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Gypsy Moth Cooperative Eradication Program in Anoka, Hennepin, and Washington Counties, Minnesota

Environmental Assessment
April 2011

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Agency Contacts:
Julie Spaulding
National GM Program Manager
USDA/APHIS/PPQ
4700 River Road, Unit 134
Riverdale, MD 20737–1236

Barbara Tormoehlen
St. Paul Field Office Field Representative
USDA / Forest Service, Northeastern Area
State and Private Forestry
1992 Folwell Avenue
St. Paul, MN 55108

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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 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 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

USDA–APHIS and FS, in cooperation with Minnesota Department of Agriculture (MDA), propose to eradicate the GM infestations located in Anoka, Hennepin, and Washington Counties, 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 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 tracking the GM population in the Minneapolis metro area for decades. In August 2010, MDA staff found evidence of reproducing GM females in three areas—one area consists of 539-acres in Coon Rapids, Minnesota (Anoka County), the second area is a 136-acre site in Minnetonka, Minnesota (Hennepin County), and a third area is an 844-acre site in the city of Grant, Minnesota (Washington County). All areas contain preferred host plants that are susceptible to defoliation by 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, 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 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.

MDA has participated in 38 similar eradication projects on over 5,000 acres throughout Minnesota, including the eradication of GM populations

in other metro areas, such as Brooklyn Park, Edina, South Minneapolis, Richfield, Minnetonka, and Golden Valley.

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 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 areas.

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

MDA conducted two public meetings on February 8, 2011 in Coon Rapids and February 9, 2011 in the city of Grant. The Minnetonka location is a business park with very few permanent residents; consequently, managers of the business park and mangers of the businesses within the park were notified and consulted.

A bulletin was mailed to residents, businesses, 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 an appearance in front of the Coon Rapids City Council provided further community outreach. A presentation was given to the Edina City Council on April 5, 2011. In addition, information regarding the GM program will be made available at the Coon Rapids Green Trade Show on April 30, 2011, and there was a segment on the GM proposed spray area on the cable access television show "All About Grant" taped on April 16, and aired throughout April and May.

Ongoing communication with local leaders about the project helps them stay informed. Approximately 2 weeks ahead of the treatment date, a postcard will be mailed to residents and businesses reminding them of the event and offering the Arrest the Pest Hotline (888) 545–6684 to call for pre-recorded messages about the progress of treatment activities.

Mass media outlets will be contacted through press releases before treatments, and local community newspapers and webmasters will be offered information. Social media, such as facebook and twitter, will be used to provide real-time updates to MDA followers.

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 (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 National Environmental Policy Act (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. USDA Departmental Gypsy Moth Policy (USDA, 1990) assigns the FS State and Private Forestry and APHIS responsibility to assist States in protecting nonfederal lands from gypsy moth damage.

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

The eradication work considered in this EA 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 FS, 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. For the treatments proposed for 2011, two areas (Coon Rapids and Minnetonka) fall under APHIS responsibility and one (City of Grant) falls to FS–S&PF.

The preferred alternative in this document proposes a multiagency approach between APHIS and FS S&PF and APHIS as a cooperator with MDA as a cooperator. 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 environmental impact statement (EIS) if treatments are to be implemented?

D. Responsible Officials

The responsible official for the APHIS is:

Julie Spaulding
National GM Program Manager
USDA/APHIS/PPQ
4700 River Road, Unit 134
Riverdale, MD 20737–1236

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 Anoka and Hennepin County for two proposed eradication sites under 640-acres, if an action alternative is selected.

The responsible official for FS–S&PF is:

Barbara Tormoehlen
St. Paul Field Office Field Representative
USDA–FS, Northeastern Area
State & Private Forestry
1992 Folwell Avenue
St. Paul, MN 55108

The responsible official for FS–S&PF 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 Washington County, if an action alternative is selected for the 844-acre site. This decision is not subject to appeal.

