 2). Five GM egg masses were found within this area. This area consists of mostly residential and commercial residences. Glen Lake Elementary School is adjacent to the treatment block, but remains outside the treatment area. There is a small pond in the southwestern section of the treatment area, a 200 ft. buffer will be applied to limit any effects to aquatic resources. Neither site is at risk for ground water contamination as local wells are deep (200-300 feet below surface).

Figure 2. GM Treatment Area in Minnetonka, MN



IV. Alternatives

This Environmental Assessment is tiered to the USDA's 1995 Final EIS for GM Management in the United States. The preferred alternative in the 1995 EIS is Alternative 6: Suppression, Eradication, and Slow the Spread. Under this alternative, we propose eradication because of the isolated nature of GM infestations in Minnesota. This site-specific Environmental Assessment is designed to examine the environmental consequences of a range of treatment options under Alternative 6 that may accomplish the program's goal.

Under Alternative 6 there were 6 treatment options available in the 1995 EIS:

1) Btk. This is a biological insecticide containing the bacterium, *Bacillus thuringiensis var kurstaki* (Btk). The insecticide is specifically effective against caterpillars of many species of moths and butterflies, including GM.

2) Diflubenzuron (Dimilin). This is an insect growth regulator that interferes with the growth of some immature insects.

3) GM virus (Gypcheck). This is a nucleopolyhedrosis virus which occurs naturally and is specific to the GM. Gypcheck is an insecticide product made from the GM nucleopolyhedrosis virus.

4) Mass Trapping. This treatment consists of large numbers of pheromone traps used to attract male GMs and prevent them from mating with females thereby causing a population reduction.

5) Mating disruption. This treatment consists of a carrier (i.e., tiny plastic flakes, beads, etc.) that releases disparlure, a synthetic GM sex pheromone. The pheromone confuses male moths and prevents them from locating and mating with females.

6) Sterile Insect Technology. This treatment consists of an aerial release of a large number of sterile male GMs. This reduces the chance that female moths will mate with fertile males. The result is progressively fewer and fewer fertile egg masses being produced, and eventual elimination of the population.

Of the treatment options listed above, Btk and diflubenzuron have proven to be the most effective eradication tools for use with small populations of GM, as the ones in these two locations. This EA analyses the no action alternative and the proposed action that will treat the area using Btk combined with trapping to ensure that the treatment is effective.

The other treatment options were not selected due to availability, environmental, or efficacy concerns. Diflubenzuron is an insect growth regulator that has a broader non-target host range than Btk and can kill many other insects besides moths and butterfly caterpillars. Its use may adversely affect other insect populations and therefore was not selected. GM virus (Gypcheck) is very host specific but is not widely available in the market and therefore was not selected.   Mating disruption and sterile insect release experiments show variable results for eradication programs and therefore were not selected.

A. No Action

Under this alternative, APHIS would not aid in the treatment of these areas. Some control measures could be taken by other Federal and non-federal entities, including the State of Minnesota, however, these measures would neither be controlled nor funded by APHIS.

B. Proposed Action

Under this alternative, Btk (Foray® 48B) will be applied via aerial application over the treatment areas. Two applications of Btk will be applied with an approximately five to ten-day interval between each application. These applications are estimated to occur sometime in May, 2009. However, the exact date of applications will be timed so that the applications occur during the early larval stages when GM caterpillars hatch from their eggs and are most susceptible to treatments. The Btk can be toxic to susceptible caterpillars of moths and butterflies that feed on treated vegetation within two weeks of application.

Trapping density will be increased in the area to determine if the treatments are successful. Trapping consists of placing pheromone-baited traps at a density of no less than 30 traps per square half mile. Traps will be placed within the standard grid of 1500 meters (0.93 miles) in at least a 2.5 mile radius around each of the sites. These traps will attract adult male GMs.

V. Environmental Impacts of the Proposed Action and Alternatives

There are potential environmental consequences from both the alternatives being considered. The risks associated with ecological and human impacts are examined under both alternatives.

