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Gypsy Moth Cooperative Eradication Program in Hennepin County, Minnesota

Environmental Assessment
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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 GM—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 Michigan and parts of 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 throughout most of the continental United States.

The U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS), in cooperation with the U.S. Forest Service (FS) 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. APHIS provides assistance to States to eradicate isolated infestations of GM on 640 acres or less, while FS provides assistance when areas exceed 640 acres.

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, are dispersed to other trees in forests. Small larvae begin feeding on leaves. GM larvae go through five or six 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 eight 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 females 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 larval feeding can alter wildlife habitat, change water quality, reduce property and esthetic value, and reduce the recreational and timber 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), propose to eradicate the GM infestation located in Hennepin County, Minnesota (within the cities of Richfield and Minneapolis). The alternatives being considered have been analyzed in detail in the 1995 final environmental impact statement (EIS) for GM management in the United States and a recent supplemental EIS (USDA, 1995; 2012). The findings of that EIS regarding the alternatives being considered 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 surveying for GM population in the Minneapolis metro area since 1973. In 2016 several adult GM moths were found in a single trap and egg masses were also detected in an alternative life stage survey. The area contains preferred host plants that are susceptible to defoliation by GM, and which could support successful reproduction and spread of the pest. This population needs to be eradicated to avoid potential ecological, economic, and 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 these areas, it could potentially spread to other areas within Minnesota, as well as other parts of the country, including the surrounding States. In the absence of timely eradication action, the associated damage, defoliation, and mortality of host plants from such an occurrence could be devastating.

This EA is tiered to USDA's 1995 final EIS and 2012 supplemental EIS for GM management in the United States. Eradication is being proposed because of the isolated nature of these infestations and the threat that a reproducing population of GM would pose to the vegetation resources of this area.

This site-specific EA is designed to examine the environmental consequences in the proposed treatment areas when using a range of treatment options analyzed in the 1995 final EIS and 2012 supplemental EIS for GM management in the United States that may accomplish the program's goals. The goal of this project is to eliminate GM from the identified area in Hennepin County, Minnesota.

This EA is prepared consistent with National Environmental Policy Act of 1969 (NEPA) (42 United States Code (U.S.C.) § 4231 et seq.), the Council of Environmental Quality NEPA regulations (40 Code of Federal Regulations (CFR) part 1500 et seq.), APHIS' NEPA implementing regulations (7 CFR part 372), and FS' NEPA implementing regulations (36 CFR part 220) 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.

A. Public Outreach

After the treatment sites were proposed for 2017, MDA presented the information to the Minnesota Gypsy Moth Program Advisory Committee for their formal concurrence on the projects as submitted. Next, contact was made with local government units to communicate the proposal and partner on public scoping activities. A formal presentation was given to the city of Richfield's city council and a second is scheduled for the Minneapolis Park and Recreation Board of Directors in mid-April.

Notification letters were sent to legislators whose districts intercepted the proposed treatment block.

A public open house regarding the proposed treatments was held March 1, 2017 at the Sheridan Hill Elementary School. Parcels within and surrounding the proposed treatment block were mailed a four page "Proposal for Gypsy Moth Management" brochure inviting them to the public open house. A press release regarding the public open house was sent to local media advertising the event. Meeting announcements were also posted on the MDA website and social media channels. An open house meeting was held to give interested parties (citizens, residents, municipality officials, other agency officials, etc.) an opportunity to get information, ask questions, and voice concerns. Staff from participating agencies, including the MDA gypsy moth program and Minnesota Department of Health attended. Staff were available for questions and discussion before, during, and after the open house. Informational posters were displayed and a wide array of printed information was available.

MDA also contacted local agency partners including Minnesota Department of Natural Resources, and county park managers near the proposed block so that they may direct citizens to the appropriate information. Other scoping activities included press releases, as well as information on the MDA and partner city and neighborhood association websites.

MDA plans to continue to inform local leaders and affected residents with press releases, legal notices, email blasts, and other outreach opportunities. Additional postings, contacts, and media releases are planned to inform (and remind) the public approximately two weeks before treatments begin. A reminder postcard will be mailed to residents and businesses within the block approximately two weeks prior to application. An information line will be displayed on this postcard to allow residents to call for the most current information leading up to and during applications. The MDA gypsy moth program hotline, Arrest the Pest Hotline (888) 545-6684, will be updated frequently to alert the public of actual treatment dates while social media sites,

including Facebook and Twitter, will also be used for notification. During the treatment period, calls to the hotline and online comments will be directly connected to MDA gypsy moth program staff.