The official responsible for implementation for MDA is:

Geir Friisoe, Division Director
Plant Protection Division
Minnesota Department of Agriculture
625 Robert Street North
St. Paul, MN 55155–6448

E. Other Gypsy Moth Work

Additional GM work is planned elsewhere in Minnesota for 2011. Approximately 115,500 acres are proposed for treatment with mating disruption in Cook, Lake, St. Louis, and Carlton Counties near the Lake Superior shore. Additionally, a single Btk treatment block (~350 acres) is proposed within the city of Duluth. A separate EA and decision notice will be issued for this work. They are not considered connected actions and will not be considered further in this EA.

III. Alternatives

This EA 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. 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:

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.

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 three areas 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. 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, 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 delimit trapping for 2 years to ensure that the treatment is effective.

A. No Action

Under the no action alternative, APHIS and FS would not aid in the treatment of any of the three 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 or FS.

B. Proposed Action

Under the proposed action alternative, APHIS would provide funding for both the Coon Rapids and Minnetonka proposed treatment areas. FS would provide funding for the city of Grant proposed treatment area.

Btk (Foray® 48B) will be applied via aerial application over each of the three proposed treatment areas. Two applications of Btk will be applied with an interval of approximately 5 to 10 days between each application. These applications are estimated to occur sometime in mid-May 2011. 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.

Baited GM traps will be used to monitor success of the treatments. Trapping density will be as high as 1 trap per 250 meters in each treatment area to determine if the treatments are successful.

IV. Affected Environment

There are three treatment sites proposed for GM eradication in Anoka, Hennepin, and Washington Counties, Minnesota. One of the proposed treatment areas is a 539-acre area in Coon Rapids, Minnesota (Anoka County). A second site is a 136-acre site in Minnetonka, Minnesota (Hennepin County). The third site is an 844-acre site in the city of Grant, Minnesota (Washington County). Maps of these areas are available in attachment A. A description of each area is below.

A. Coon Rapids (Anoka County)

A total of 83 adult moths were trapped within the 539-acre area in 2010. These finds prompted an alternate life stage search that revealed one spent egg mass, a fresh egg mass, and two empty GM pupal cases. The area is densely covered with a network of suburban streets. Crooked Lake is a 118-acre lake ½ mile to the west of the area with no portion falling inside the proposed treatment area. There are no other named or unnamed bodies of water or streams of note in this area.

The proposed treatment area falls mainly in the city of Coon Rapids with just a northern tip (16 acres) in the city of Andover; both cities are entirely within Anoka County. There is a city park with a ball field and trails in the southern region of the area, as well as an agricultural field. Outside the area to the west is a medium-sized sod farm operation of 74 acres. The majority of development is low-intensity residential.

The estimated population density in this proposed treatment area is 3,000 people per square mile. There are no schools or hospitals located in this area; however, there are 28 licensed daycare centers.

B. Minnetonka (Hennepin County)

Within this 136-acre proposed treatment area, 29 GM adults and one egg mass were identified in 2010. This is a site MDA has been monitoring as part of a trace-forward regulatory activity. This area is mostly within Minnetonka with portions reaching into Eden Prairie and Edina within Hennepin County. The area is primarily composed of a large business park with many office buildings, one hotel, and one building of condominiums. There are a few wooded areas between parking lots that have walking paths between buildings. A few retention ponds fall within the area, but there are no other notable bodies of water or streams.

The acreage proposed for treatment is almost completely developed. The population density in this area is 3,500 people per square mile, although the proportion is skewed to workers in office buildings, not full-time residents. There are no licensed daycare facilities located in or around this area, and the closest school/daycare center is located more than .25 miles outside of the area.

C. City of Grant (Washington County)

This proposed treatment area (844 acres) is found in the city of Grant and is the largest of the three sites. In 2010, a total of 69 GM adults and hundreds of GM egg masses, empty pupal cases, and shed caterpillar skins were found within this area. This proposed treatment area contains one permanent body of water—Sunnybrook Lake, which is approximately 12.5 acres. It is in the western portion of the area and is hydrologically connected to four smaller unnamed lakes that may be seasonal reservoirs. There are no streams of note in the area.

This area falls entirely in the city of Grant in Washington County. An average of 170 people per square mile can be found in this area, and only about 20 percent of the land cover is developed. Indian Hills Golf Club covers the southeast quarter of the area. There are two dense residential developments, as well as some scattered, large acreage homesteads. There is also an agricultural field in the northeast corner with approximately 46 acres that are plowed. A few other smaller, open meadows or agricultural fields are scattered through the area, as well as a large field outside the area to the southeast. There are no licensed daycare facilities, schools, or hospitals located within the proposed treatment boundaries.