A. No Action

Selecting the no action alternative would likely result in the establishment of GM populations in both the Richfield and Minnetonka areas which could lead to commensurate damage to trees relative to the level of infestation. The majority of the trees in the eradication and surrounding areas are susceptible to damage from GM larva. The no action alternative would allow the GM to flourish in the existing area and continue to spread into surrounding areas. With the establishment of GM, the environmental concerns discussed below would be likely to occur, The ecological and human health effects associated with the GM were examined in the 1995 Final EIS for GM Management in the United States which is currently being updated (USDA, 1995; USDA, 2008). This EA incorporates by reference the material discussed in the EIS and is summarized below:

1. Gypsy Moth

Ecological Impacts

Most of the environmental impacts associated with GM are caused by the larval stage. This stage of the GM is the feeding stage which can lead to changes in forest stand composition (USDA, 1995). In areas where GM populations are high, the trees can be defoliated, leading to stress (USDA, 1995). Trees that are stressed are more susceptible to diseases and other plant pests (USDA, 1995). In circumstances where high populations are sustained over several years, GM feeding damage can cause tree mortality (USDA, 1995).

The area of infestation, as well as surrounding areas, contain many host trees and would be threatened by GM defoliation. GM larva feeding can lead to changes in forest stand composition and nesting sites and cover for birds and other animals could be reduced (USDA, 1995). If GMs were to spread to other areas changes in water quality and effects to aquatic organisms could occur (USDA, 1995). The loss of vegetation in this area could lead to increased erosion of soil and loss of moisture retention (USDA, 1995).

Human Impacts

In addition to these effects, some people have been shown to be allergic to the tiny hairs on GM caterpillars. These people could suffer minor allergic reactions, primarily rashes, if GMs were allowed to become established. Also, irritation to eyes and throat are common reactions with increased GM infestations (USDA, 1995). In heavily infested areas, large numbers of caterpillars limit enjoyment of the outdoors for some people due to GM larval droppings and defoliation (USDA, 1995).

B. Proposed Action

The preferred action alternative is the, aerial application of Btk and placement of pheromone-baited traps. Potential impacts to human health and the environment are discussed below.

1. Btk

Bacillus thuringiensis kurstaki, or Btk, is a naturally occurring bacterium that has selective insecticidal activity against certain butterflies and moths. The Bacillus bacterium is a large group of bacteria that occurs naturally in soil, water, air, plants and wildlife. The subspecies kurstaki is part of the *Bacillus thuringiensis* biopesticide group that has been registered for more than forty-five years for a variety of agricultural and non-agricultural uses. Btk is widely used in agriculture, both conventional, organic and as a transgene in genetically engineered crops, to control pests on a variety of crops. Btk also has multiple non-agriculture uses and has been the preferred material for GM eradication programs in the United States for several years. The specificity of Btk to certain insects is based on its mode of action that requires ingestion by lepidopteran larvae where once in the midgut, the alkaline pH breaks down the crystalline proteins that produce the toxins that bind to the midgut cells in the larvae (Cooper, 1994). The alkaline conditions and binding sites present in the midgut of lepidopteran larvae are not present in mammals and most other non-target organisms.

Btk is available in several formulations depending on its use. The formulation proposed for use in this program is Foray® 48B which is a commonly used formulation for control of lepidopteran pests. Additionally, Foray® 48B is OMRI listed as a Certified Organic product. Two aerial applications of Foray® 48B, five to ten days apart will be made at a rate ranging from 21 to 107 oz of product per acre. Rates of application vary based on the life stage and level of infestation. The program will use the lowest rate possible to insure adequate control of GM.

Human Impact

Based on the extensive use of Btk and its long historical use in these types of programs a large amount of mammalian toxicity data exists as well as information from surveillance programs in previously conducted treatments. Available acute laboratory toxicity data with Btk and its various formulations demonstrate low acute mammalian oral, dermal and inhalation toxicity and pathogenicity (McClintock et al. 1995; EPA, 1998, WHO, 1999; Siegel, 2001, USDA, 2004). The material safety data sheet (MSDS) Foray® 48B, states that the formulated material can be a transient mild eye and skin irritant. The information in the MSDS typically applies to workers handling larger quantities of the concentrated material compared to the reduced potential exposure from material applied during application. Previously conducted human health risk assessments that compare potential exposure data from similar applications to those proposed in this program to the available toxicity data have demonstrated wide margins of safety with potential exposure values to the general public ranging from 28,000 to four million times below levels where effects were observed in laboratory studies.(EPA, 1998; USDA, 2004).