Local law enforcement, emergency care facilities, poison control and the 911 system will be notified the weeks prior to application.

B. Authorizing Laws

1. USDA Authorities

Authorization to conduct treatments for GM infestations is given in the Plant Protection Act of 2000 (7 U.S.C. section 7701), and the Cooperation with State Agencies in Administration and Enforcement of Certain Federal Laws (7 U.S.C. section 450). The Cooperative Forestry Assistance Act of 1978 (Public Law (P.L.) 95–313) provides the authority for Federal and State cooperation in managing forest insects and diseases. The 1990 Farm Bill (P.L. 101–624) reauthorizes the basic charter of the Cooperative Forestry Assistance Act. The NEPA of 1969 requires detailed environmental analysis of any proposed Federal action that may affect the human environment. The Federal Insecticide, Fungicide and Rodenticide Act of 1947, as amended, known as FIFRA, requires insecticides used within the United States be registered by the U.S. Environmental Protection Agency (EPA). Section 7 of the Endangered Species Act prohibits Federal actions from jeopardizing the continued existence of federally listed threatened, endangered, or candidate species or adversely affecting critical habitat of such species. Section 106 of the National Historical Preservation Act and 36 CFR part 800: Protection of Historic Properties requires the State Historic Preservation Officer be consulted regarding the proposed activities.

2. State Authorities

The Minnesota State Statutes Chapter 18G, Plant Protection and Export Certification, authorizes MDA to conduct detection and eradication projects for plant pests. MDA's Pesticide Control Law Chapter 18B provides the State statutes governing pesticide application.

C. Decisions to be Made

Gypsy moth eradication work is supported by two agencies within USDA. Each agency has different roles and responsibilities in gypsy moth management. Per the revised memorandum of understanding between APHIS and the Forest Service, signed in 2009, APHIS is responsible for eradication work of 640 acres or less, while FS' State and Private Forestry (S&PF) is the lead agency for treatment areas larger than 640 acres. The proposed treatment area in Hennepin County for the GM eradication is 329 acres. APHIS will have responsibility for the proposed treatment in Hennepin County in 2017.

The preferred alternative in this document proposes a multiagency approach between APHIS and MDA. The responsible officials must decide the following:

- Should there be a cooperative treatment program, and if so, what type of treatment options should be used?

- Is the proposed action likely to have any significant impacts requiring further analysis in an EIS if treatments are to be implemented?

D. Responsible Officials

The responsible official for APHIS is:

Anthony Man-Son-Hing
National GM Program Manager
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The responsible official for APHIS will make a decision before mid-May to ensure timely funding for an effective program that meets the State's objectives on State and private lands in Hennepin County for the proposed eradication site under 640-acres, if an action alternative is selected.

The official responsible for implementation for MDA is:

Kimberly Thielen Cremers
Pest Mitigation and Regulatory Response Unit Supervisor
Minnesota Department of Agriculture
Plant Protection Division
625 Robert Street North
St. Paul, MN 55155

E. Other Gypsy Moth Work

In addition to the proposed work in Hennepin County, there is GM work proposed for two other sites in Minnesota in 2017. There is a proposed treatment block approximately two miles north of the town of Hinckley in Pine County. The proposed treatment block proposed at this site is 791 acres. Btk treatments similar to those proposed for the Richfield area are proposed for the Hinckley site. The other area proposed for treatment is a 1,751 acre site approximately 0.35 miles northeast of Pine Creek in Winona County. Mating disruption is proposed for the Pine Creek site. The Hinckley and Pine Creek sites are located in rural areas in Minnesota. These blocks are larger than the 640-acre limit that would receive treatment by APHIS. These treatment sites will be analyzed in other NEPA documents and are not part of the analysis in the preferred alternative in this EA.

III. Alternatives

This EA is tiered to the USDA's 1995 Final EIS and 2012 supplemental EIS for GM Management in the United States. The preferred alternative in the 1995 EIS is alternative 6: Suppression, Eradication, and Slow the Spread. This alternative was proposed because of the isolated nature of GM infestations in Minnesota. This site-specific EA is designed to examine the environmental consequences of a range of treatment options listed under the EIS preferred alternative (alternative 6) that may accomplish the program's goal.