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 the Coon Rapids, the city of Grant, and the 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 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 for GM management in the United States, which is currently being updated (USDA–APHIS, 2008; USDA, 1995). This EA incorporates by reference the material discussed in the EIS, and is summarized 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).

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. 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 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 OMRI-listed as a Certified Organic product. Two aerial applications of Foray® 48B, 5- to 10-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 of GM found and the level of infestation. The program will use 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–APHIS, 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–APHIS, 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–APHIS, 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–APHIS, 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. One small pond is located in the Minnetonka proposed treatment area; however, an appropriate application buffer will be used 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–APHIS, 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–APHIS, 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–APHIS, 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–APHIS, 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 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–APHIS, 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, 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–APHIS, 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–APHIS, 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–APHIS, 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–APHIS, 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–APHIS, 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–APHIS, 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. Public meetings regarding the spray have already occurred; 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 recommendations. A continuation of local outreach and education will minimize anxiety and 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 areas 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 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–APHIS, 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–APHIS, 2006). Studies using cladocerans revealed toxicity was related to the organisms becoming physically trapped at the water surface where undissolved pheromone was present (USDA–APHIS, 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 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; if this were to occur, the individuals may attract adult male moths for prolonged periods of time (up to 2 to 3 years) (USDA–APHIS, 2006). No toxic effects are expected but it may be a considerable nuisance in GM-infested areas, such as the eastern United States (USDA–APHIS, 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 trap.

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. The potential for exposure is greatest to workers who handle the concentrated product; however, exposure 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 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. 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 impacts 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.

Cumulative effects are considered for all proposed treatment blocks 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 was solicited from a variety of sources, including the U.S. Fish and Wildlife Service, the Minnesota Department of Natural Resources' Natural Heritage Group, as well as environmental organizations.

1. Previous Actions

There have been a total of eight GM Btk treatment areas in these three counties since 1984 for a total of 3,220 acres. This acreage includes a treatment area in 2002 which had approximately 1,800 acres. Other

treatment areas were similar to the three treatment sites examined in this EA. None of these areas overlap with the current proposed treatment sites.

In addition, a 21-acre area was treated with diflubenzuron in 1999. This treatment site does not overlap any of the other treatment sites conducted in the past or proposed for treatment this year.

The previous treatment areas discussed above are unlikely to add impacts to the current proposed treatment areas because none of the areas overlap. In addition, impacts from the use of Btk and the one site of diflubenzuron are short term and limited to the treatment area. The potential of cumulative impacts with Btk application occurs when the same area is treated consecutive years or when application sites overlap.

2. Other Actions in 2011

In 2011, several other treatment areas in Minnesota will be federally funded through the GM Slow the Spread Foundation (STS). Thirteen separate sites have been identified for GM treatment, both with Btk and mating disruption. The closest mating disruption treatment site to the proposed eradication areas is approximately 140 miles away, near Proctor, Minnesota, and the nearest Btk treatment site is approximately 150 miles away in Duluth, Minnesota. An EA will be prepared separately for all STS sites.

3. Future Actions

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 conducted 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 and FS have considered the impacts of the proposed program regarding listed species in Anoka, Hennepin, and Washington Counties.

There are no federally listed species in Anoka County and, therefore, the proposed program at Coon Rapids will have no effect on listed species. One species, the Higgins eye pearlymussel (*Lampsilis higginsi*), is federally listed as endangered, and occurs in the Mississippi River in Hennepin County. Impacts to aquatic species from Btk (including fish and mussels) are not expected and, in addition, treatment sites are more than

3 miles from the Mississippi River thus eliminating exposure of mussels and glochidial host fish to Btk. Therefore, APHIS has determined that the proposed program will have no effect on the Higgins eye pearlymussel.