Concerns have been raised regarding the pathogenicity of Btk, and in particular the production of enterotoxins that are summarized in a publication from an anti-spray advocacy group (Ginsberg, 2006). Btk belongs to a group of bacteria within the Bacillus genus, including *Bacillus cereus*, which has been linked to food borne illness incidents via the production of enterotoxins which can cause gastrointestinal symptoms such as diarrhea. The Centers for Disease Control report that *B. cereus* is responsible for approximately 0.6% of the total number of food borne illness cases reported between 1988 and 1992 as well as between 1998 and 2002 (EPA, 1998; CDC, 2006).

Btk has been shown to produce low levels of enterotoxin in cultures however no reported food borne illness cases linked to Btk exist in over forty-five years of extensive use. The lack of pathogenicity may be related to the comparatively low levels of enterotoxin produced in Btk compared to *B. cereus* (Damgaard, 1995) or the enterotoxins are not typically present in commercial formulations that are produced in North America. Siegel (2001) reported that enterotoxins may be degraded during the fermentation process or that the isolates used may not produce enterotoxins under the conditions of the fermentation process. In addition impacts of *B. cereus* enterotoxin are only realized in cases where the enterotoxin can multiply under appropriate conditions which don’t appear to occur for Btk in the environment. This is supported by a lack of gastrointestinal symptoms linked to Btk applications in workers or the public, and laboratory studies that report no enterotoxin production in rats orally dosed with Btk or associated symptoms (EPA, 1998; USDA, 2004; Wilcks et al., 2006). The lack of reported gastrointestinal symptoms associated with Btk use in workers and the general public, as well as a lack of effects observed in laboratory studies indicates factors other than the presence of enterotoxin are required to cause symptoms similar to those in *B. cereus* (Federici and Siegel, 2008). Immune response and infectivity data for Btk, as well as results from surveillance studies, suggest that immune related adverse effects in the general public are unlikely (USDA, 2004; Federici and Siegel, 2008).

Several epidemiology studies have been published based on surveillance data from applications similar to those proposed in this program in the United States, Canada and New Zealand. These studies are summarized in several publications and indicate that no significant adverse effects were reported in the general population including sensitive subgroups such as children or asthmatics (Aer'Aqua Medicine, 2001. Siegel, 2001; Noble, et al., 2002; Pearce et al., 2002; Parks Canada, 2003; USDA, 2004; Otvos et al., 2005). One of the larger monitoring studies conducted in association with forestry Btk applications was in New Zealand (Aer'Aqua Medicine, 2001). Applications to an area containing approximately 88,000 residents were monitored using self reporting of adverse effects as well as information from participating physicians. Results from the study demonstrated no Btk related cases of anaphylaxis, incidences of birth defects or changes in birthweight, meningococcal disease, or infections. Adverse effects that were self-reported during the study were related to dermal, respiratory and ocular irritation.