Under alternative 6 of the EIS, six treatment options were analyzed in the 1995 EIS with an additional treatment option analyzed in the 2012 supplemental EIS:

1) Btk—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®)—an insect growth regulator that interferes with the growth of some immature insects.

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

4) Mass Trapping—a treatment that consists of large numbers of pheromone traps used to attract the male GM thus preventing them from mating with females and, thereby, causing a population reduction.

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

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

7) Tebufenozide—an insecticide that controls molting in various insects and other invertebrates.

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,

such as the area being proposed in this site-specific EA.

The remaining treatment options were not selected due to availability, or environmental or efficacy concerns. As such, diflubenzuron is an insect growth regulator that has a broader nontarget host range than Btk, and can kill many other insects in addition to moths and butterfly caterpillars. Its use may adversely affect other insect populations and, therefore, was not selected. Similar types of impacts would be expected with the use of tebufenozide. GM virus (Gypcheck) is very host-specific, but is not widely available in the market; therefore, it was not selected. Mating disruption was not selected due to the presence of alternate life stages. Sterile insect release experiments show variable results for eradication programs and, consequently, sterile insects were not selected.

This EA analyses two alternatives (1) the no action alternative and (2) the proposed action that will utilize two applications of Btk, combined with post-treatment delimitation trapping for two years to ensure that the treatment is effective.

A. No Action

Under the no action alternative, GM would reproduce and populations would spread to surrounding areas. This is not a preferred alternative because environmental damage and regulatory action will occur sooner than if other alternatives are selected. If no action was taken APHIS would not aid in the treatment of the area in Hennepin County. 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 the proposed action alternative, APHIS would provide funding for the Hennepin County proposed treatment area. Btk (Foray® 48B) will be applied via aerial application over the proposed treatment area. Two applications of Btk will be applied with an interval of approximately five to 10 days between each application. These applications are estimated to occur sometime in mid-May 2017. The exact date of application 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.

Pheromone-baited GM traps will be used to monitor success of the treatments. Trapping density will be as high as one trap per 250 square meters in each treatment area to determine if the treatments are successful.

IV. Affected Environment

The treatment site proposed for GM eradication is a 329-acre area located in Hennepin County, Minnesota. A map of the area is available in attachment A with a description of the area below.

Richfield (Hennepin County)

The proposed treatment area falls primarily (275 acres) within the northeastern section of the city of Richfield within Hennepin County. A small section (54 acres) falls within the southwest portion of Minneapolis. State Highway 62 is the dividing line between Minneapolis to the north, and the City of Richfield to the south. The proposed treatment area is an urban area that is home to approximately 2,522 residents/mi^2. The majority of development is low density residential with some light commercial development. The treatment block is comprised of 1,068 parcels, ranging from single-family residential homes to retail development. Sheridan Hills Elementary school is centrally located within the proposed treatment block. There are several known day care providers located within this block, including three child care centers and two family child care providers. Within close proximity to the treatment block are several additional childcare providers, schools, multiple health care clinics, and a hospital. There are no Federal, State or tribal lands located within the proposed treatment area.

V. Environmental Impacts of the Proposed Action and Alternatives

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

A. No Action

Selection of the no action alternative would likely result in the establishment of GM populations in Hennepin County which could lead to commensurate damage to trees relative to the level of infestation. The majority of the trees in the eradication and surrounding area are susceptible to damage from GM larvae. The no action alternative would allow 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 likely occur. The ecological and human health effects associated with GM were examined in the 1995 final EIS and the 2012 supplemental EIS for GM management in the United States (USDA, 2012; USDA, 1995). This EA incorporates the EIS evaluation by reference from the material discussed in both of the EIS documents. An ecological and human health effects summary is provided below.

1. Gypsy Moth

a. Ecological Impact

Most of the environmental impacts associated with GM are caused by the larval stage. This stage of GM is the feeding stage which can lead to changes in forest stand composition (USDA, 1995). In areas where GM populations are high, 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). GM-related defoliation of trees can also result in negative impacts to native Lepidoptera (Manderino et al., 2014).