In Washington County, the only threatened or endangered species are mussels (Higgins eye pearlymussel, Snuffbox, Spectaclecase, and Winged mapleleaf). Impacts to aquatic species from Btk, including fish and mussels, are not expected and, in addition, treatment sites are more than 3 miles from the Mississippi River, eliminating exposure of mussels and glochidial host fish to Btk. Therefore, FS has determined that the proposed program will have no effect on these species.

Two State-listed species were identified by the Minnesota Natural Heritage Information System which included the *Hesperia leonardus leonardus* (Leonard's Skipper) and the *Lycaeides nabokovi* (Nabokov's Blue). Both species are approximately .3 to over 1 mile away from the treatment areas. In addition, the proposed treatment areas and the habitat of both species are separated by a residential development and a golf course. Based on this buffer, none of the Btk applied to the proposed treatment areas is expected to negatively impact these two species.

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 to the Minnesota Department of Natural Resources Natural Heritage Group and the Minnesota Historical Society. The proposed project was reviewed and, based on the proposed action, the State Historic Preservation Office concluded that no historic properties listed in or eligible for the National Register of Historic Places will be affected by the proposed project (B. Bloomberg, pers. com., Jan. 7, 2011).

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.

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

U.S. Department of Agriculture
U. S. Forest Service
Northeastern Area State & Private Forestry
Forest Health Protection
1992 Folwell Avenue
St. Paul, MN 55108

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 Ball, City Forester, City of Minnetonka
- Ed Quinn, MN DNR Division of Parks, St. Paul, MN
- Kate Sande, Minnesota Department of Health
- Donna Leonard, USFS State and Private Forestry, Asheville, NC
- John Kyhl, USFS State and Private Forestry, St. Paul, MN
- Laura Van Riper, MN DNR Division of Ecological Resources—Natural Heritage and Nongame Research Program, St. Paul, MN
- Tamara Smith, USDI Fish&Wildlife Service, Bloomington, MN
- Stephen Nicholson, Valent BioSciences
- Minnesota State Historical Society, St. Paul, MN
- Kevin Connors, USDA–APHIS–PPQ, St. Paul, MN