Petrie et al. (2003) conducted a study to investigate the impacts of an aerial application of Foray® 48B on self-reported symptom complaints and visits to health care providers after applications in West Auckland in 1999 to control the Painted Apple Moth. A group of 292 residents within the spray area were questioned prior to treatment with only 192 or 62% responding after treatment. The authors of the paper assessed the frequency of twenty-five potential health problems before and after treatment. Of these twenty-five symptoms including sleep problems, dizziness, difficulty concentrating, irritated throat, itchy nose, diarrhea, stomach discomfort, and gas discomfort, eight were found to have increased after application. These results are similar to those reported from the same area by an advocacy group opposed to the spray (Blackmore, 2003; Goven et al., 2007). Petrie et al. (2003) states that sleep problems, dizziness and difficulty concentrating may be related to anxiety regarding perceptions about the risk of the program. A significant increase in participants with hay fever symptoms was noted, however, this may be incidental as the authors point out, since the onset of the pollen season could have influenced reporting. The authors attribute the gastrointestinal symptoms to possible enterotoxin production from the microbial insecticide, however this possibility is not supported by any available literature nor do they offer additional information. The authors do not discuss the possibility that the gastrointestinal symptoms may be related to the reported anxiety from the perceived risks of the application. In addition, the statistical comparisons that were utilized in the study are not considered appropriate for the multiple comparisons that were made (Federici and Siegel, 2008; USDA, 2004). A review of the study and the application of conservative statistical analysis more appropriate for multiple comparisons revealed that none of the endpoints were found to be statistically significant (USDA, 2004). The authors point out that the results should be interpreted with caution since only slightly more than half of the original residents responded post-application through self-reporting which could bias the results. It is important to note that there was no increase in the frequency of visits to general practitioners or other health care providers after treatment which is consistent with results from other surveillance studies making Btk applications.

Proposed applications of Btk in this program pose minimal risk to the general population based on the large amount of available toxicity data, surveillance data and long term use without significant reports of adverse effects. Mild irritation of the eyes, skin, and respiratory tract may be associated with exposures to Btk but is more likely to occur with applicators who are handling the concentrated material. Risks to applicators will be minimized when Foray® 48B is handled according to label requirements. Public outreach and education will continue as a means to reduce concerns from the public that can lead to anxiety and other effects. Public meetings regarding the spray have already occurred and additional public outreach and education will continue with local citizens as well as the MN Department of Health and local hospitals and clinics closer to the time of treatment.

Environmentall Impact

Non-target species (i.e., birds, mammals, amphibians, and reptiles) should not be affected by the proposed Btk treatments for this program. Available toxicity data for all terrestrial vertebrates indicate low toxicity (EPA, 1998; WHO, 1999; USDA, 2004). Although no direct effects to birds and wild mammals are expected, there is the possibility of indirect effects through the loss of invertebrate prey items which may serve as a temporal input into their diet. Based on the available data indirect effects have not been noted in studies with wild mammals (Innes and Bendell, 1989; Belloco et al., 1994) however one study reports indirect reproductive effects to birds that rely on caterpillars as a primary food source (USDA, 2004). Slight effects on reproduction in spruce grouse (such as nestling growth rates) were seen when applications occurred over large forested areas (Norton et al., 2001); however, in several other studies assessing impacts to a wide diversity of songbirds, no indirect effects on reproduction and other endpoints were noted (USDA, 2004). Bird populations that may occur in these residential areas are not expected to be impacted by the loss of prey items. Bird species expected in these areas have shown no indirect effects based on Btk applications over larger areas. In addition the areas of treatment are relatively small compared to the foraging area that birds may use. Finally only some lepidopteran larvae will be impacted in the area of treatment while other terrestrial insects will be available as prey items for birds.

Effects to most non-target terrestrial invertebrates are not expected with the exception of lepidopteran larvae with early instars more sensitive than later instars. Within the Lepidopteran group, sensitivities can be highly variable (Peacock et al., 1998). In general, due to Btk's unique mode of action, toxicity to pollinators and beneficial insects are considered low based on laboratory and field studies testing honeybees, as well as other beneficial insects (USDA, 2004). Some non-target Lepidoptera larvae (caterpillars) present in the proposed spray area would likely be killed by the application of Btk. However, depressions in caterpillar populations are expected to be temporary due to recolonization from adjacent untreated areas. No endangered lepidopteran species are expected to be present in the treatment site based on consultation with the US Fish and Wildlife Service.