The areas of infestation, as well as surrounding areas, contain many host trees that would be threatened by GM defoliation. GM larval 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 GM were to spread to other areas, changes in water quality and effects to aquatic organisms could occur (USDA, 1995). The loss of vegetation in the affected areas could lead to increased erosion of soil and loss of moisture retention (USDA, 1995).

b. Human Impact

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 GM 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 var *kurstaki*, or Btk, is a naturally occurring bacterium that has selective insecticidal activity against certain butterflies and moths. *Bacillus* 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 45 years for a variety of agricultural and nonagricultural uses. Btk is widely used in agriculture, both conventional and organic, and as a transgene in genetically engineered crops to control pests on a variety of crops. Btk also has multiple nonagricultural 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 which requires ingestion by lepidopteran larvae where, once in the midgut, the alkaline pH breaks down the crystalline proteins that produce the toxins which 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 nontarget 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 Organic Materials Review Institute listed as a Certified Organic product. Two aerial applications of Foray® 48B, 5- to 10-days apart, will be made at a rate of 64 fluid ounces (fl oz.) of product per acre. Rates of application vary based on the life stage of GM found and the level of infestation. The program uses the lowest rate possible that will still ensure adequate control of GM.

a. Ecological Impact

Nontarget 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., 1992); 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); nevertheless, in several other studies assessing impacts to a wide diversity of songbirds, no indirect effects on reproduction or 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 potential treatment areas are relatively small compared to the foraging areas that birds may use. Finally, only some lepidopteran larvae will be impacted in the potential treatment areas, while other terrestrial insects will be available as prey items for birds.

Effects to most nontarget 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 honey bees, as well as other beneficial insects (USDA, 2004). Effects to honey bees, in particular, are not expected based on the available published studies designed to evaluate short- and long-term effects from exposure to Btk or Bt-related proteins (EPA, 1998; Sterk et al., 2002; Bailey et al., 2005; Duan, et al, 2008). These studies evaluated impacts to larval and adult honey bees from oral or contact exposures with no lethal or sublethal impacts noted at concentrations above those expected from the proposed use pattern for Btk in this program. Some nontarget Lepidoptera larvae (caterpillars) present in the proposed spray areas 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 U.S. Fish and Wildlife Service and Department of Natural Resources information.

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. 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 as a result of this program (USDA, 2004). There have been laboratory studies supported by field data which suggest that 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 of 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. In addition to the lack of effects to aquatic organisms from Btk exposure, there are current label restrictions on distance requirements to a water body that will reduce the potential for exposure to aquatic resources.

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 one week; however, other studies have shown that while persistence of Btk in the environment may decrease rapidly, the insecticidal activity can persist up to three 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 four weeks, after application (USDA, 1995). Variations in environmental fate are attributable to various factors, including environmental conditions, formulation chemistry, study protocols, and sampling substrates.

b. 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 safety data sheet (SDS) of Foray® 48B, states that the formulated material can be a transient mild eye and skin irritant. The information in the SDS 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, which compare

potential exposure data from similar applications to those proposed in this program, have demonstrated wide margins of safety with potential exposure values to the general public ranging from 28,000 to 4 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 (which 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 foodborne 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 percent of the total number of foodborne 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 foodborne illness cases linked to Btk exist in more than 45 years of extensive use. The lack of pathogenicity may be related to the relatively 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; this does not appear to occur for Btk in the environment. This is supported by a lack of gastrointestinal symptoms linked to Btk applications by 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, indicate 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., 1992; 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 birth weight, meningococcal disease, or infections. Adverse effects that were self-reported during the study were related to dermal, respiratory, and eye 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 residents (or 62 percent) responding after treatment. The authors of the paper assessed the frequency of 25 potential health problems before and after treatment. Of these 25 symptoms, including sleep problems, dizziness, difficulty concentrating, irritated throat, itchy nose, diarrhea, stomach discomfort, and gas discomfort, 8 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, because 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, and no other additional information is offered. 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 as 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 of 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. Glare and O'Callaghan (2000) provide a comprehensive review of *Bacillus thuringiensis*, including Btk. They conclude with this statement, "After covering this vast amount of literature, our view is a qualified verdict of safe to use" (Glare and O'Callaghan, 2000). The World Health Organization's Environmental Health Report (1999) states "Bt products can be used safely for the control of insect pests of agricultural and horticultural crops as well as forests."

Mild irritation of the eyes, skin, and respiratory tract may be associated with exposures to Btk; however, this is more likely to occur to applicators who are handling the concentrated material. Risks to applicators will be minimized as long as Foray® 48B is handled according to label requirements.