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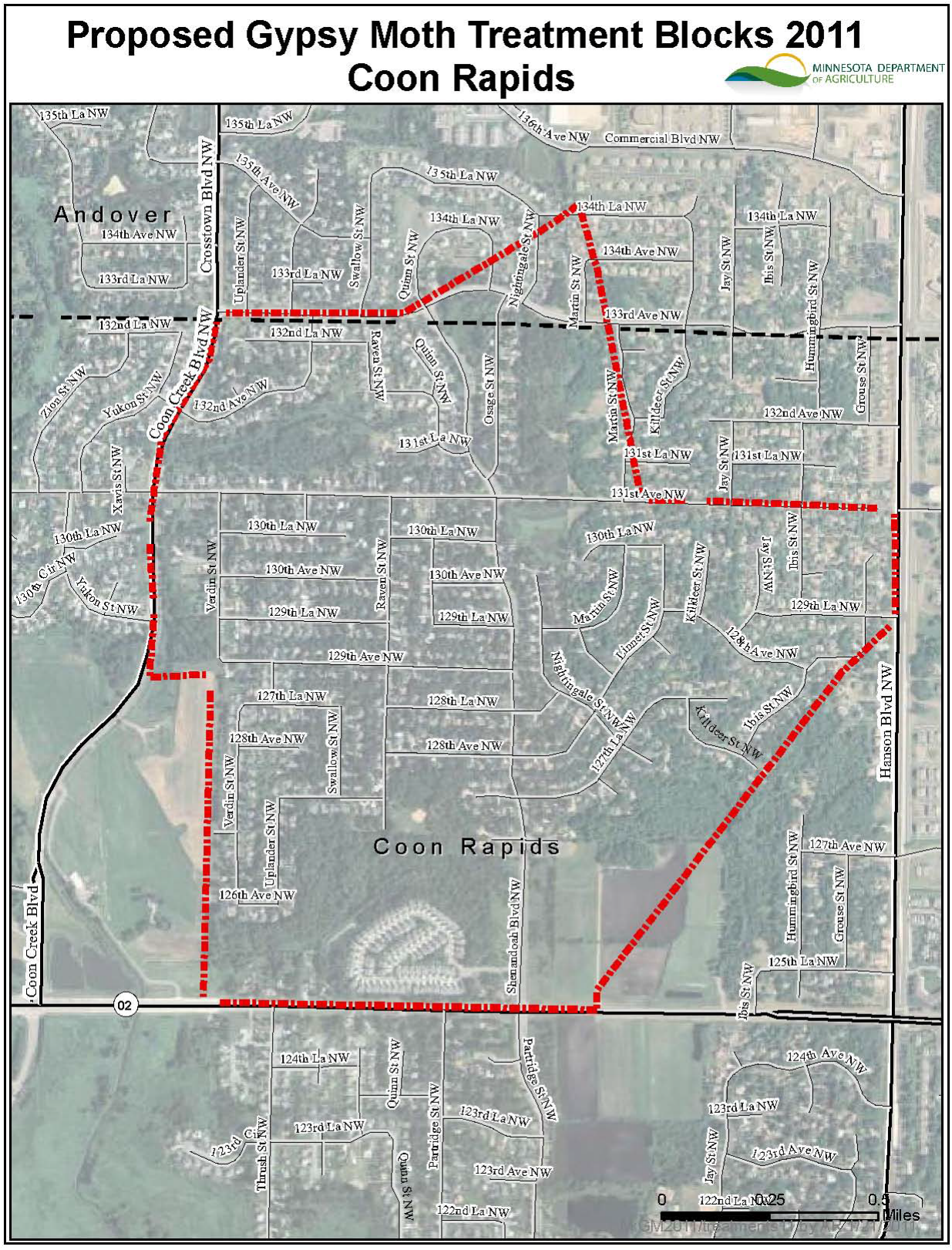
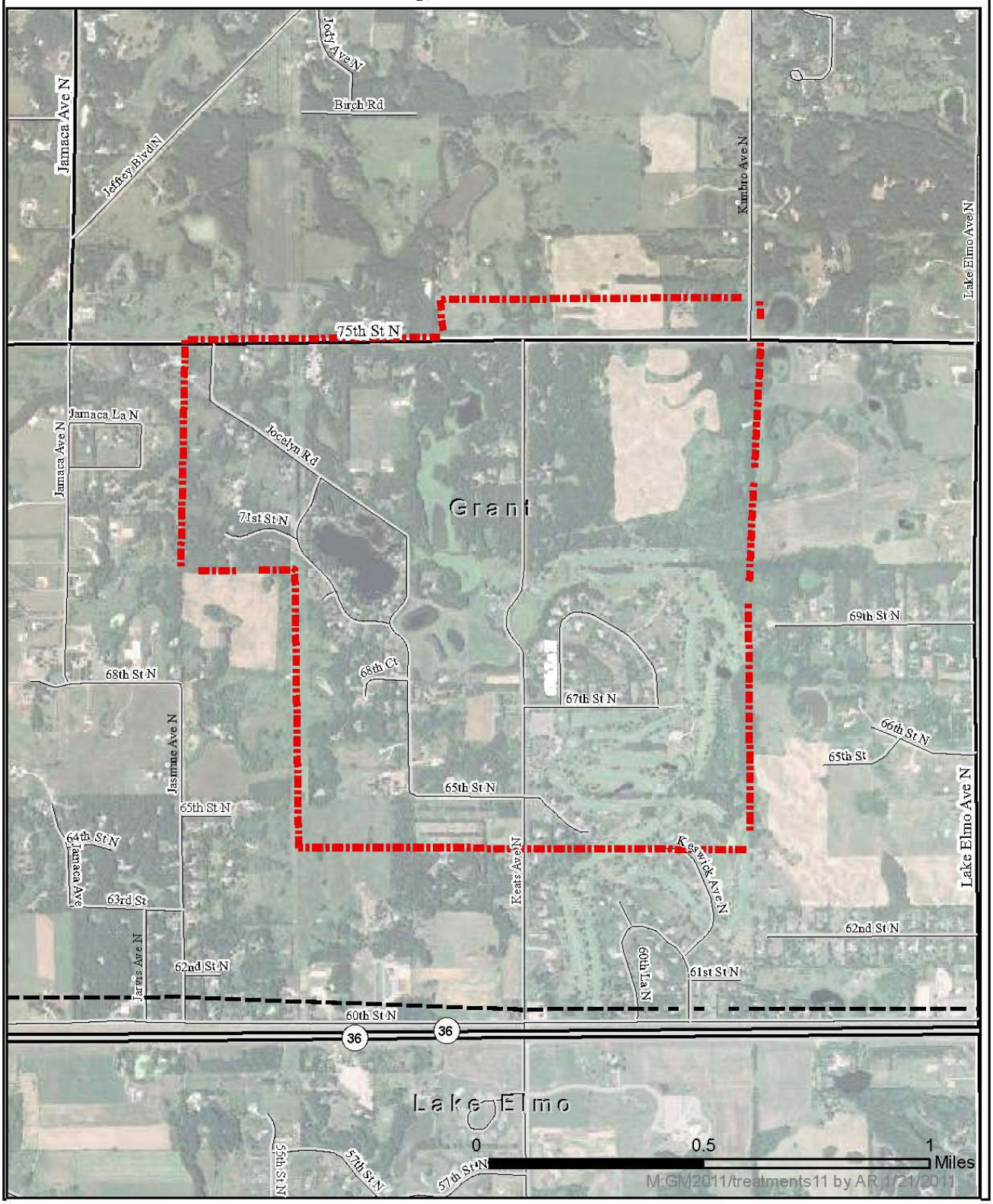
Appendix A. Maps of Treatment Areas