Btk is not expected to be of significant risk to aquatic resources in this program due to the low toxicity of Btk to aquatic organisms and the lack of significant exposure. One small pond is present in the Minnetonka treatment area however a 200 foot application buffer is proposed as a means to minimize exposure to aquatic resources. Multiple freshwater and saltwater fish species were tested in the laboratory to determine what level of Btk exposure would result in any effect (USDA, 2004). The levels required to produce an effect were much higher than any potential off-site residues that would occur in this program (USDA, 2004). There have been laboratory studies supported by field data that suggest exposure could result in minimal effects to aquatic invertebrates at environmental concentrations above expected values in this program (Richardson and Perrin, 1994; Kreutzweiser et al., 1992; USDA, 2004). However, studies showed that *Daphnia. magna*, mayflies, stoneflies, copepods and mysid shrimp were not affected when exposed to concentrations well above those expected in the environment after application with Btk (USDA, 2004). Therefore, it is unlikely that fish and other aquatic organisms will be negatively impacted by the use of Btk in the proposed GM eradication program.

After application, exposure to light, higher temperatures, and moisture decrease the amount of Btk remaining in the environment. In a summary of studies regarding the environmental fate of Btk, the majority of studies indicated that insects were only affected for approximately 1 week; however, other studies have shown that while persistence of Btk in the environment may decrease rapidly, the insecticidal activity can persist up to 3 months under certain environmental conditions (USDA, 1995). Btk's persistence in water depends on organic matter, content and salinity (USDA, 1995). Btk has been found in aquatic field studies for up to 13 days and in some studies up to 4 weeks after spraying (USDA, 1995).Variations in environmental fate are attributable to various factors, including environmental conditions, formulation chemistry, study protocols, and sampling substrates.

Summary

Human health risks are expected to be minimal from Btk applications in this program based on its long term safety that has been demonstrated through laboratory and monitoring studies. The potential for exposure is greatest to workers who handle the concentrated product but will be minimized by following label recommendations. A continuation of local outreach and education will minimize anxiety and concerns associated with these treatments.

There will be minimal risk to most non-target terrestrial and aquatic organisms due to limited exposure and low toxicity. Impacts to some native lepidopteran larvae within the spray area may occur however the effects are expected to be minor due to the size of the area of treatment and specificity of Btk to the larval stage of the insect. Label requirements and other restrictions, where appropriate, will further reduce risk to sensitive organisms such as some aquatic invertebrates and pollinator species as described above.

2. Trapping

Trapping will involve disparlure-pheromone baited traps to attract male GM. Disparlure is the common name for cis-7,8-epoxy-2-methyloctadecane, a synthetically produced sex pheromone of the natural pheromone that is used by the female GM to attract male GM. The environmental impacts and human impacts are summarized below.

Human Impact

Disparlure belongs to a group of compounds known as straight-chain lepidopteran pheromones. Acute toxicity studies with this group of compounds have shown very low mammalian toxicity through multiple exposure routes. The lack of toxicity with these types of compounds has resulted in reduced data requirements for their registration by the U.S. Environmental Protection Agency (EPA) (EPA, 2004). Subchronic and chronic studies are limited for these types of chemicals; however, given the low acute toxicity and the fact that pheromones occur naturally in the environment, human health risks are expected to be minimal. The reduced data requirements introduce uncertainty into potential long-term risks; however, the lack of significant exposure to the public given its use in sticky traps and the limited amount used in the proposed program substantially reduces the potential for exposure and risk. The pheromone can be persistent on individuals who come into physical contact with disparlure and they may attract adult male moths for prolonged periods of time (up to 2 to 3 years) (USDA, 2006). No toxic effects are expected but it may be a considerable nuisance in GM-infested areas such as the eastern United States (USDA, 2006). The level of exposure required to cause the attractant effect cannot be characterized, although the likelihood of the effect is much greater for workers than for the general public. However, physical contact with disparlure from trapping is unlikely and would only occur if someone were to tamper with the trap themselves.

Environmental Impact

In acute toxicity tests, disparlure was not toxic to mammals, birds, or fish (USDA, 2006). Disparlure does exhibit some toxicity to aquatic invertebrates; however, the effects are related to study design and the limited solubility of the pheromone (USDA, 2006). Studies using cladocerans revealed toxicity was related to the organisms becoming physically trapped at the water surface where undissolved pheromone was present (USDA, 2006). Risks to aquatic organisms are not expected in this program because all pheromone will be placed in sticky traps, thus eliminating any potential offsite run-off or drift. Pheromone traps do catch small numbers of nontarget organisms that accidently fly or crawl into the traps. However, because the pheromone in the trap is specific to GM and nontarget insects will not be attracted to traps, the number of nontarget organisms affected will be very small and will have minimal impacts to the environment.