A public meeting regarding the proposed Btk applications occurred on March 1, 2017; additional public outreach and education will continue with local citizens, as well as the Minnesota Department of Health and local hospitals and clinics closer to the time of treatment.

c. Summary

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

There will be minimal risk to most nontarget terrestrial and aquatic organisms due to limited exposure and low toxicity. Impacts to some native lepidopteran larvae within the spray areas may occur; however, the effects are expected to be minor due to the size of the treatment areas 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 the male GM. The environmental impacts and human impacts are summarized below.

a. Ecological 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, nontarget insects will not be attracted to traps, the number of nontarget organisms affected will be very small, and the pheromone will have minimal impacts to the environment.

b. 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 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; if this were to occur, the individuals 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. Nevertheless, physical contact with disparlure from trapping is unlikely, and would only occur if someone were to tamper with the traps.

c. Summary

Human health risks are expected to be minimal from using disparlure baited traps in this program based on disparlure's long-term safety and the fact that it would be unlikely that humans would come into contact with disparlure in the traps. The potential for exposure is greatest to workers who handle the concentrated product; however, exposure will be minimized by following label requirements. A continuation of local outreach and education will minimize anxiety and health concerns associated with these treatments.

There will be minimal risk to most nontarget terrestrial and aquatic organisms due to limited exposure and low toxicity. The traps themselves are baited with pheromone specific to gypsy moth. There may be incidental captures of nontarget insects that enter the trap by mistake, but the number of nontargets affected would be very small.

VI. Other Issues

A. Cumulative Impacts

The proposed GM eradication program has limited impacts to lepidopteran and other nontarget 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 consequences 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 projects in the proposed treatment areas that will affect lepidopterans or other nontarget organisms that may be affected by this action.

Btk has other uses including organic and inorganic crop, and home and garden uses. The amount of Btk currently used in the treatment area is unknown; however, there would be an expected increase in environmental loading of Btk with the proposed treatments. However the cumulative impacts from additional Btk use, relative to other stressors is expected to be incrementally negligible to human health and the environment due to the very low risk of Btk. The proposed use of Btk at the Hinckley site is not expected to result in any Btk-related cumulative impacts because that site is over 100 miles away from the proposed Richfield site. The proposed treatments at all three sites will result in cumulative impacts related to the protection of vulnerable GM host trees in the proposed treatment areas as well as other areas in the state if GM were allowed to expand.

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, thus limiting their chances to reestablish in the proposed treatment area. However, if future treatments are needed, a subsequent EA will be prepared and risks will be evaluated further.

B. Threatened and Endangered Species

Section 7 of the Endangered Species Act (ESA) and ESA'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. USDA APHIS has considered the impacts of the proposed program regarding listed species in Hennepin County.

The threatened northern long-eared bat, *Myotis septentrionalis,* is the only federally listed species that occurs in Hennepin County. APHIS has determined that the proposed gypsy moth program is not likely to jeopardize the continued existence of the northern long-eared bat. APHIS prepared a biological assessment and submitted it to the U.S. Fish and Wildlife Service, Twin Cities Ecological Services field office for concurrence. The biological assessment, prepared by T. Willard, dated November 2016, is included in the administrative record for this EA. APHIS received a concurrence letter from the U.S Fish and Wildlife Service on December 28, 2016.

C. Historical Preservation

Consistent with the National Historic Preservation Act of 1966, APHIS has examined the proposed action in light of its impacts to national historical properties. Requests to review State historical sites were submitted by MDA to the Minnesota Historical Society on February 06, 2017. MDA received a response from the Minnesota Historical Society on March 01, 2017 confirming that no historical properties are present in the proposed treatment area. MDA will continue to coordinate with the State Historic Preservation Office to ensure that if any historic properties occur in the proposed treatment area there will be no impacts to these properties.

D. 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 proposed treatment areas have been determined based on GM finds in the area. The proposed 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 proposed treatment areas are not expected to be adversely affected disproportionately more than adults from the proposed program actions. Btk poses a very low risk to the human population, including children. There are child care centers and a school within the proposed treatment area, however notification to the public prior to the proposed spray and the low risk of adverse impacts from Btk will ensure protection of this group of the human population.