Proposed Gypsy Moth Treatment Blocks 2011
Minnetonka

Proposed Gypsy Moth Treatment Blocks 2011
City of Grant



Appendix B. Comparative Summary of Gypsy Moth Treatment Alternatives by Issue

	No Action Alternative	Proposed Alternative
Human Health & Safety	- No risk of an aircraft accident or spill. - No risk of pesticide contact with humans. - Gypsy moth (GM) outbreaks and associated nuisance impacts on humans would occur sooner than under other alternatives. - The effects of GM outbreaks on humans would occur sooner than if other alternatives are selected.	- Risk of aircraft accident and/or a pesticide spill exists, but it is slight. - Risk to human health from contact with Btk is minimal. - Work, safety and security plans are developed to minimize the chance of an accident or exposure to Btk. - Contact with Btk may cause mild and temporary irritation (eye, skin & respiratory) to a few people. - Use would delay the effects of GM outbreaks on humans
Effects on Nontarget Organisms & Environmental Quality	- No direct risk to nontarget organisms, including T&E species. - Positive and negative ecological impacts associated with GM would occur sooner, which includes defoliation and reduction in the oak and aspen-birch components of forest stands. - Noticeable defoliation likely in 5-15 years, sooner than under other alternatives. - Some mortality of preferred host species is possible. - Eventual changes in ecosystem plant and animal composition, especially those that feed on GM hosts. - Without STS project work, GM will establish and cause damage sooner than if STS is not implemented. In response to GM presence, private landowners will react, in some cases, with private applications of insecticides. There are few restrictions on the use of broad spectrum insecticides resulting in greater likelihood for impacts to forest communities, water quality and non targets when compared to other alternatives. With private pesticide applications, consideration of T&E species is not required.	- Direct impact is likely on some spring feeding caterpillars (Lepidoptera) within the proposed treatment area, resulting in a temporary reduction in local populations. - Not likely to adversely affect T&E or sensitive species other than the Lepidoptera. Effects to Lepidoptera would be minor due to the design of the treatment area, the small size of the areas to be treated, and expected recolonization from adjacent areas. - Indirect impact on other non-target organisms (birds, mammals, etc.) that feed on caterpillars is unlikely due to small acreage proposed and because Btk does not bioaccumulate. - Delayed gypsy moth-related defoliation. - Delayed impact to the preferred host species of GM. - Minimal gypsy moth-related change in tree and shrub species composition in treated areas.
Likelihood of Success of the Project	- Project objectives would not be met. - Gypsy moth would not be eliminated or suppressed in treatment sites. - Spread of GM into adjacent counties would not be slowed.	- Success is probable within individual treatment blocks - Slowing the spread of GM is probable, considerably delayinthe buildup and spread of gypsy moth. - New infestations will still occur in the future resulting in future projects.