VI. Other Issues

A. Cumulative Impacts

This eradication program has limited impacts to Lepidopteran and other non-target species in the affected areas. These limited impacts are not expected to have a cumulative impact with past, present or future projects in these areas. Based on the analysis in the environmental consequence section, there are more potential impacts to the environment with the use of Btk versus trapping. Btk primarily impacts Lepidopterans and also species that may rely on Lepidopterans as a primary source of food. There are no known current federal, state, or other federal projects in the given treatment area that will affect lepidopterans and other non-target organisms that may be affected by this action.

In the event that the GM population is not eradicated from these areas, future treatments may be required. Treatment with Btk in the same areas over several years may lead to an increase in effects to Lepidopteran species that may be affected, thus limiting their chances to reestablish in the treatment area. However, if future treatments are needed, a subsequent EA will be conducted and these risks will be evaluated further.

In 2009, several other treatment areas in Minnesota will be federally funded through the GM Slow the Spread Foundation (STS). Eleven separate sites have been identified for GM treatment, both with Btk and mating disruption. The closest mating disruption site to the proposed eradication areas is approximately 100 miles away near Rollingstone, MN and the nearest Btk site is over 240 miles away near Tofte, MN. EAs will be prepared separately for all STS sites.

All proposed treatment blocks consider cumulative effects when they are designed, and when appropriate, block shape and size are changed to further limit concern about cumulative effects without limiting the treatment's effectiveness. Input is solicited from a variety of sources, including the United States Department of Interior, Fish and Wildlife Service (FWS) and Minnesota Department of Natural Resources's Natural Heritage Group, as well as environmental organizations. As of this writing, no changes have been suggested from these groups.

B. Threatened and Endangered Species and Historical Preservation

Section 7 of the Endangered Species Act (ESA) and it's implementing regulations require Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of critical habitat. In cooperation with the FWS, APHIS has considered the impacts of the proposed program on listed species in Hennepin County.

One species, the Higgins eye pearlymussel (*Lampsilis higginsi*) is federally listed as endangered and occurs in Hennepin County, in the Mississippi River. Impacts to aquatic species including fish or mussels from Btk are not expected, and in addition, treatments sites are more than 4 miles from the Mississippi River, eliminating exposure of mussels or glochidial host fish to Btk. Therefore, APHIS has determined that the proposed program will have no effect on the Higgins eye pearlymussel.

Requests to review state threatened and endangered species as well as sites of state historical value were submitted to the MN-DNR's Natural Heritage Group and the Minnesota Historical Society, respectively. No state-listed threatened or endangered species were identified, nor were any historical sites considered to be affected by these actions.

C. Executive Orders

Consistent with Executive Order (EO) 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” APHIS considered the potential for disproportionately high and adverse human health or environmental effects on any minority or low income populations. The treatment area has been determined based on GM finds in the area. The treatment itself will have minimal effects to those that live in this area and will not have disproportionate effects to any minority or low income population.

Consistent with EO 13045, “Protection of Children from Environmental Health Risks and Safety Risks,” APHIS considered the potential for disproportionately high or adverse environmental health and safety risks to children. The children in the area are not expected to be adversely affected disproportionately over adults from the program actions proposed.

VII. Listing of Agencies and Persons Consulted

Minnesota Department of Agriculture
625 Robert Street North
St. Paul, MN 55155 - 2538

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

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
900 American Blvd East, Suite 204
Bloomington, MN 55420

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

VIII. Individuals and Organizations Consulted for Technical Information

The Minnesota GM Program has been ongoing since 1973. A number of people have been contacted in years prior to 2009. The information, comments and concerns obtained from those people are still valid in many cases. Therefore, some of the names listed below were not necessarily contacted in association with this action.