VII. Listing of Agencies and Persons Consulted

Minnesota Department of Agriculture
Plant Protection Division
625 Robert Street North
St. Paul, MN 55155

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. 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 and Risk Analysis Services
4700 River Road, Unit 149
Riverdale, MD 20737

U.S. Fish and Wildlife Service
Twin Cities Ecological Services Field Office
4101 American Blvd East
Bloomington, MN 55425-1665

Minnesota Department of Natural Resources
Division of Ecological and Water Resources
500 Lafayette Rd.
St. Paul, MN 55155

Minnesota Historical Society
Manager of Government Programs and Compliance
345 Kellogg Blvd. West
St. Paul, MN 55102

Minnesota Department of Health
Environmental Health Division
625 Robert Street N
St. Paul MN 55164

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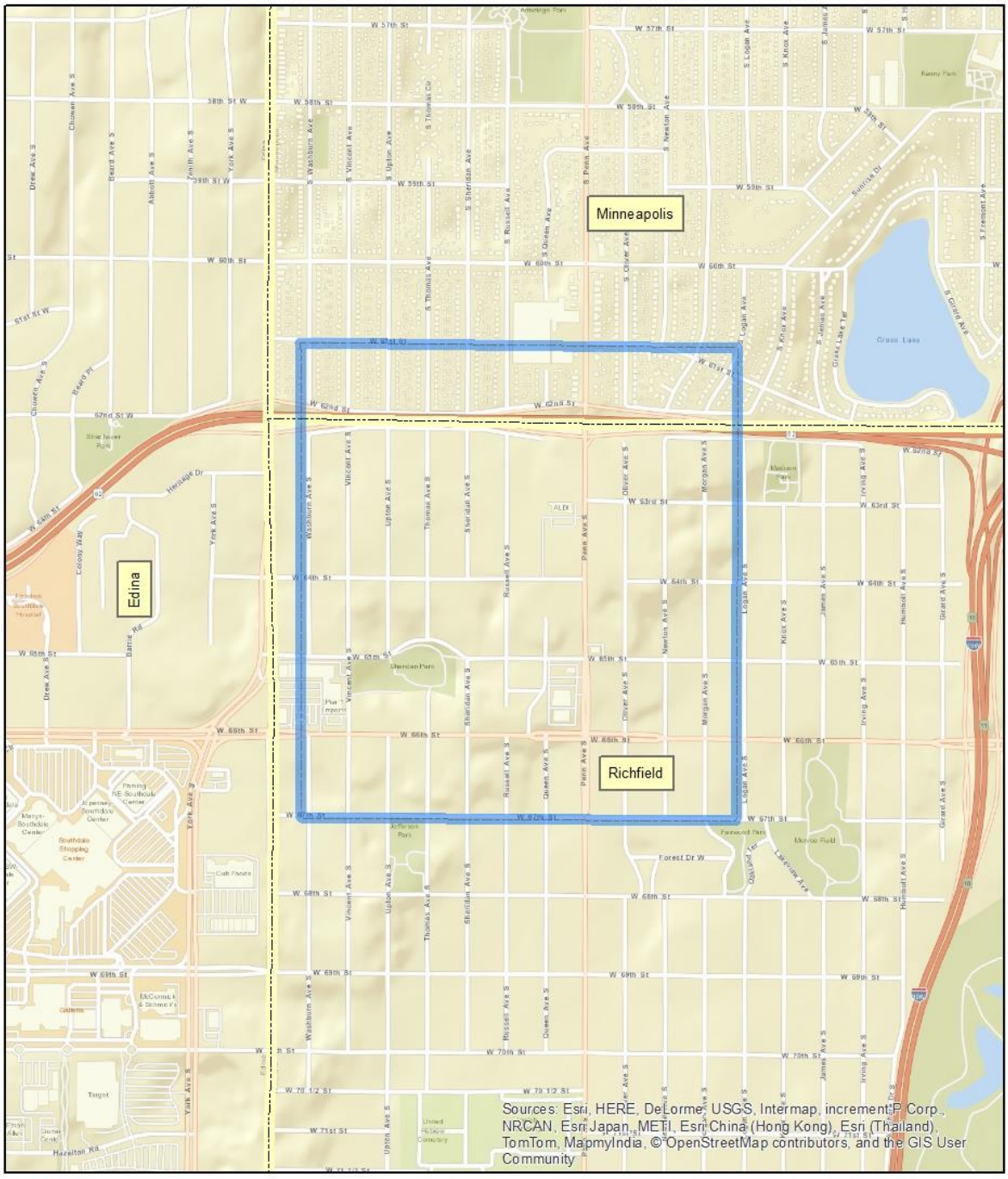
Appendix A. Map of Treatment Area

Richfield Proposed Btk Treatment Site



329 acres

Treatment Boundary

City Boundary

0 500 1,000 2,000 Feet

0 0.25 0.5 Miles

N W E S

Date: 1/11/2017

Minnesota Department of Agriculture