- Emily Barbeau, City Forester, City of Minnetonka
- Ray Wroblewski, City Forester, City of Richfield
- Ed Quinn, MN DNR Division of Parks, St. Paul, MN
- Chuck Stroebel, Minnesota Department of Health
- Donna Leonard, USFS State and Private Forestry, Asheville, NC
- John Kyhl, USFS State and Private Forestry, St. Paul, MN
- Luke Skinner, MN DNR Division of Ecological Resources—Natural Heritage and Nongame Research Program, St. Paul, MN
- Stephen Nicholson, Valent BioSciences
- Minnesota State Historical Society, St. Paul, MN
- Kevin Connors, USDA APHIS PPQ, St. Paul, MN
- US Department of Interior, Fish and Wildlife Service, Minneapolis, MN

IX. References

Aer'Aqua Medicine. 2001. Health surveillance following Operation Evergreen: a programme to eradicate the White Spotted Tussock Moth from Eastern suburbs of Auckland.

Auckland District Health Board. 2002. Health Risk Assessment of the 2002 Aerial Spray Eradication Programme for the Painted Apple Moth in Some Western Suburbs of Auckland. A Report to the Ministry of Agriculture and Forestry. Prepared by: Public Health Service, Auckland District Health Board, Auckland, New Zealand. 83 pp.

Belloco, M.I., Bendell, J.F., and B.L. Cadogan. 1992. Effects of the insecticide *Bacillus thuringiensis* on *Sorex cinereus* (masked shrew) populations, diet, and prey selection in a jack pine plantation in northern Ontario. Can. J. Zool. 70:505-510.

Blackmore H. 2003. Painted Apple Moth Eradication Campaign West Auckland. Interim Report of the Community-based Health and Incident Monitoring of the Aerial Spray Programme. January-December 2002.

Center for Disease Control. 2006. Surveillance for Foodborne-Disease Outbreaks --- United States, 1998—2002. MMWR Surveillance Summaries. 11/10/2006. 55:10 (1-34). Accessed at: http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5510a1.htm?s_cid=ss5510a1_e

Cooper, D. 1994. *Bacillus thuringiensis* toxins and mode of action. Agric., Ecosystems and Env. 49:21-26.

Damgaard, P.H. 1995. Diarrhoeal enterotoxin production by strains of Bacillus thuringiensis isolated from commercial Bacillus thuringiensis-based insecticides. FEMS Immun. Med. Microbiol. 12:245-250.

Federici, B.A. and J.P. Siegel. 2008. Safety assessment of *Bacillus thuringiensis* and Bt crops used in insect control. In: Food Safety of Proteins in Agricultural Biotechnology. Chaper 3: 45 – 102. Ed. B,G, Hammond. CRC Press Taylor and Francis Group.

Ginsberg, C. Aerial spraying of *Bacillus thuringiensis kurstaki* (Btk). 2006. J. Pest. Reform. 26(2): 13-16.

Goven, J., Kerns, T., Quijano, R.F. and D. Wihongi. 2007. Report of the March 2006 People's Inquiry into the Impacts and Effects of Aerial Spraying Pesticide over Urban Areas of Auckland. 117 pp.

Green, M., Heumann, M., Sokolow, R., Foster, L.R., Bryant,R. and M. Skeels. 1990. Public health implications of the microbial pesticide Bacillus thuringiensis: an epidemiological study, Oregon, 1985-86. Am. J. Public Health. 80:848-852.

Innes, D.G.L. and J.F. Bendell. 1989. The effects on small mammal populations of aerial applications of *Bacillus thuringiensis*, fenitrothion, and Matacil® used against jack pine budworm in Ontario. Can. J. Zool. 67:1318-1323.

Kreutzweiser, D.P., Holmes, S.B., Capell, S.S., and Eichenberg, D.C., 1992. Lethal and sublethal effects of Bacillus thuringiensis var. kurstaki on aquatic insects in laboratory bioassays and outdoor stream channels. Bull, Environ. Contam. Toxicol. 49:252-257.

McClintock, J.T., Schaffer, C.R. and R.D. Sjoblad. 1995. A comparative review of the mammalian toxicity of Bacillus thuringiensis based pesticides. Pest. Scie. 45:95-105.

Noble, M.A. Riben, P.D. Cook, G.J. 1992. Microbiological and epidemiological surveillance programme to monitor the health effects of Foray 48B BTK spray. Vancouver, Canada, Ministry of Forests of the Province of British Columbia. p. 1-63

Norton, M.L., Bendell, J.F., Bendell-Young, L.I., and Leblanc, C.w., 2001. Secondary effects of the pesticide *Bacillus thuringiensis kurstaki* on chicks of spruce grouse (*Dendragapus Canadensis*). Arch. Environ. Contam. Toxicol. 41(3):369-373.

Otvos, I.S., Armstrong, H. and N. Conder. 2005. Safety of *Bacillus thuringiensis* var. *kurstaki* applications for insect control to humans and large mammals. Sixth Pacific Rim Conference on the Biotechnology of Bacillus thuringiensis and its Environmental Impact. Pp. 45-60.

Parks Canada. Western Canada Service Centre. 2003. Assessment of environmental and human health effects from proposed application of Foray® 48B in Waskesiu, Prince Albert National Park of Canada. 120 pp.

Peacock, J.W., Schweitzer, D.F., Carter, J.L., and Dubois, N.R., 1998. Laboratory assessment of the native effects of *Bacillus thuringiensis* on native Lepidoptera. Environ. Entomol. 27(2): 450-457.

Pearce, M., Habbick, B., Williams, J., Eastman, M. and M. Newman. 2002. The effects of aerial spraying with *Bacillus thuringiensis kurstaki* on children with asthma. Can. J. Public Health. 93(1): 21-25.

Petrie, K., Thomas, M. and E. Broadbent. 2003. Symptom complaints following aerial spraying with biological insecticide Foray 48B. New Zealand Med. J. 116(1170): 1-7.

Richardson, J.S., and Perrin, C.J., 1994. Effects of bacterial insecticide *Bacillus thuringiensis* var. *kurstaki* (Btk) on a stream benthic community. Can. J. Fish Aquatic Sci. 41:1037-1045.

USDA – See U.S. Department of Agriculture

U.S. Department of Agriculture, 1995. GM Management in the United States: A Cooperative Approach. Final Environmental Impact Statement. November 1995. United States Forest Service and Animal and Plant Health Inspection Service.

U.S. Department of Agriculture, 2004. Control/Eradication Agents for the GM – Human Health and Ecological Risk Assessment for *Bacillus thuringiensis* var. *kurstake* (*B.t.k.*) Final Report. United States Forest Service. SERA TR 03-43-05-02c. 152 pp.

U.S. Department of Agriculture, 2006. Control/Eradication Agents for the GM – Human Health and Ecological Risk Assessment for Disparlure (a.i.) and Disrupt II formulation – Revised Draft. United States Forest Service. SERA TR 06-52-07-01a. 79 pp.

U.S. Department of Agriculture. 2008. Gypsy Moth Management in the United States: a cooperative approach. Draft Supplemental Environmental Impact Statement. Summary. United States Department of Agriculture, Newtown Square, Pennsylvania. NA-MR-01-08.

U.S. Environmental Protection Agency. 1998. Office of Prevention, Pesticides and Toxic Substances. Reregristration Eligibility Decision: *Bacillus thuringiensis*. EPA738-R-98-004. 170 pp.

U.S. Environmental Protection Agency. 2004. Lepidopteran Pheromones Fact Sheet..Accessed at: http://www.epa.gov/pesticides/biopesticides/ingredients/factsheets/factsheet_lep_pheromones.htm.

Wilcks, A., Hansen, B.M., Hendriksen, N.B. and T.R. Licht. 2006. Persistence of *Bacillus thuringiensis* bioinsecticides in the gut of human flora associated rats. FEMS Immunol. Med. Microbiol. 48:410-418.

World Health Organization (WHO). 1999. Environmental Health Criteria: microbial pest control agent – *Bacillus thuringiensis*. 125 pp.